

NAFTA Trade (and some extra NAFTA Trade) in Value Added and its Distribution, 1995-2011

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ABSTRACT

The trade deficit of the United States with his NAFTA partners, Mexico and Canada, increased since 1994 from 21,991 to 119,257 million dollars in 2013 (UNCOMTRADE, 2015), most of this increase it's explained by the growth in the volume of commerce between Mexico and the United States. Nonetheless, since the mid - 1990s Mexico has been experiencing its lowest economic growth rates. By using the WIOD (Timmer, Dietzenbacher, Los, Stehrer, and de Vries, 2015) and the Input-Output Analysis this paper presents an estimate of the intra-NAFTA trade flows in terms of value added and its distribution among both labor and capital; labor by skills level; and content of persons engaged. The findings show that trade between the NAFTA members it is quite different concerning value added. In 1995 the United States had a trade deficit of 30,351 million dollars with Canada, of which 6,384 million dollars were a surplus in favor of Canada in terms of value added. Similarly, the same year the United States had a deficit of 4,276 million dollars with Mexico that became a surplus for the latter of 4,561 million dollars in terms of value added. For the following years, until 2011, a similar pattern is observed. The distribution of this value added between capital and labor compensations tends to favor U.S.A. and Canadian workers, especially middle skilled labor and the sector that tends to have the lowest share are the low skilled Mexican and Canadian workers.

1. Introduction

On the first of January of 1994 the North American Free Trade Agreement (NAFTA) entered into effect, signed by Mexico, the United States and Canada. With this treaty it was hoped that, particularly in Mexico, greater economic growth, employment and wage rates would be observed. Today, after more than 20 years after the beginning of the agreement, the Mexican economy has not achieved greater growth rates, and in fact they are below those observed during the 1950 – 1980 time period. Annual average growth rates for the 50's, 60's and 70's were around 6.5 percent, and after the so called "lost decade" of the 80's, the higher annual average growth rate was the one observed in the 90's at 3.4 percent, a decade in which the largest volume of foreign trade was achieved¹.

¹ GDP growth rates for Mexico were calculated using World Bank data (2013)

The literature on the reasons why the Mexican economy has lagged behind the expected growth rates dwells on the need of deeper reforms, but also on the possibility that it was the way the nation entered the world economy the fact that helps to explain the lack of economic performance of the latter years. From the analysis of the Global Value Chains (GVC) and the way Mexico participates in them, this research estimates the domestic value added contained in trade flows between the NAFTA members, its distribution in labor and capital compensations, and its employment content (measured as the volume of persons engaged), in order to validate the second explanation given above, as one of the main reasons why Mexico's economic performance has not being as expected. The main goal is to show that, when the largest share of the volume of foreign trade it's constituted by intermediate goods and raw materials, not only a double accounting problem in trade flows is observed, but also that production specialization and trade of goods with a low value added content impose and additional restriction to the "export- led growth strategies"² and that , through factorial distribution of income as a consequence of exports and median income, it can also be explained how exports growth did not contributed to the growth of the Mexican economy significantly.

The rest of the document is organized as follows: in section 2, a brief literature review on the theoretical aspects of free trade advantages, free trade agreements and trade evolution between the NAFTA members, is made. Section 3 describes the method used in the estimation of the account balances of trade flows between the NAFTA members in terms of value added, its distribution as payments to factors of production and its employment content. In section 4, the estimation results for the total amount of value added, in both the intermediate and final goods trade flows, as well as its distribution in compensations to capital or labor, are reported. In section 5 a brief balance of persons engaged, directly or indirectly, in the intra – NAFTA trade is made and some conclusions are put forward in the last section.

2. Free trade, free trade agreements and the evolution of NAFTA

Since the publication of *An Inquiry into the Nature and Causes of the Wealth of Nations* by Adam Smith (2008, [1776]) it has been discussed that production specialization and free trade are both essential aspects for the better use of available and scarce resources. In an over simplified way, it is supposed that, if every individual exclusively does what it does best, more production can be achieved and, through free trade, each participant obtains more and better goods and services than without such free trade. However, the economic systems in which goods and services are traded through monetary payments are complex systems in which, during the resource allocation; the production volume; and the price determination processes, multiple and dynamic relationships can be observed between buyers and producers of raw materials, capital and consumption goods, financial services and labor. The latter implies that in the development of free

² In Giles and Williams (2000) can be found a survey of the extensive amount of empirical works measuring or validating the relationship between exports and economic growth.

trade theory more elements that help understanding free trade advantages, both at an individual and economic system levels, functioning with different currencies, had to be introduced.

After Smith, David Ricardo, around 1821, introduces the concept of the comparative advantage in order to highlight that, even when a particular agent or economic system do not possess an absolute advantage, gains can still be obtained if each agent or system focuses in the production of that in which is relatively better at. Furthermore, in the first decades of the XX century, Eli Hecksher and Bertil Ohlin noticed that, when trade is present between economies, the relative endowments of factors of production and natural resources constitutes the basis of trade advantages through relative prices of factors of production³ and of different forms of production that require a relatively more intensive use of any given factor, depending on the good being produced. From the latter, the Hecksher – Ohlin theorem is derived, according to which free trade advantages will also lead economies to a productive specialization. Such specialization is a consequence of economies being relatively labor-abundant produce more labor –intensive goods, while those economies with a relatively more abundant endowment of capital produce capital-intensive goods. Moreover, through the Leontief paradox and Paul Krugman’s elaborations, among others, more elements were added to the analysis of international trade and its advantages, such as the possibility of allowing, besides labor and capital, specialized labor in the production of capital- intensive goods and the achievement of economies of scale, which would explain the benefits of free trade between countries with similar factors of production endowments and trade under imperfect competition settings.

On the other hand, in works by List (1997,[1841]) and Prebisch (1949), arguments are put forward that are contrary to the idea that international trade without barriers is always advantageous for those economies involved. For List, free trade can represent a threat to the development of poor economies if such trade impairs the development of productive capabilities. This is, instead of considering trade as one of the causes of the “wealth of nations”, the author argues that the main cause of the wealth of nations is the enhancement of domestic production, institutional and political processes that enable the achievement of wealth, so that once such wealth is achieved, through trade, more benefits can be obtained. From List’s arguments on the need of protecting domestic industries, it can be thought of a dynamic version of the H-O model that would allow the distinction between the assumption of “a given relative endowment of factors of production” and the assumptions on the conditions that allow the accumulation of such factors, particularly capital and human capital.

For Prebisch, and the Latin-American structuralism (Rodriguez, 2006), the deterioration of the terms of trade is a risk that developing economies face when participating in international trade with the more developed ones. From the latter, additional considerations are introduced into the forms of production, on both the supply and demand sides, that might affect the gains derived from trade. It is argued that, for example, a differentiated productivity growth of tradable goods

³ This is the Ricardian version of comparative advantage, explained by the unit labor cost as a determinant of labor productivity.

would make median income to increase to a lesser rate than in those economies specialized in the production y commercialization of goods with a lower productivity growth rate (i.e. raw materials). Hence, trade advantages would not be obtained given lower levels of relative income. As for the demand side, different income elasticities of tradable goods demand would make that the median income of the economies specialized in the production and commercialization of low demand - income elasticity goods or low demand – price elasticity of exports, but high income elasticity of imports, explain why international trade gains can be lower for these economies when observing lower growth rates. Thus, by adding to the Kaldor-Dixon-Thirwall model (see Thirwall, 2013) the elements from the deterioration of the terms of trade thesis, if productivity is a consequence of income growth (Verdoon Law) and income is conditional on the terms of trade, free trade could lead not only to a divergence process between developed and developing economies but to the economic stagnation of the latter. This is, in the non-static analysis of the consequences of trade liberalization, it must be considered which are the determinants of both productivity and income growth. The latter given that it is trough income growth that companies guarantee their profits in order to achieve capital accumulation.

