What were the consequences of China entering the WTO in 2001 for the bilateral trade between Latin America and the United States?

Erasmus University Rotterdam

Erasmus School of Economics

Department of Economics

Bachelor Thesis

Anouk Schriel

373576

Supervisor: Prof. dr. J.M.A Viaene

Abstract

In this research, we looked into the consequences on the trade between Latin America and the United States of China entering the World Trade Organisation (WTO). We first used an equation regarding trade diversion and trade creation to see whether the entrance of China into the WTO has led to trade diversion or trade creation in the Latin American trade. To delve deeper into the effect of China entering the WTO, we used a gravity model of bilateral trade to see if China entering the WTO had significant consequences for the trade between Latin America and the United States. We did not find evidence of significant consequences of this. We found strong evidence of trade creation in Latin America. There is no strong evidence of trade diversion toward China, but we did find that China has profited the most from the trade created in Latin America.

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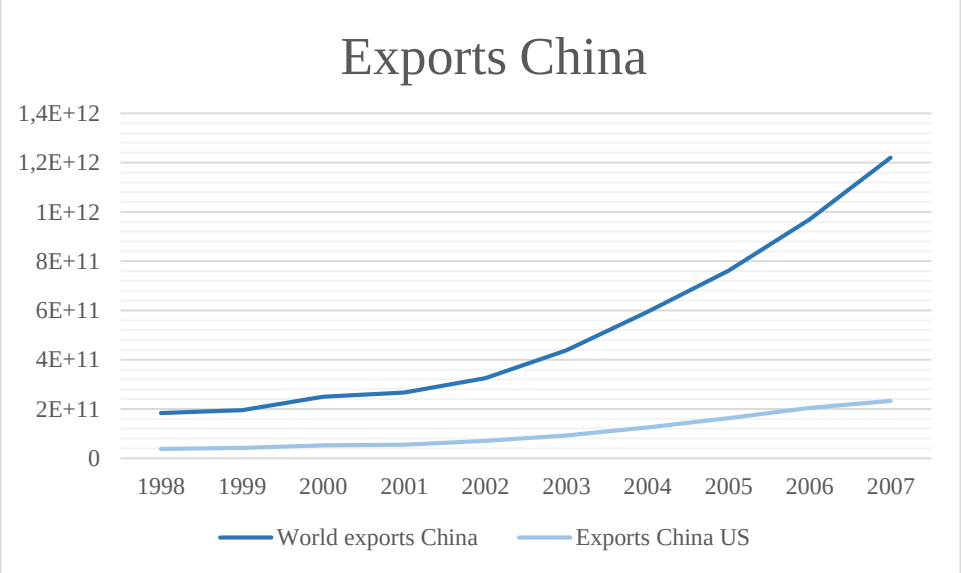
1. *Introduction*

After years of hard work and negotiations, China entered the World Trade Organisation (WTO) in 2001. It took China fifteen years to accomplish this. As Zhu Rongji, the former Chinese prime minister said, "*it took long enough to turn black hear white*" (The Economist, 2011). After China entered the WTO, there was a large increase in Chinese exports and it even became the largest exporter and the second largest importer in the world. Keeping this in mind, the entrance of China has had big consequences for world trade. China's exports increased rapidly from 2001 onwards, as can be seen in the graph below. With China entering the WTO, the trade between China and the United States (US) expanded rapidly. US exports to China rose from $19.182,3 million in 2001 to $91.911,1 million in 2010 (U.S. Department of Commerce, 2015). Graph 1 shows China exports, to the United States and their exports to the world. Considering this graph, it is clear that China's exports have grown rapidly the last few years.