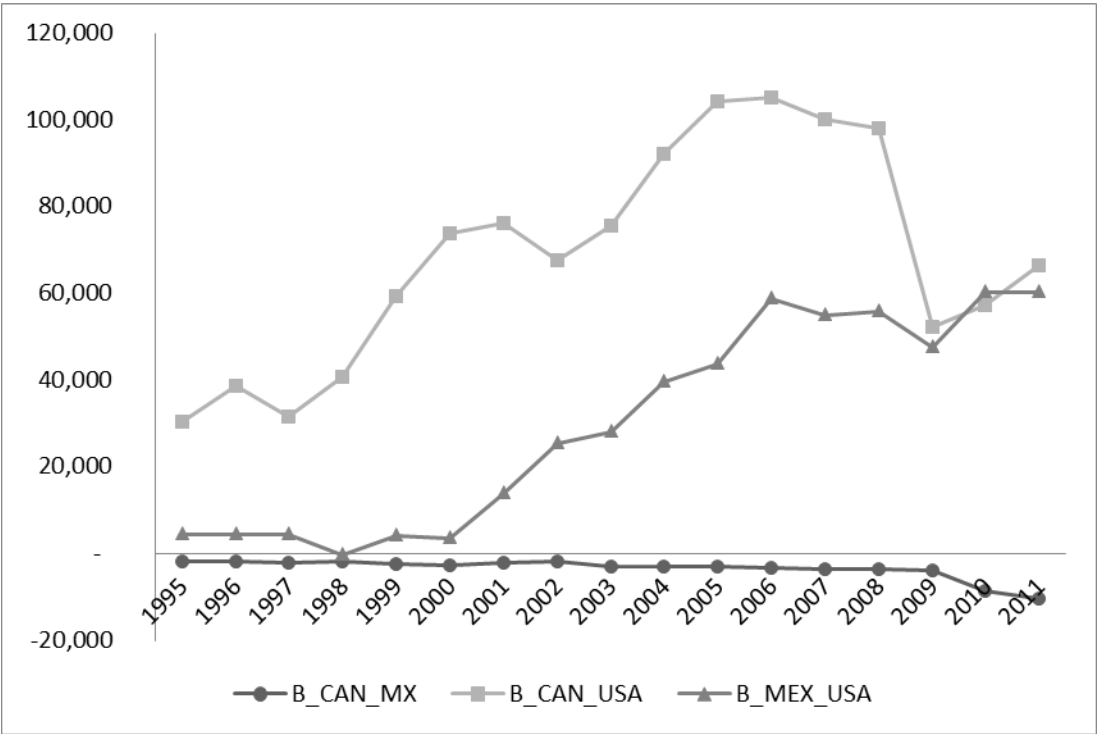
In the value added content analysis made in Cervantes y Villaseñor (2014), following the Kaldor-Dixon- Thirwall model, it is also argued that, distinguishing between the gross value of exports and the domestic value added content in them, allows for a better understanding of the conditions that must be attained in order for free trade, through exports growth, to translate in to larger economic growth rates. Furthermore, it is also argued that the analysis of the benefits of free trade that focus on the idea of final goods trade is inadequate given the XXI century trade patterns, in which it is not only wine or cheese that its being traded, or just manufactured goods using raw materials, but goods that are used in many stages of the production process. This is, through the analysis of international trade in terms of value added (see OECD–WTO, 2012 and Stehrer et al. 2013, and Gereffi 2013, among others) the estimation of the form in which the final value of finished goods is added, or the way in which the gains from trade are distributed in the form of payments to the factors of production, through direct or indirect trade of goods and services, is attempted. Moreover, for Gereffi (2013:11) and Kaplinsky (2000), the new trade patterns derived from the growth of the global production nets (GPN's) and “the dynamics of profits in global value chains” had been associated with “growth in income inequality levels”, both between individuals and between nations. And, it is possible that the distribution patterns that have led to this growth in inequality, affect the conditions that allow increasing the domestic demand of the nations involved, through the consumption and demand of investment goods.

Regarding free trade agreements, it was in Mexico in the mid – 80's when the liberalization of the economic activity begun and would be the basis for the signing of 11 free trade agreements, of which only one has not come into force. The latter amount of treaties implies that Mexico has preferential trade agreements with more than 40 nations, including most of the largest economies in the world. However, by signing the General Agreement on Tariffs and Trade (GATT), in Mexico trade barriers and tariffs for imports were unilaterally and significantly reduced: maximum and weighted average tariffs went from 100 y 23.5 per cent to 20 y 12.5 percent, respectively,

between June 1985 and June 1990; while the share of tradable goods production subject to import permits went from 92.2 percent to 19.9 percent in the same period, (Clavijo and Valdivieso, 2000:16). Thus, the negotiations for the signing of NAFTA initiated when the nation had already made significant advancements in the liberalization of its foreign trade, the latter being for some authors, the proof that these kinds of treaties are more related to the integration processes of the production systems than with the free exchange of merchandise. As an example, Puyana (2003) suggests that NAFTA, the treaty with the European Union, as well as the free trade agreement with the European Free Trade Association, are all projects that aim to achieve more freedom for foreign investment, which would also explain the way Mexico participates in the GVC's and the income distribution derived from exports.

Hence, with data from the WIOD, in gross terms, from 1995 to 2001, the trade balances between NAFTA members have been increasing in favor of surpluses for Canada and Mexico with the United States and of Mexico with Canada (see Figure 1). In 1995 the exports surplus of Canada to the United States and of Mexico to the United States were of 30,351 and 4,276 million dollars respectively, while the surplus of Mexico with Canada was of 1,692 million dollars. By 2011, the amounts increased to 66,414, 60,211 and 10,386 million dollars respectively. As it can be observed, the more significant increases were those of in favor of the Mexican economy.

Figure 1. Bilateral Exports Balances of NAFTA members, 1995-2011 (millions of dollars)



Source: Authors' estimations based on WIOD.

From Table 1 and Figure 2, it can also be observed that, of the exports between the NAFTA members, in average, 60 percent is of intermediate goods. And, during the whole period, the United States is the largest exporter of intermediate goods with, approximately, 44 percent of the total exports and 63.5 percent of its total exports. However, the trade balances change when breaking down these two exports categories. Particularly, from 1995 to 2003, Mexico had a deficit in trade of intermediate goods with the United States, while from 2003 onwards most of the surplus of Canada would be explained by the surplus derived from the trade of intermediate goods with the United States.

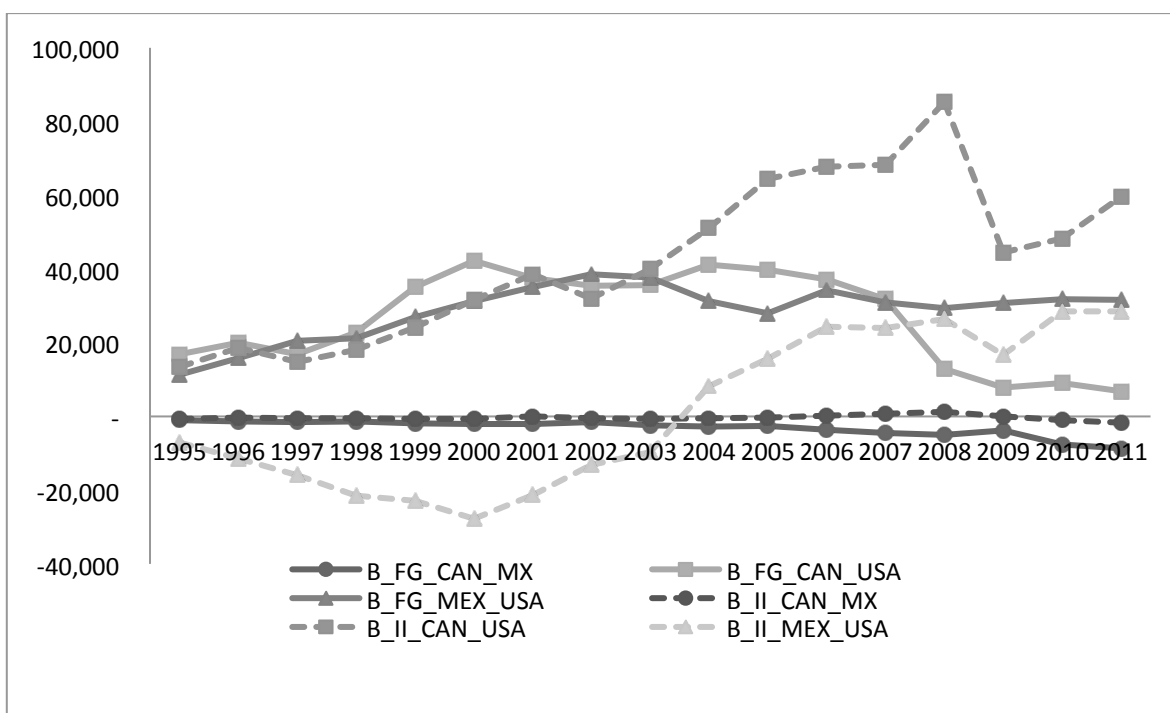
Table 1. Intra-NAFTA exports by type of product, 1995-2011 (millions of dollars)

	Intermediate Inputs			Final goods			Intermediate Inputs exports' share of total exports		
	Canada	Mexico	United States	Canada	Mexico	United States	Canada	Mexico	United States
1995	81,391	30,412	102,715	62,041	26,187	58,351	56.7	53.7	63.8
1996	90,274	36,345	115,757	67,332	34,221	63,644	57.3	51.5	64.5
1997	97,474	42,118	136,498	73,487	43,449	77,090	57.0	49.2	63.9
1998	99,859	40,275	138,907	79,102	49,790	81,816	55.8	44.7	62.9
1999	111,244	46,962	150,267	94,142	58,085	85,785	54.2	44.7	63.7
2000	130,064	57,633	175,508	105,014	69,347	95,668	55.3	45.4	64.7
2001	128,109	52,388	155,203	128,109	52,104	128,027	56.8	42.6	63.2
2002	121,539	56,774	152,120	95,732	71,367	86,908	55.9	44.3	63.6
2003	134,088	60,532	156,656	101,022	69,265	90,548	57.0	46.6	63.4
2004	159,687	83,741	174,647	112,083	64,714	96,904	58.8	56.4	64.3
2005	184,378	95,448	189,270	118,424	64,383	106,489	60.9	59.7	64.0
2006	196,919	112,236	204,882	121,682	76,028	115,882	61.8	59.6	63.9
2007	204,808	120,462	220,043	124,304	77,643	127,677	62.2	60.8	63.3
2008	219,896	126,529	220,022	108,145	78,349	132,211	67.0	61.8	62.5
2009	154,063	91,760	173,648	84,295	72,391	108,179	64.6	55.9	61.6
2010	187,719	126,712	222,595	99,017	86,498	130,855	65.5	59.4	63.0
2011	217,057	149,499	260,142	109,225	99,947	155,451	66.5	59.9	62.6

Source: Authors' estimations based on WIOD.

By type of product at industry level, Table 2 shows that, in average, from 1995 to 2001 between the three nations, the greater volume of trade is concentrated in exports of manufactured goods. However, for the United States, almost half of its total exports to its commercial partners are in the form of intermediate goods from manufacturing industries, particularly high- technology goods. Mexico is also the nation in which raw materials exports are higher, both in the form of intermediate and final goods. As for Canada, the greatest volume of its exports are from intermediate goods as manufactures, but differently from the United States, such volume is much more concentrated towards the export of mid- technology and raw materials manufactures.

Figure 2. Bilateral Exports Balances of NAFTA members by type of export, 1995-2011
(millions of dollars)



Source: Authors' estimations based on WIOD.

Table 2. Exports' share by type of product, 1995-2011 (average)

		Canada	Mexico	United States
Intermediate inputs	Primary goods	11.2	14.2	3.5
	A. Manufactures based in natural resources	12.5	2.2	8.5
	B. Medium Tech manufactures	16.3	9.1	19.5
	C. High tech manufactures	11.8	21.7	22.8
	Manufacturing, Nec; Recycling	1.0	3.3	0.5
	Manufacturing	41.6	36.3	51.3
	Other exports	6.9	2.2	8.7
Final goods	Primary goods	1.3	1.0	0.6
	A. Manufactures based in natural resources	6.1	7.5	7.1
	B. Medium Tech manufactures	4.3	1.8	3.5
	C. High tech manufactures	24.8	34.0	22.4
	Manufacturing, Nec; Recycling	2.3	1.2	1.4
	Manufacturing	37.4	44.5	34.5
	Other exports	2.5	0.8	2.3
Total		100	100	100

Source: Authors' estimations based on WIOD.

These trade patterns between NAFTA members, not only illustrate the kind of trade derived from vertical specialization, but that it is possible from a given form of task distribution in the productive process to generate the gains from trade. The latter being, according to Gereffi (2014), a U form pattern for the relationship between tasks or stages of the productive process and the generation of value added, a pattern that would also be subject to changes derived from technological development, but that actually indicates that the first stages of the productive process involve research and development, other products design, and purchasing logistics; in this order the value added goes from more to less until reaching the tasks that remunerate the less to the factors of production which would be the actual production tasks (transformation) and assembling so that once the products are made, the logistics of selling (distribution), marketing, and after- purchase service start to generate more value added. In the following section, a description of the methods used to breakdown the value of exports intra- NAFTA in terms of value added and by country of origin of the factors of production, is given. And, in the next sections we will focus in the difference between the bilateral balances in gross exports and in value added, since for Mexico most of its volume of commerce is intra-NAFTA, in order to show that even if the gross balances of trade and the value added balances are only different in bilateral terms; these differences could be important in place and time for economies that are mostly integrated to one partner.

3. Value Added and Employment Content in Trade

The method employed for the distribution of value added and content of employment, in direct and indirect exports, between the NAFTA members follows the traditional input - output analysis based on demand. As a starting point, a set of fixed proportion production functions its used and through which it is assumed that, for each product, is necessary an unique combination of intermediate inputs, raw materials and components, labor and capital, so that there is no substitution between inputs or factors of production. It is considered that, for a given period, satisfying the demand implies a set of intermediate transactions and payments to the factors of production. Also, since it is a demand model, the method employed does not explain the value added content in terms of changes in productivity, economies of scale or market power. The method is just an approximation to the description of what happened, assuming that the market conditions were given and that any observed change in the generation of value, labor content and as well as other inputs could be explained by the changes in the demand and /or in the supply. In research conducted by Ferrarini (2011), Timmer and de Vries (2012) and Erumban et al. (2011), the authors show in detail how the method employed here represents the GVC's as a geographical and sectorial model of value distribution of the final production.

For countries like China and Mexico, estimation and analysis of value added content in exports has been performed by Chen et al. (2005), Chen et al. (2008), He and Zhang (2010), Koopman, Wang and Wei (2008), Lau et al. (2006), Los, Timmer, and de Vries (2012), De la Cruz, Koopman and Wang (2011), Larudee (2012), Fujii and Cervantes (2013a y 2013b); and Shafaeddin and Pizarro (2010). From all the latter research, it can be argued that for China, as well as Mexico, there is a significant difference between exports value and value added, generated in their national

economies as a consequence of the use of imported inputs. Furthermore, trade balances between two or more economies in terms of national value added has not been thoroughly explored yet. Lau et al. (2006) presents an estimation of the trade relationship between China and the United States in which it is found that, after discounting the value of imported direct and indirect inputs found in trade flows between both countries, the trade deficit of the United States with China would be about 4 to 5 times lower⁴. Moreover, Johnson and Noguera (2012) estimate bilateral trade in terms of value added for 94 countries and regions, finding that: 1) the range of coefficients of national value added of a country's exports varies significantly among countries; 2) as a consequence, bilateral trade balances in terms of value added tend to differ from those measured by traditional means and; 3) in the context of this research, "Looking at the U.S.... (its) Value added exports to Canada are \$77 billion (40%) smaller than gross exports, and value added exports to Mexico are \$40- \$50 (36-44%) smaller." (Johnson and Noguera 2012:233). But, according to the estimations made by the same authors, the trade deficit of the United States with Canada of almost 40 billion dollars, in gross terms, would be about 35 billion dollars in value added terms; while for Mexico this would go from a 10 billion dollars deficit to about 4 billion surplus in value added terms, in 2004, (Johnson and Noguera, 2012:234, Fig 4). Stehrer (2012) also finds that the US trade deficit with the rest of the world will be explained differently in terms of value added than in gross terms, and he also explains the conceptual differences between the analysis of "trade in value added" (TIVA) and the "value added in trade" (VAIT) that are found in the literature, that we will later discuss.