Graph 1.1: Increase in China's exports to the United States and the rest of the world



Source: this graph is based on data obtained from the UN Comtrade database

Not every country was equally pleased by the entrance of China into the WTO. Many countries feared their position in the world market, especially the countries that mainly produce manufactured goods. For example, there are some Latin American countries that have cheap labour and produce goods that use this cheap labour. For these countries, China entering the WTO could mean trouble. An example of a Latin American country that mainly produces manufactured goods is Mexico. Geographically, Mexico has an advantage over China, considering the trade with the US. However, with China entering the WTO, many trade barriers were eliminated, which made it less complicated and expensive for the US to trade with China. Was the fear of China grounded? Fifteen years after China's entry to the WTO, a lot of research has looked into the effect

of China entering the WTO on trading relationships and the world economy. Here, our main focus is on the effect that the entrance of China to the WTO had on the trade between the US and Latin America. The following question has a central role in this thesis:

What were the consequences for the bilateral trade between Latin America and the United States of China entering the WTO in 2001?

First, we give an overview of the literature regarding our topic. In the third chapter, we explain the theories that we use to answer our research question. Thereafter, in Chapter 4, we explain which data we used and how we obtained the data. We also present our hypothesis in Chapter 4. In Chapter 5, we explain the methodology we have used to test our hypothesis, and eventually, answer the research question. The results are presented in Chapter 6. In Chapter 7, we sum up our findings and make some concluding remarks. Finally, in Chapter 8, we discuss the limitations of our research and make some recommendations for further research.

2. Literature Review

Some countries worried about their own position when China became a significant player in world trade. There were some countries that were claiming that they were losing trade to China and that they were suffering from the growth of China. Several research studies relating this topic have already been conducted. There are several ways to look at this. Weiss et al. used the export structure of several countries to look at whether Latin America is suffering from the competitive threat of China. Of all of the Latin American countries, only Mexico has a significantly similar export structure to the export structure of China (Weiss et al., 2005). A possible explanation is the fact that Latin America mainly exports raw materials to China, and China does not have a lot of raw materials of its own (Gallagher et al., 2008). Mexico, on the other hand, does export a lot of manufactured goods. The top three Mexican export products are vehicles, electronic equipment and machines, engines and pumps (Worlds top Exports, 2014). This could be an indication that Mexico suffers more from the rise of China in comparison to other Latin American countries.

In another paper, published by Lall et al. in 2005, the authors looked into the question of whether China's competiveness formed a threat to Latin America. The analysis of Lall et al. focused on the years 1990 until 2002. They took the Heckscher-Olin model (H-O model) as a starting point. The H-O model is a theoretical framework with two final goods, two factors of production, and two countries with identical homothetic tastes. A country will export the good that uses the most abundant factor of production during the production of that good (van Marrewijk, 2007). Thus, in a world with two factors of production, capital and labour, a country where labour is the most abundant factor of production will export goods that are labour intensive and import goods that are capital intensive. Using the H-O model, Lall et al. hypothesised that everyone will profit from trade, so there should not be a competitive threat from China for Latin America (Weiss et al., 2005). Lall et al. used data to further investigate the competitive threat from China for Latin America. They distinguished four types of goods: resource-based goods, low technology goods, medium technology goods, and high technology goods. Lall et al. found that some countries are benefiting from China as a more important country in trade, but there are also countries who are suffering under China's competition. The countries that profit from China are countries that mainly export resource-based goods, although China is still a relative small market for Latin America. Countries, such as Mexico, do suffer from the Chinese competition, and are losing World Market Share, although it is not certain that they are losing their market share to China. In order to support this, further research is required (Weiss et al., 2005).

In 2005, the European Central Bank published a report in which they used the gravity model to look at the trade integration of China in the world economy. They found that Chinese trade is particularly well integrated in the trade of the following countries: United States, Canada, Australia, Mexico, and Argentina.

The ECB measured the Chinese integration by comparing the trade intensity of China with the overall trade intensity of these countries. Thus, saying China is well integrated in the economies of these countries means that the trade intensity of the trade with China is high in comparison to the intensity of their trade overall.

In 2001, when China joined the World Trade Organisation (WTO), many countries feared for their position within the world economy. As mentioned before, China does not have any commodities of its own, so they have to import these from countries that are "resource-rich". In their paper, Barnebeck Andersen et al. aim to provide an estimate of China's impact on the growth of "resource rich" countries. Barnebeck Andersen et al. find that approximately one-tenth of the average annual growth of resource-rich countries after China's entry in the WTO was due to China's increase in demand for natural resources (Barnebeck Andersen et al., 2014). Many Latin America countries have a lot of natural resources, so these countries have benefited from the growth of China. It is in the best interest of these resource-rich countries that China keeps growing, because if the growth in China's economy declines, this would have a large effect on the resource-rich countries (Barnebeck Andersen et al., 2014).

Geographically, Latin America is more interesting as a trading partner for the United States than China. Due to the shorter distance, it should be less expensive to import and export goods from Latin America. Throughout the years, the political relationships between the United States and some Latin American countries have been somewhat tense. In addition to these tense relationships, there were many tariffs in force between Latin America and the United States, which led to an obstruction of trade. In the last few years, more and more of the tariffs have been removed due to the increasing number of free trade agreements (Congressional Research Service, 2011). At the moment, the United States has trade agreements with ten different Latin American countries: Colombia, Chile, Dominican Republic, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, and Peru (United States Government, 2015). These trading agreements are intended to promote trade between the countries, but Latin America is still a relatively small market for the United States.

3. Theoretical Framework

3.1 Trade diversion and trade creation

Although there is no customs union between Latin American, the US and China, we use an equation concerning customs unions as a starting point. This equation is transformed into a more suitable equation for our research, without too much divergence from the original equation. In the chapter on Methodology, we present the adjusted equation that was applied for this research. First, we explain the original equation and the theory behind it. As mentioned, this equation applies to customs unions. A customs union develops

a common trade policy; for example, common external tariffs toward non-member countries (van Marrewijk, 2007). In the process of forming a customs union, several effects have to be considered. Trade diversion and trade creation are commonly used to analyse the effects of a customs unions, regarding trade flows. Trade creation is often defined as follows: the trade created within the customs unions when production in member countries is replaced by imports from a more efficient producer in the union. Trade diversion can be described as the amount of trade diverted by the customs unions when imports from an outsider are replaced by imports from a less efficient union producer (Bowen et al., 2012). A case of trade diversion can be made using the following equation:

$$\frac{(q-x)}{d} + \frac{m_i}{d} + \frac{m_*}{d} * 100 = 100\% \tag{3.1}$$

where q is production, x is export, m_i is intra-union imports, m_* is extra-union imports and d is apparent consumption. The apparent consumption is calculated by taking the production of a country's Gross Domestic Product (GDP), plus the imports, and minus the exports (Deardorff, 2010). All three components of the equation represent a share in the apparent consumption. The first component represents the domestic share, the second is the share of the partner countries, and the third is the outside share. After calculating all three components, a check should be made for trade diversion and trade creation. A decreasing value of the first term implies a case of trade creation. When an increase in the third term is observed, there is most likely a case of trade diversion. A fall in the share of imports of countries within the customs union from countries outside the customs union implies trade diversion (Bowen et al., 2012).

3.2 The gravity model

To look at the trade flows between the US, China and Latin America in more depth, we used the gravity model of trade. For several years, the gravity model was overlooked as an important tool for analysing bilateral trade flows. However, the gravity model has gained more popularity within the field of international trade research, most likely due to several empirical successes in its use. The fundamentals of the gravity equation of trade lie in physics. In 1687, Isaac Newton published his book in which he presented Newton's law of universal gravitation. This law describes the gravitational attraction between two objects. Tinbergen used this law to describe and explain trade flows between countries. This led to the flowing equation:

$$X_{ij} = \frac{M_i * M_j}{D} \tag{3.2}$$

where M represents the economic mass of a country, often expressed as the GDP of the country, D represent the distance between the two countries (Reindert, 2008). These variables explain the bilateral trade between both countries (X_{ij}). In general, equation (3.2) is transformed in log to estimate the gravity equation. This gives the following equation:

$$Ln(X_{ij}) = \beta_0 + \beta_1 \ln(M_{i)} + \beta_3 \ln(M_j) + \epsilon \tag{3.3}$$