Finally, Benedetto (2012) and Stehrer (2012) point out that the estimations of trade flows in terms of value added do not strictly modify the total amounts of trade balances, given that, for example, if the national value added content of exports of China is less than the gross value of their exports, the foreign value added content of imports of China as final goods, would also be less. Hence, the methodology used in this research only allows to eliminate the problem of double accounting in the trade flows among NAFTA members; at the time that "true gains from trade" are estimated between the three nations, locating geographically and by sector the areas in which the value added integrates gradually to final value of the products sold; so that the model used is an ex post distribution model of the production value.

With data from the *World Input Output Database* (WIOD) on the total transactions matrices for all the available years of the period from 1995 to 2011, the international merchandise flow is considered, distinguishing the ones that will be integrated in other processes from those that satisfy the final demand volume, according to the origin and destination by industry and country. From these transaction matrices the direct requirement matrices are derived, B_t ; and, assuming

⁴ Their methodology is based in an estimation of the national value added content in exports from the United States to China and vice versa. The latter resulting in the fact that, in average, between 2002 and 2005, the percentage of national value added contained in exports from the United States to China was 87.3 percent; while the percentage of national value added content of exports from China to the United States was 36.8.

that it is the final demand of goods and services , \mathbf{f}_t , the one determining (in the short run) the gross volume of production, \mathbf{y}_t :

$$\mathbf{y}_t = (\mathbf{I} - \mathbf{B}_t)^{-1}\mathbf{f}_t \quad (1)$$

Where \mathbf{y}_t is a vector of the gross value of production by industry/country of origin, for period t , \mathbf{B}_t is a squared matrix with a dimension of n countries by m industries, in which each element represents the proportion of direct input of industry i , country p incorporated in the production of industry j , in country q and, $(\mathbf{I} - \mathbf{B}_t)^{-1}$ is the known Leontief inverse. The problem of double accounting of the national and international trade flows is solved by using a value added matrix by industry sector and country of origin (residence) of the factors of production:

$$\text{WVA}_t = (\mathbf{V}_t(\mathbf{I} - \mathbf{B}_t)^{-1}\mathbf{F}_t \quad (2)$$

Where WVA_t is a squared matrix which elements represent the value added generated in each industry in each country by the volume of the final demand. \mathbf{V}_t is a diagonal matrix of value added coefficients and \mathbf{F}_t is the diagonal matrix of final demand by country of origin/destination. For this research, a breakdown of the final demand matrix , \mathbf{F}_t , into matrices of final demand that NAFTA members satisfy, either by domestic consumption or demand from the rest of the world and final good exports matrices intra NAFTA, is made. Equations (3) through (11) represent the value added generated directly or indirectly in industry i , country p , the final demand that directly satisfies the final production of each NAFTA member, and the direct exports of final goods between them:

$$\text{WVA}_{can,t} = (\mathbf{V}_t(\mathbf{I} - \mathbf{B}_t)^{-1}\mathbf{F}_{can,t} \quad (3)$$

$$\text{WVA}_{mex,t} = (\mathbf{V}_t(\mathbf{I} - \mathbf{B}_t)^{-1}\mathbf{F}_{mex,t} \quad (4)$$

$$\text{WVA}_{usa,t} = (\mathbf{V}_t(\mathbf{I} - \mathbf{B}_t)^{-1}\mathbf{F}_{usa,t} \quad (5)$$

$$\text{WVA}_{can_mex,t} = (\mathbf{V}_t(\mathbf{I} - \mathbf{B}_t)^{-1}\mathbf{E}_{can_mex,t} \quad (6)$$

$$\text{WVA}_{can_usa,t} = (\mathbf{V}_t(\mathbf{I} - \mathbf{B}_t)^{-1}\mathbf{E}_{can_usa,t} \quad (7)$$

$$\text{WVA}_{mex_can,t} = (\mathbf{V}_t(\mathbf{I} - \mathbf{B}_t)^{-1}\mathbf{E}_{mex_can,t} \quad (8)$$

$$\text{WVA}_{mex_usa,t} = (\mathbf{V}_t(\mathbf{I} - \mathbf{B}_t)^{-1}\mathbf{E}_{mex_usa,t} \quad (9)$$

$$\text{WVA}_{usa_can,t} = (\mathbf{V}_t(\mathbf{I} - \mathbf{B}_t)^{-1}\mathbf{E}_{usa_can,t} \quad (10)$$

$$\text{WVA}_{usa_mex,t} = (\mathbf{V}_t(\mathbf{I} - \mathbf{B}_t)^{-1}\mathbf{E}_{usa_mex,t} \quad (11)$$

In which the sub-indices *can*, *mex* y *usa* in the value added multiplier matrices, WVA , represent the country of “origin” of the finished goods. Thus, for example, in equation (3), $\mathbf{F}_{can,t}$ is the diagonal matrix of world final demand that it is satisfied with final goods from Canada, therefore, from the value added matrix $\text{WVA}_{can,t}$, for all the set of rows for which $p = mx$ and $p = usa$, the

value added generated in these countries is added in order to obtain the total intermediate inputs exports that these countries sell to Canada, in terms of value added. Since we are considering all the direct and indirect effects that the final production of a NAFTA member will have in the value added generation of the other two members, with these estimations our results differ from those found in Stehrer (2012). And the importance of those differences is that if the method for calculating the value added of intermediate inputs exports accounts for direct and indirect exports, this could imply a limitation for the interpretation of the advantages derived from NAFTA for each of its members. The latter since it is possible that some of the Mexican value added content in the gross value of Canadian final production is a consequence of selling intermediate inputs to a non-NAFTA country which in turn re-exports as an intermediate input (the Mexican product plus more inputs and value added), and then in Canada the final product is finished. As it will be shown in the next section, considering the total indirect effects widens the difference between the gross bilateral balances of trade and the value added bilateral balances, mostly because of the way each NAFTA member is integrated with the rest of the world.

Furthermore, from equations (6) to (11), the value added matrices generated indicate the total value added content (direct or indirect) of the final goods exports between NAFTA members. Therefore, for example, in equation (6) the diagonal matrix of final goods exports from Canada to Mexico, $E_{can_mex,t}$, by rows, indicates the value added generated by industry and country that participates in the final goods value chain exported to Mexico from Canada. In this matrix for all $p \neq can$ the total value added generated directly or indirectly as industries / countries that export intermediate inputs, is accounted for.

In order to obtain the bilateral and total trade balances of trade flows between NAFTA members in terms of value added, in equation (1) to (3) the total value added is added for both countries members of NAFTA that are not the final producer; while in equations (6) to (11) only the value added of the country that exports the final goods, is considered.

In order to perform the labor content analysis, such is estimated in the same way the value added of intra- NAFTA trade flows were estimated; by substituting in equations (3) to (11) the diagonal matrices of value added coefficients, V_t , by diagonal matrices of labor coefficients, L_t , which elements are obtained from dividing the total amount of persons engaged in production by industry and country of origin between the gross product of the respective industry. For the latter the WIOD socioeconomic statistics were used and also, from these data, estimations of the distribution of value added between compensations to capital, labor and labor by skill levels, were performed. In the following section results for the entire above are presented.

4. Balance of trade in value added and its factorial distribution.

Considering that, for the all of its members the signing of NAFTA could bring direct and indirect effects into the domestic economies, in this paper we choose an estimation of the trade balances in terms of value added that represents a broader estimation than the estimations known as Trade

in Value Added (TiVA) that measure “the value added of a particular country r (that) is contained in consumption (f^s) of another country s .”(Stehrer, 2012:2) and the estimations of bilateral balances of Value Added in Trade (VAiT) that exclude the indirect effects through third parties.

In Table 3 the results of estimating trade flows between NAFTA members compared with the measurement of these flows in terms of their gross values show that, if other countries are involved in the production of goods and services, the differences in the proportions of intermediate inputs that come from the rest of the world, provoke that for trade between Mexico Canada, and the United States, in average, the value added proportion over the gross value of exports to be less for Mexico and Canada. For the whole period, in average, the value added of the United States as a proportion of its own exports equals 74.1 percent, while for Canada and Mexico these proportions are 65.7 and 59.6 percent, respectively. However, between 1995 and 2011, for Mexico and the United States a slight trend towards a lesser content of domestic value added in their exports is present; for Canada the opposite can be observed; the latter since, as observed in Figure 2, towards the end of the period most of Canada’s surplus with the United States was explained by a trade surplus of intermediate inputs.

In Figure 3 it can be observed that the bilateral trade balances can change significantly when measured in terms of value added. As for the trade relationship between Mexico and the United States, the increasing surplus of Mexico, in reality represents a deficit in terms of value added for the period of 1995 to 2003. Given that in both countries exports, intermediate inputs from Mexico and the United States can be present, if the gross value balance was 4,276 million dollars in favor of Mexico in 1995, in value added the balance was of 4,561 million dollars in favor of the United States, the latter without considering the possibility that the compensations to capital contained in the domestic value added can be due to foreign capital. Towards 2011, the corresponding amounts were 60,211 million dollars of surplus for Mexico in gross value and 19,901 in terms of value added.

As for the bilateral trade balance between Canada and the United States, it can also be observed that the surplus in favor of Canada is less in terms of domestic value added and that, towards the end of the period, the gap between both surpluses tends to close, the latter can be attributed either to the increase in the incorporation of intermediate inputs produced in Canada or, as previously observed, the increase of the surplus of Canada with the United States explained by the trade surplus of intermediate goods.

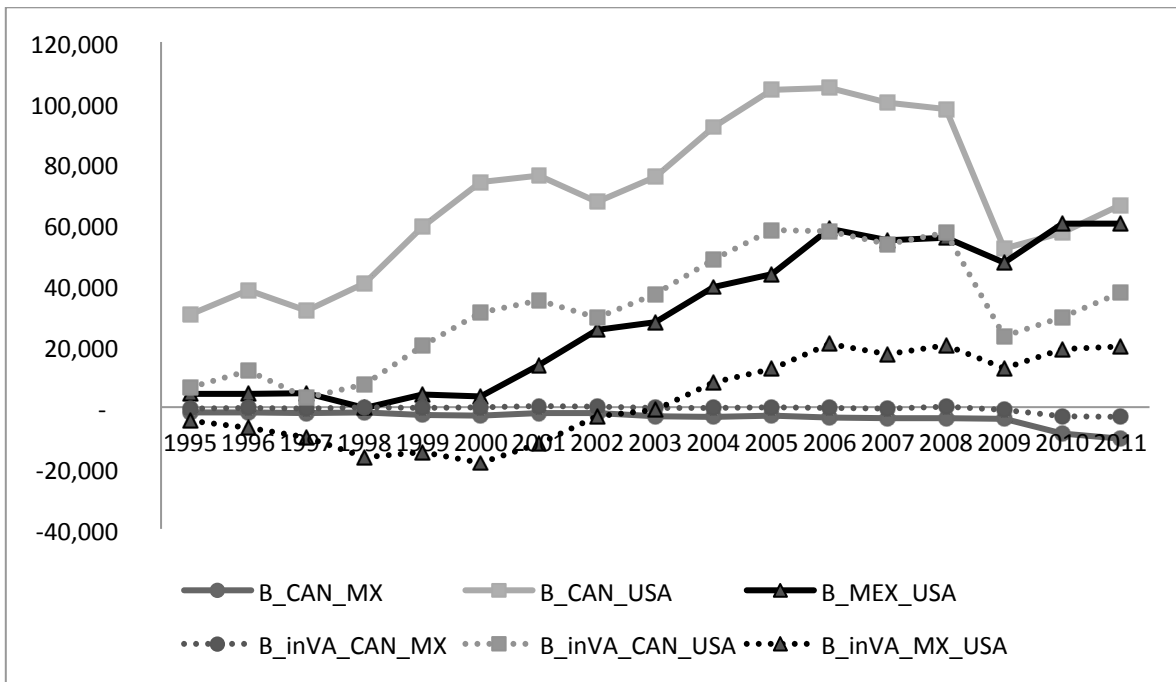
The trade relationship between Mexico and Canada, also changes when the analysis is made in terms of value added, given that the Canadian trade deficit in 1995 of 1,692 million dollars was reduced to 488 million dollars in terms of value added, and in 2011, the gap between deficits for Canada widened from 10,386 million dollars in gross value terms to 3,195 in value added terms.

Table 3. NAFTA trade in Gross Value and in Value Added

	Canada					Mexico					United States				
	VA	Direct VA	GV	VA/GV	DVA/VA	VA	Direct VA	GV	VA/GV	DVA/VA	VA	Direct VA	GV	VA/GV	DVA/VA
1995	90,882	50,870	143,432	63.4	56.0	34,707	19,373	56,599	61.3	55.8	120,574	57,983	161,066	74.9	48.1
1996	100,951	56,058	157,606	64.1	55.5	43,233	25,693	70,566	61.3	59.4	134,923	64,871	179,402	75.2	48.1
1997	107,024	60,215	170,961	62.6	56.3	51,940	31,535	85,566	60.7	60.7	160,962	76,211	213,589	75.4	47.3
1998	111,230	62,987	178,961	62.2	56.6	53,508	31,282	90,065	59.4	58.5	168,216	80,728	220,723	76.2	48.0
1999	128,723	74,408	205,386	62.7	57.8	61,838	36,423	105,047	58.9	58.9	178,123	84,748	236,052	75.5	47.6
2000	148,640	84,407	235,078	63.2	56.8	74,116	44,829	126,980	58.4	60.5	201,246	97,676	271,176	74.2	48.5
2001	145,453	80,429	225,673	64.5	55.3	72,472	42,696	122,966	58.9	58.9	185,994	89,140	245,443	75.8	47.9
2002	141,618	77,202	217,272	65.2	54.5	76,765	44,898	128,141	59.9	58.5	183,293	91,142	239,029	76.7	49.7
2003	157,294	85,703	235,110	66.9	54.5	76,877	45,825	129,797	59.2	59.6	188,624	92,897	247,204	76.3	49.2
2004	179,219	99,659	271,769	65.9	55.6	86,539	53,274	148,454	58.3	61.6	198,233	104,486	271,551	73.0	52.7
2005	202,210	113,375	302,802	66.8	56.1	95,020	58,125	159,831	59.4	61.2	214,300	110,495	295,759	72.5	51.6
2006	211,100	118,462	318,601	66.3	56.1	112,605	70,396	188,264	59.8	62.5	230,425	119,465	320,764	71.8	51.8
2007	219,029	123,094	329,112	66.6	56.2	118,660	74,921	198,105	59.9	63.1	250,371	125,861	347,720	72.0	50.3
2008	220,479	130,105	328,041	67.2	59.0	123,914	78,675	204,878	60.5	63.5	248,779	123,217	352,233	70.6	49.5
2009	166,852	94,459	238,358	70.0	56.6	98,531	58,262	164,151	60.0	59.1	215,604	112,081	281,827	76.5	52.0
2010	200,423	110,507	286,737	69.9	55.1	124,664	77,149	213,210	58.5	61.9	257,778	138,824	353,450	72.9	53.9
2011	226,512	127,604	326,283	69.4	56.3	147,124	94,797	249,446	59.0	64.4	293,773	160,338	415,593	70.7	54.6

Source: Authors' estimations based on WIOD.