In order to improve the explanatory value of the gravity model, several explanatory variables can be added. One of the most commonly used is a variable in which the size of the population of the particular country is used. Adding a variable concerning population-size leads to the following equation.

$$Ln(X_{ij}) = \beta_0 + \beta_1 \ln(M_{i)} + \beta_3 \ln(M_j) + \beta_3 \ln(pop_{i)} + \beta_4 \ln(pop_{j)} + \epsilon \qquad (3.4)$$

Next to adding a variable concerning the population size, dummy variables can also be added. The most commonly used dummy variables are variables concerning common language, common borders, and whether or not countries share a colonial history. These are all factors that could influence the bilateral trade between two countries.

4. Data Sources and Methods

4.1 Sample

For this research, we used panel data from China, the United States, and Latin America for the years 1991 until 2014. For the Latin America countries, we used the data of the twelve largest economies for this analysis (Appendix Table A). Additionally, we used data on China and the US. In the table below, the data is presented.

Table 4.1: Descriptive statistics

	Mean	*Std. Dev*	*Minimum*	*Maximum*
Ln (bilateral trade)	18.26	2.88	6.46	25.72
Ln (gdp reporter)	26.35	1.93	23.73	30.48
Ln (gdp partner)	26.35	1.93	23.73	30.48
Ln (population reporter)	17.042	1.74	14.74	21,03
Ln (population partner)	17.049	1.73	14.74	21,03
Ln (distance)	8.207	0.86	5.34	9,87

Notes: (i) 5 040 observations (ii) the data is transformed into logs
Sources: data obtained from the UN Comtrade databank and the World Bank Databank

4.2 Trade diversion equation

In order the check for trade diversion, we made use of the equation explained in Chapter 3. In order to calculate this equation, we used the following information: Latin America's apparent consumption, Latin America's import from the US, Latin America's import from China. To calculate the apparent consumption, we used the GDP, and import and export of the six largest economies in Latin America. These are the six Latin American countries with the highest GDP: Argentina, Brazil, Chile, Colombia, Mexico, and Venezuela. The data regarding the GDP was obtained for the World Bank Databank. We used the PPP GDP, which is the gross domestic product of a country converted to international dollars using Purchasing Power Parity (PPP). An international dollar has the same PPP over GDP as the US dollar has in the United States

(World Bank, 2016). This way you correct for the difference in purchasing power between countries. PPP can be calculated in this way, which gives a better measure for comparison. All the data used is expressed in US dollars. When we speak of Latin America, we mean the six largest economies of Latin America. We calculated the equation regarding trade diversion and trade creation for each country separately, in order to analyse the results per country. After all the countries were analysed separately, we drew a conclusion for all the countries as a whole.

4.3 Gravity equation

For estimating the gravity equation, we used the bilateral trade flows between the countries, obtained from the UN Comtrade Databank. For the estimation of the gravity equation, we used data regarding the US, China, and in addition, six Latin American countries (fourteen in total). We added the six additional Latin American countries to provide more data, leading to a more accurate estimation of the gravity model. Furthermore, we used data on the population size of the countries and the distance between the countries. Data regarding population-size was obtained from the World Bank Databank. To obtain data regarding the distance between countries, we used a website[1], where they calculate the great circle distance. The data on the distance is based on the distance between the capitals of the countries.

4.4 Hypothesis

The Chinese economy has developed rapidly in the last few years. Among other things, Chinese exports have grown significantly. This could lead to a decrease in the exports of other countries, but due to the economic growth of China, the Chinese demand for goods also has risen, providing opportunities for other countries to increase their exports to China. Because of the growth of the Chinese economy, the Chinese demand for commodities has also risen. Unfortunately for China, it has no commodities itself, so to import these commodities in order to sustain the growth. Many Latin American countries primarily export commodities, so these countries can profit from the growth of China's economy. When considering the threat of China to the Latin American countries, their import structures are significant. There is a big difference between China's export structure and the export structure of the Latin American countries. Countries in Latin America mainly export commodities, while China mainly exports manufactured goods. Since there is a big difference in export structure between China and Latin America, no significant effect of China entering the WTO was expected on the trade between Latin America and the US. This led to the following hypothesis.