Figure 3. Exports bilateral balances in Gross Value and in Value Added

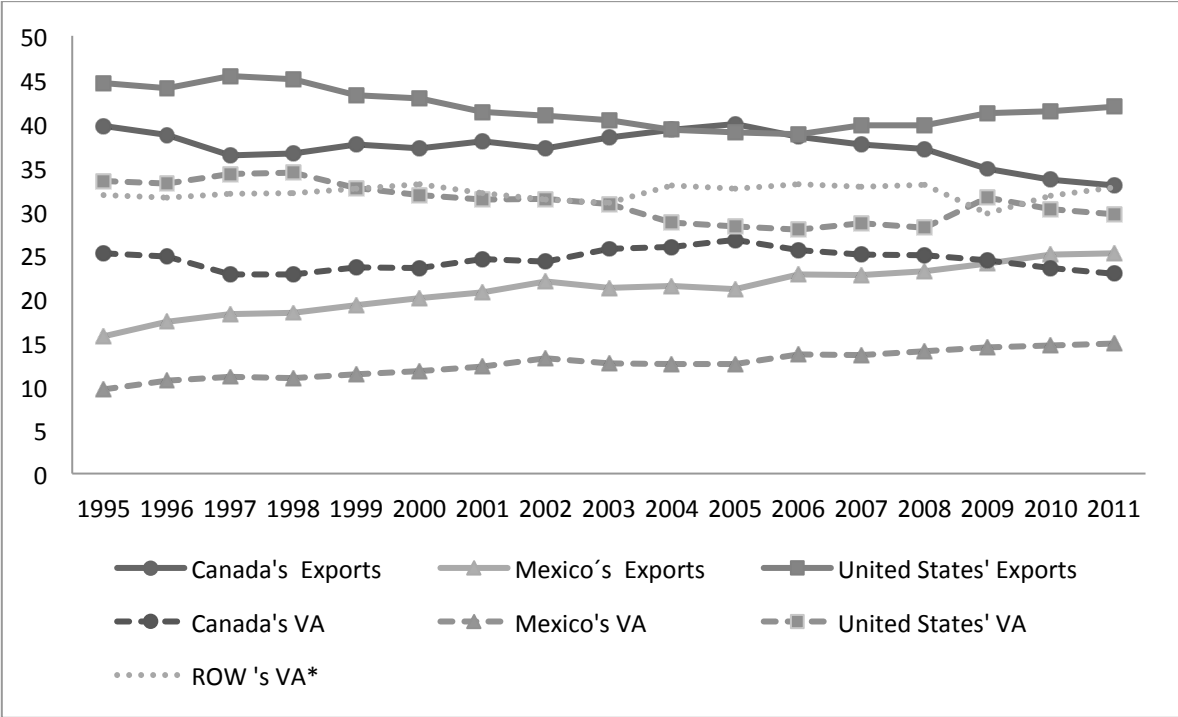


Source: Authors' estimations based on WIOD

The general trade balance for the three NAFTA members, once the double accounting in trade flows is eliminated, shows that between 1995 and 2011, according to the estimations performed in this research, the value added generated by the Mexican and Canadian economies would have

been less than the value added generated in the rest of the world.⁵ Even more, it can be observed that, even for some sub periods (2000-2001, 2003-2008 y 2010-2011), the value added generated in the United States would also be less than the one generated by the rest of the world (see Figure 4).

Figure 4. Share of NAFTA's Exports in Gross Value and in Value Added



Source: Authors' estimations based on WIOD.

Additionally, considering that in the shared international production, multinational companies participate, especially in economies like the Mexican one, breaking down the value added in compensations to capital and labor allows to further advance in defining the type of prerequisites that must be fulfilled in order for exports growth to translate into economic growth. This is, considering that the multiplier effect of exports assumes that the income generated by these exports equals an increase of the domestic demand of consumption and/or capital, once the intermediate inputs content of imported origin plus the marginal propensity to import consumption goods and capital is discounted; it must be considered that the compensations to capital to which multinational companies are entitled to, could be brought back to the country, spent or saved in different economies to the one directly exporting; such that it is the

⁵ In these value added estimations for the rest of the world a estimation of the international transport margins is included together with the net tax balance for all the countries involved, so the domestic value added for each country to be interpreted only as payments to factors of production.

compensations to labor the ones that come back to the system in the form of consumption goods and savings.

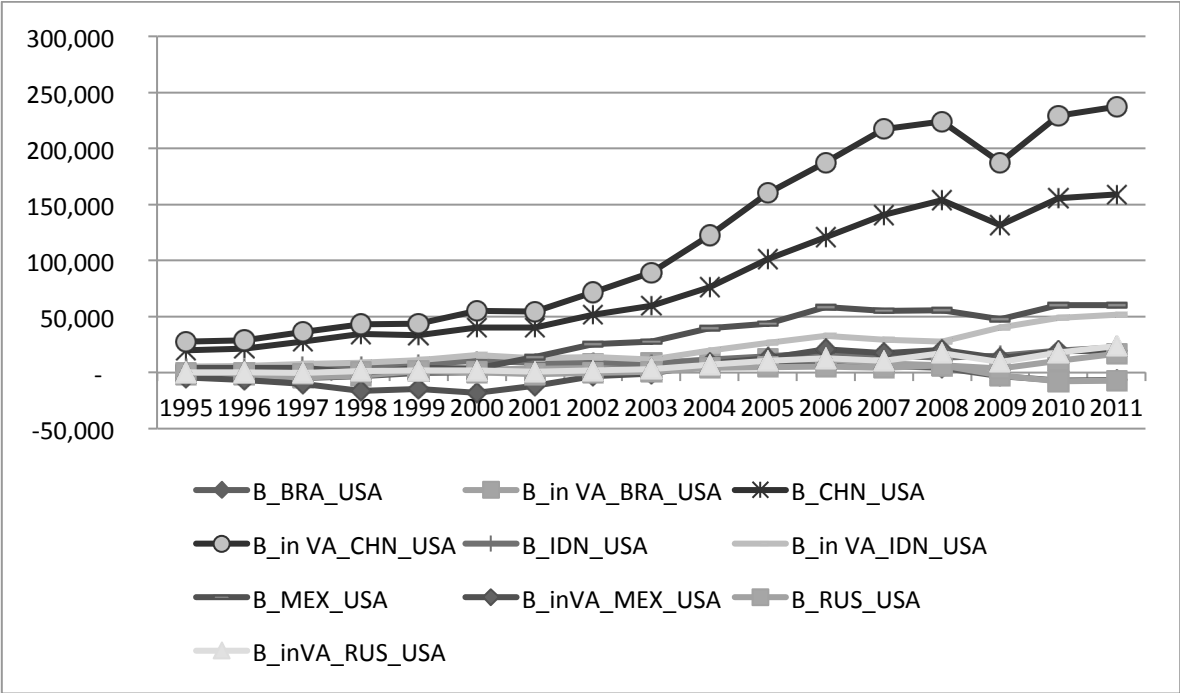
These results in the estimation of the bilateral balances in terms of value added seem quite unfavorable for the Mexican economy, especially as it can be seen in the Table 4 and Figure 5, for China and India although there are wider gaps between their trade surplus with the US in gross exports and in value added, in millions of dollars, on average these that gaps are relatively smaller. And, again the main difference between our estimations and the ones presented in Johnson and Noguera (2012) and Stehrer (2012) is that we account for some indirect exports from the NAFTA members through a third country that might be a NAFTA member or not. Therefore, since the Mexican economy is less integrated to the rest of the world than the US and Canadian economies as an intermediate input supplier, in our estimations the Mexican surplus with the United States in value added in 2005 equals 12.5 billion dollars while in Stehrer equals 36.1 billion (Stehrer, 2012:12)

Table 4. Bilateral Balances in Gross Exports an in Value Added for US partners.