[1] http://www.chemical-ecology.net/java/lat-long.htm

H_1: the entrance of China had a significant positive influence on the bilateral trade between the US and Latin America

H_A: the entrance of China had a significant negative influence on the bilateral trade between the US and Latin America

Looking for a breaking point in the data is a convenient way to discover whether an event that occurred at a specific point in time had a significant impact. Since we do not expect a significant impact on the trade between Latin America and the US from the entrance of China to the WTO, we did not expect to find a significant break in the data in the year 2001. This led to our second hypothesis:

H_2: There is a significant data break in the year 2001, regarding the trade between Latin America and the United States

H_A: There is no significant data break in the year 2001, regarding the trade between Latin America and the United States

With the rise of China's economy, the Chinese demand for goods has also risen. To fulfil this extra demand, China had to increase its imports. This has created export opportunities for other countries, but at the same time, countries feared that China would take over a significant part of their trade. However, taking the difference in export structures into account, Latin America should not have to fear China. Therefore, no US trade diversion was expected from Latin America to China, leading to the third hypothesis:

H_3: There is evidence for trade diversion of US trade from Latin America to China.

H_A: There is no evidence for trade diversion of US trade from Latin America to China.

5. Methodology

5.1 Trade diversion and trade creation

We considered trade diversion and trade creation from the point of view from the six defined Latin American countries separately. In order to discover whether there is a case of trade diversion or trade creation, we used the following equation:

$$\left(\frac{(q-x)}{d}+\frac{m_{US}}{d}+\frac{m_C}{d}+\frac{m_{LAM}}{d}+\frac{(m_{world}-m_{LAM}-m_{US}-m_C)}{d}\right)*100=100\% \quad (5.1)$$

where q is production, x is export, m_{US} stands for import from the US, m_C stands for the import from China, m_{LAM} represent the imports form one of the other five Latin American countries, and d stands for apparent consumption. The apparent consumption is calculated by taking the production of a county, plus imports, minus exports (Deardorff, 2010). All four components in the equation above represent a share in the apparent consumption. The first component of the equation stands for the domestic share, the second term reflects the share of imports from the US, the third is the share of import from China, the fourth term reflects the share of imports all of the other five Latin American countries, and the fifth term represents the share of imports from the rest of the world, excluding the imports from China, the US and the other Latin American countries. After calculating these four components of the equation separately, it is possible to identify trade creation and trade diversion.

5.2 Gravity model

In order to estimate the gravity equation, we made use of Stata 14.1 MP. In Chapter 3, we describe the gravity equation we used as a starting point. In order to make this equation more suitable for our specific case we included a dummy for the years after the 2001, the year China entered the WTO, and a dummy for the trade between Latin American countries. This led to the following equation:

$$Ln(X_{ij}) = \beta_0 + \beta_1 \ln(M_{i)} + \beta_3 \ln(M_j) + \beta_3 \ln(pop_{i)} + \beta_4 \ln(pop_{j)} \quad (5.2)$$
$$+\beta_5\, dummy\ China\ WTO + \beta_6 dummy\ common\ border + \beta_7 dummy\ common\ language$$
$$+ \beta_8 dummy\ RTA + \beta_9 \Sigma(year\ effect) + \beta_{10} \Sigma(country\ effect) + \epsilon$$

For the dummy regarding the years after 2001, we took the value of one in the years after 2001 and the value of zero for the years before 2001.

Here we are particularly interested in the effect of China becoming an important player in world trade on the trade of Latin America with the US. In order to see how the growth of China as an international trading party has influenced the trade between the US and Latin America, we looked at the dummy variable concerning the entrance of China to the WTO. When this dummy takes a positive value, this implies that the entrance of China into the WTO had a positive influence on the trade between the US and Latin America. The other way around, a negative value of this dummy implies a negative effect on the trade between the US and Latin America.

We inserted dummy variables for the effects of the year and the country. Each year and each country has his own dummy variable except for Argentina and China, and for 1992 and 2007, since Stata uses these as reference points. We could not use a fixed-effects model in our regression because these the dummy variables, such as common language, common border, and the variable distance take on the same value for all fourteen years. Stata omits these variables when running a fixed-effects regression. Stata does this because when running a fixed-effects model, it already corrects for effects that remain the same over time, and since the distance and the dummies regarding the common border and the common language stay the same over time, Stata omits these variables. However, since the variable distance is an important component of the gravity equation, we choose to use an OLS regression with year and country effects. Since GDP and population are essentially country effects, we tested whether we would get a better model when excluding these variables. However, when we excluded these four variables, we saw a big drop in the R-squared of our model. Because of this, and the fact that GDP and population are important and distinctive variables of the gravity model, we choose to include them in our model.

6. Results

6.1 Trade creation and trade diversion

For the analysis of trade creation and trade diversion, every Latin American country was analysed separately, which led to the results explained in this chapter. First, we sum up the results regarding trade creation and then we discuss the results regarding trade diversion.

When considering the results, it is clear that all of the Latin American countries show signs of trade creation. The results of the calculations we performed are presented in the tables on the next pages.

Table 6.1(a) Apparent consumption Argentina

Year	***(q-x)/d***	***m_{US}/d***	***m_{China}/d***	***m_{LAM}/d***	***(m_{World} – m_{LAM}- m_{China} – m_{US}) / d***
1991	N.A.	N.A.	N.A.	N.A.	N.A.
1992	N.A.	N.A.	N.A.	N.A.	N.A.
1993	93.	1.6	0.1	1.9	3.37
1994	91.8	1.9	0.1	2.1	4.16
1995	92.2	1.6	0.2	2.0	3.94
1996	91.3	1.8	0.2	2.4	4.31
1997	89.8	2.1	0.3	2.8	5.03
1998	89.7	2.1	0.4	2.8	5.08
1999	91.1	1.8	0.4	2.4	4.43
2000	91.1	1.7	0.4	2.7	4.09
2001	92.3	1.4	0.4	2.4	3.50
2002	88.9	2.2	0.4	3.6	4.91
2003	87.6	2.0	0.7	4.7	5.03
2004	86.8	2.0	0.8	5.2	5.19
2005	86.3	2.2	0.7	5.8	5.01
2006	86.4	1.7	1.3	5.5	5.23
2007	86.0	1.7	1.6	5.3	5.48
2008	85.3	1.8	1.8	5.3	5.80
2009	89.2	1.4	1.3	3.8	4.18
2010	87.4	1.4	1.7	4.6	4.93
2011	86.4	1.4	1.9	4.8	5.45
2012	88.4	1.4	1.7	3.6	4.82
2013	88.0	1.3	1.9	3.7	5.15
2014	87.8	1.7	2.0	3.2	5.40