	Brasil		Canada		China		India		Mexico		Rusia	
	B_X	B_VA	B_X	B_VA	B_X	B_VA	B_X	B_VA	B_X	B_VA	B_X	B_VA
1995	- 2,776	- 2,202	6,384	30,351	19,909	27,569	3,637	5,398	- 4,561	4,276	- 18	- 436
1996	- 2,556	- 1,768	11,904	38,533	21,527	28,695	4,033	5,904	- 6,872	4,354	256	- 435
1997	- 4,633	- 4,135	3,062	31,683	27,637	36,178	5,381	7,639	- 9,968	4,469	- 290	- 1,013
1998	- 3,308	- 2,469	7,574	40,851	34,301	43,009	6,003	8,834	- 16,453	- 318	1,271	809
1999	- 374	1,200	20,176	59,331	33,265	43,406	7,456	10,991	- 14,856	4,158	1,676	1,232
2000	439	2,752	31,084	73,942	40,319	55,253	10,725	15,393	- 18,305	3,480	1,953	271
2001	859	3,820	35,070	76,059	40,055	54,529	8,846	12,953	- 11,972	13,776	652	- 1,408
2002	4,242	7,851	29,297	67,455	51,397	71,435	9,510	14,169	- 3,051	25,413	2,142	- 97
2003	5,675	9,026	37,076	75,610	59,813	89,077	7,688	11,529	- 917	27,927	3,120	958
2004	7,749	11,496	48,512	92,167	76,264	122,499	11,685	19,372	8,161	39,512	7,288	4,223
2005	8,802	12,206	58,140	104,319	101,180	160,200	14,720	26,526	12,523	43,690	10,301	4,810
2006	8,672	11,465	57,795	104,973	120,968	187,396	18,103	32,667	20,827	58,655	12,869	5,265
2007	5,884	8,482	53,612	100,066	140,649	217,141	15,012	29,398	17,342	54,786	10,749	4,100
2008	4,290	6,675	57,379	97,995	153,902	223,870	13,551	27,524	20,294	55,782	17,432	6,669
2009	- 3,306	- 2,807	23,310	52,199	131,522	187,676	15,338	40,236	12,810	47,469	9,603	3,666
2010	- 7,025	- 7,778	29,536	57,278	155,549	229,216	19,755	48,790	18,982	60,348	17,693	10,693
2011	- 6,866	- 6,969	37,669	66,414	159,112	237,503	22,468	51,581	19,901	60,211	23,856	17,035

Source: Authors' estimations based on WIOD.

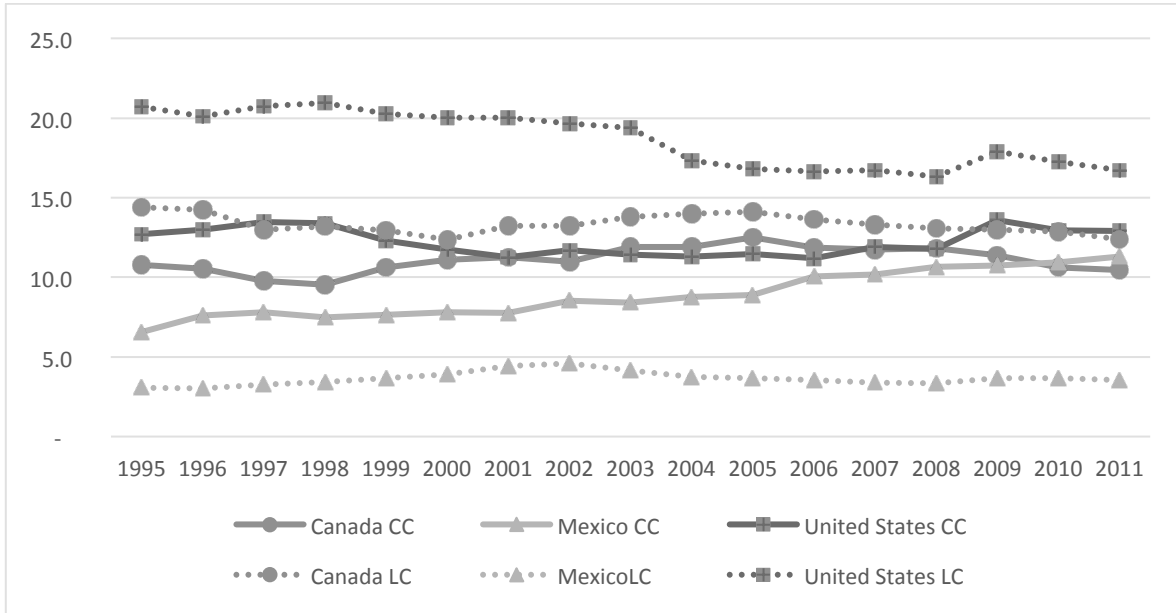
Figure 5. US bilateral balances of trade in gross exports and in Value Added



Source: Authors' estimations based on WIOD.

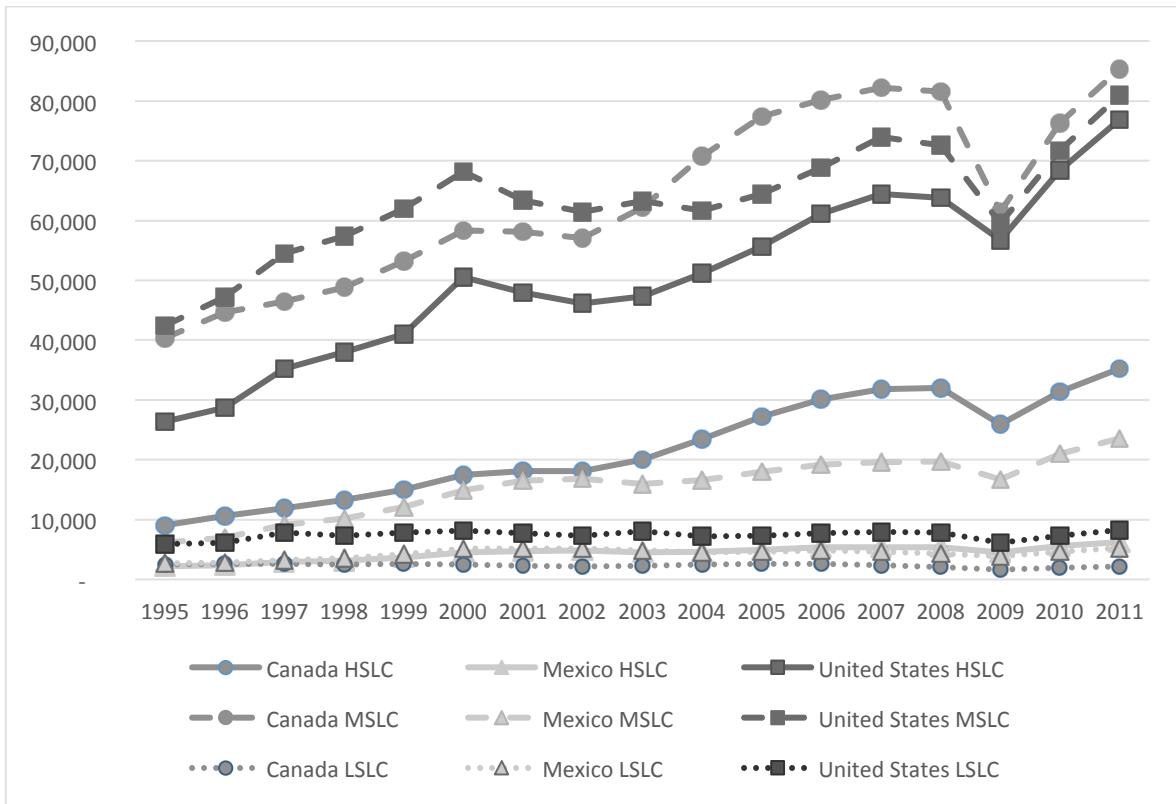
For the factorial distribution of domestic value added due to trade flows between NAFTA members, figure 6 shows the estimation results of the compensations to capital and labor as proportions of the gross value of the total of exports. As can be observed, firstly, most of the participation percentages correspond to compensations to labor in the United States, with a diminishing trend throughout the whole period. Secondly, the lowest participation in the distribution of value added corresponds to the compensations to labor in Mexico. Both for the United States and Canada during the whole time period considered, compensations to labor are larger than the compensations to capital, for Mexico the opposite can be said. In average, a little more than 18 percent of exports value added between the three members corresponds to labor compensations in the United States, 13.3 percent of labor compensations in Canada and, 3.1 percent for Mexico. Furthermore, in Mexico the gap between labor and capital compensations widens throughout the period considered. Even though is not one of the objectives of this research to empirically link such distribution to the households consumption goods demand and the companies investment goods demand, two main aspects of this distribution pattern must be considered when linking theoretically the benefits from trade liberalization and economic integration with economic growth: 1) as mentioned before, for developing countries such as Mexico, a significant volume of its exports is made by transnational companies that can (or not) decide on whether to bring back their utilities in order to reinvest them in different economies; 2) low levels of labor compensations derived from export activities may have an insignificant impact on the effective domestic demand; so that this “re-flow” of income do not guarantee that exports will constitute the main drive for economic growth in emerging economies.