Table 6.1 (b) Apparent consumption Brazil

Year	***(q-x)/d***	***m_{US}/d***	***m_{China}/d***	***m_{LAM}/d***	***(m_{World} – m_{LAM}- m_{China} – m_{US}) / d***
1991	96.1	0.9	0.0	0.5	2.4
1992	94.2	1.4	0.0	0.8	3.6
1993	93.6	1.5	0.0	1.0	3.9
1994	93.5	1.5	0.0	1.0	3.9
1995	93.2	1.6	0.1	1.1	4.0
1996	93.4	1.5	0.2	1.2	3.8
1997	92.8	1.7	0.2	1.4	4.0
1998	93.1	1.6	0.1	1.3	3.9
1999	91.5	2.1	0.2	1.5	4.9
2000	91.5	2.0	0.2	1.6	4.8
2001	90.0	2.3	0.2	1.6	5.8
2002	90.5	2.1	0.3	1.4	5.8
2003	91.0	1.8	0.4	1.2	5.6
2004	90.1	1.8	0.6	1.3	6.2
2005	91.3	1.5	0.6	1.1	5.5
2006	91.4	1.4	0.8	1.3	5.2
2007	91.1	1.4	0.9	1.3	5.3
2008	89.6	1.6	1.2	1.3	6.3
2009	92.2	1.2	1.0	1.1	4.5
2010	91.	1.2	1.2	1.1	4.7
2011	91.3	1.3	1.3	1.1	5.0
2012	90.7	1.4	1.4	1.2	5.3
2013	90.0	1.5	1.6	1.2	5.7
2014	90.3	1.5	1.9	1.1	5.5

Table 6.1 (c) Apparent consumption Chile

Year	(q-x)/d	m_{US}/d	m_{China} /d	m_{LAM}/d	(m_{World} – m_{LAM}- m_{China} – m_{US}) / d
1991	*78.7*	*4.5*	*0.3*	*5.0*	*11.5*
1992	*78.5*	*4.5*	*0.3*	*4.7*	*12.0*
1993	*78.5*	*5,1*	*0.3*	*4.3*	*11.8*
1994	*79.7*	*4.8*	*0.5*	*4.5*	*10.5*
1995	*78.8*	*5.4*	*0.6*	*5.1*	*10.2*
1996	*78.2*	*5.3*	*0.7*	*5.4*	*10.4*
1997	*78.5*	*5.1*	*0.8*	*5.5*	*10.1*
1998	*79.1*	*4.9*	*0.9*	*5.2*	*9.9*
1999	*80.5*	*4.2*	*0.9*	*5.5*	*8.9*
2000	*78.6*	*4.2*	*1.2*	*6.8*	*9.2*
2001	*76.9*	*4.3*	*1.5*	*7.9*	*9.6*
2002	*77.7*	*3.7*	*1.6*	*8.0*	*9.1*
2003	*74,5*	*3.7*	*2.2*	*9.2*	*10.5*
2004	*73.2*	*3.9*	*2.7*	*8.8*	*11.4*
2005	*71.5*	*4.5*	*2.8*	*8.6*	*12.7*
2006	*70.8*	*4.6*	*3.3*	*7.8*	*13.4*
2007	*68.7*	*5.2*	*4.0*	*7.5*	*14.6*
2008	*64.7*	*6.7*	*4.7*	*8.2*	*15.7*
2009	*73.1*	*5.0*	*3.9*	*6.5*	*11.5*
2010	*71.2*	*4.9*	*4.9*	*6.4*	*12.7*
2011	*69.4*	*6.2*	*5.2*	*6.5*	*12.7*
2012	*70.1*	*7.0*	*5.4*	*5.8*	*11.8*
2013	*71.6*	*5.8*	*5.6*	*4.8*	*12.2*
2014	*71.5*	*5.6*	*6.0*	*4.8*	*12.1*