Figure 6. Capital and Labor Compensation in NAFTA Trade (percentage)



Source: Authors' estimations based on WIOD.

Figure 7. Labor Compensation by Skill Levels



Source: Authors' estimations based on WIOD.

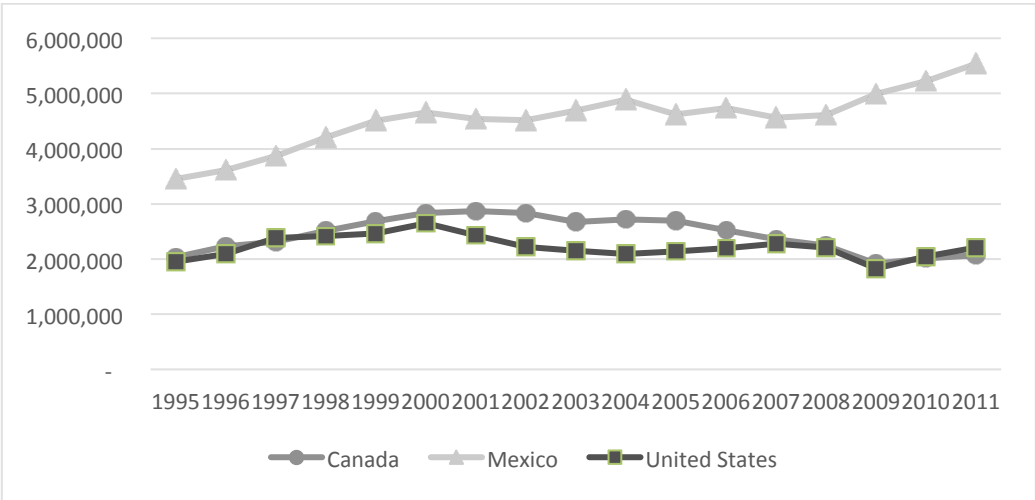
By skill level, labor compensations directly and indirectly generated by trade flow between NAFTA members show a distribution pattern that tends to compensate medium- skilled labor in the three countries. For American workers, throughout the whole period, a tendency towards a larger participation of labor compensations for high –skilled workers can be observed. The lower compensations are for low- skilled workers in Canada and Mexico, followed by highly-skilled workers in Mexico and low-skilled workers in the United States.

5. Number of persons engaged in NAFTA

Regarding the number of individuals involved in trade between Mexico, Canada and the United States, figures 7 and 8 show the total volume by country and the per capita value added derived. As expected, the larger volume of individuals (workers and owners) can be found in the Mexican economy and with an increasing trend slightly greater than the one of its commercial partners throughout the whole time period considered. This is, if by the beginning of the period, the total amount of individuals directly and indirectly involved in intra-NAFTA trade was about 7.4 million, of which 46.4 resided in Mexico, towards 2001 of the 9.8 million involved, 56.4 percent (5.5 millions) resided in Mexico.

The relatively larger growth of employment associated with NAFTA trade in Mexico, however, did not translated into a fall in per capita value added; this is, even though throughout the whole period, per capita value added in Mexico was the lowest, with 10,053 dollars in 1995 and 26,592 dollars in 2011; in comparison with the 61,725 and the 120,574 dollars of per capita value added in Canada and the United States, respectively, in 1995 and the 226,512 and 293,773 dollars in 2011: per capita value added in Mexico went from being almost 6.4 times lower than the one generated in the United States in 1995 to be 5 times lower in 2011. As for the Canadian per capita value added, a reduction in the per capita value added gap relative to the one generated in the American economy, can be observed.

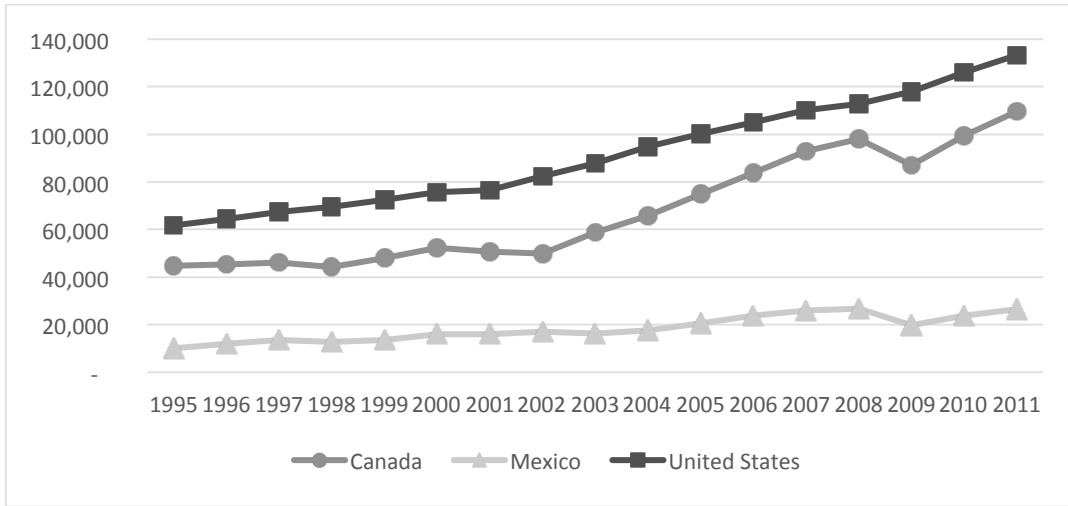
Figure 8. Total number of persons engaged in NAFTA



Source:

Authors' estimations based on WIOD.

Figure 9. NAFTA in VA per person engaged



Source: Authors' estimations based on WIOD.

6. Conclusions

From the analysis presented in this research the following final remarks are put forward:

1. Both for Mexico and Canada, their recent commercial surpluses with the United States are significantly different in terms of value added. In fact, for the Mexican economy, in the first years of NAFTA, its gross value of exports surplus with the United States was actually a deficit in terms of value added.
2. Of the trade between all three NAFTA members, throughout the whole period considered, the economy of the United States is the one with the largest proportion of domestic value added content in its exports, in average, 74.1 percent of its gross exports account for domestic value added. The averages for Canada and Mexico are 65.7 and 59.6 percent, respectively. Furthermore, both for the Mexican and American economies, between 1995 and 2011 a reduction in the proportion of domestic value added content in its exports can be observed, the opposite can be said for Canada.
3. In the three countries, there is an evident trend for the direct value added content of their exports to be a larger proportion of the gross value of their exports. However, is in the Mexican economy in the one that the direct value added represents a larger proportion of the total value added content of its exports.
4. The fragmentation processes of international production are so vast, that even in a free trade agreement context such as NAFTA, the value added generated in the rest of the world (indirectly) due to trade between Mexico, Canada and the United States, is superior to the value added generated in Mexico throughout the whole period considered, and if the international margins of transport plus net taxes are considered, in fact, the value

added generated in the United States could be less than the one from the rest of the world.

5. As for the distribution of value added as capital and labor payments, it can be observed that the most significant gap is the one between labor compensation paid on the United States and the compensations paid in Mexico, as a proportion of the total value of trade in NAFTA. Nonetheless, throughout the whole period, the gap tends to close, since if in 1995 the 20.7 percent of exports value in NAFTA represented labor compensations in the United States, in Mexico such proportion was 3.1 percent, while in 2011, the proportions changed to 16.7 and 3.5 percent, respectively.
6. It must be highlighted that for the Canadian and American economies, labor compensations are always above (in volume) the capital compensations, for Mexico is the exact opposite.
7. By level of skill, labor compensations tend to concentrate in compensations to medium – skilled labor. However, for Canada and the United States a trend towards a larger participation of labor compensations to high–skilled labor, as proportion of the total volume of trade, can be observed.
8. Finally, regarding the amount of individuals involved directly and indirectly in trade between NAFTA members, in Mexico is where the bulk of individuals (workers and owners) participated in the production of exports. The latter meaning a lower level of per capita value added that could imply lower gains from foreign trade considering that is this level of value added the one that could be translated in larger volumes of domestic demand that are necessary to achieve higher economic growth rates.

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