Table 6.1 (d) Apparent consumption Colombia

Year	(q-x)/d	m_{us} /d	m_{china} /d	m_{lam}/d	(m_{World} – m_{LAM}- m_{China} – m_{US}) / d
1991	*87.2*	*4.5*	*0.2*	*2.1*	*6.0*
1992	*86.4*	*4.9*	*0.3*	*2.4*	*6.0*
1993	*83.2*	*5.6*	*0.4*	*3.4*	*7.5*
1994	*86.0*	*4.5*	*0.3*	*2.7*	*6.5*
1995	*85.6*	*4.9*	*0.4*	*2.9*	*6.2*
1996	*86.4*	*4.8*	*0.5*	*2.7*	*5.6*
1997	*86.1*	*4.9*	*0.6*	*2.9*	*5.5*
1998	*85.7*	*4.6*	*0.7*	*2.8*	*6.2*
1999	*87.5*	*4.7*	*0.7*	*2.5*	*4.6*
2000	*88.1*	*4.0*	*1.0*	*2.4*	*4.6*
2001	*87.0*	*4.5*	*1.0*	*2.5*	*5.0*
2002	*87.2*	*4.1*	*1.1*	*2.6*	*5.0*
2003	*85.5*	*4.3*	*1.7*	*2.9*	*5.6*
2004	*85.4*	*4,1*	*2,1*	*3.4*	*5.0*
2005	*85.5*	*4.1*	*2.2*	*3.5*	*4.6*
2006	*84.1*	*4.2*	*2.7*	*4.1*	*4.9*
2007	*84.4*	*4.1*	*2.9*	*3.9*	*4.8*
2008	*83.9*	*4.7*	*3.4*	*3.4*	*4.7*
2009	*85.9*	*4.1*	*2.6*	*2.8*	*4.5*
2010	*85.8*	*3.6*	*3.5*	*3.1*	*4.0*
2011	*83.6*	*4.1*	*3.8*	*3.6*	*4.9*
2012	*84.2*	*3.9*	*3.9*	*3.5*	*4.5*
2013	*84.4*	*4.3*	*4.1*	*2.9*	*4.3*
2014	*83.5*	*4.7*	*3.9*	*2.6*	*5.3*

Table 6.1 (e) Apparent consumption Mexico

Year	(q-x)/d	m_{US}/d	m_{China}/d	m_{LAM}/d	(m_{world} - m_{LAM}- m_{China} - m_{US}) / d
1991	*88.3*	*7.6*	*0.0*	*0.4*	*3.7*
1992	*83.7*	*12.1*	*0.1*	*0.4*	*3.7*
1993	*87.4*	*9.3*	*0.1*	*0.3*	*2.9*
1994	*85.5*	*10.0*	*0.1*	*0.4*	*4.0*
1995	*78.5*	*16.0*	*0.2*	*0.4*	*5.0*
1996	*77.2*	*17.3*	*0.2*	*0.6*	*4.8*
1997	*76.8*	*17.3*	*0.3*	*0.5*	*5.2*
1998	*75.4*	*18.3*	*0.3*	*0.5*	*5.4*
1999	*75.7*	*18.0*	*0.3*	*0.5*	*5.4*
2000	*74.5*	*18.3*	*0.4*	*0.6*	*6.4*
2001	*77,3*	*15.5*	*0.5*	*0.7*	*6.2*
2002	*77.5*	*14.3*	*0.8*	*0.8*	*6.6*
2003	*76.3*	*14.7*	*1.3*	*1.0*	*6.8*
2004	*74.7*	*14.3*	*1.8*	*1.2*	*7.9*
2005	*74.6*	*13.6*	*2.0*	*1.2*	*8.5*
2006	*73.6*	*13.5*	*2.5*	*1.4*	*9.0*
2007	*73.2*	*13.3*	*2.8*	*1.3*	*9.4*
2008	*72.4*	*13.6*	*3.1*	*1.1*	*9.8*
2009	*73.9*	*12.6*	*3.6*	*0.9*	*9.0*
2010	*71.4*	*13.8*	*4.3*	*1.0*	*9.5*
2011	*70.0*	*14.9*	*4.5*	*0.9*	*9.7*
2012	*68.7*	*15.7*	*4.8*	*0.7*	*10.1*
2013	*69.8*	*14.9*	*4.9*	*0.7*	*9.8*
2014	*69.2*	*15.1*	*5.1*	*0.7*	*10.0*

Table 6.1 (f) Apparent consumption Venezuela

Year	(q-x)/d	m_{US}/d	m_{China}/d	m_{LAM}/d	(m_{World} – m_{LAM}- m_{China} – m_{US}) / d
1991	*N.A.*	*N.A.*	*N.A.*	*N.A.*	*N.A.*
1992	*N.A.*	*N.A.*	*N.A.*	*N.A.*	*N.A.*
1993	*N.A.*	*N.A.*	*N.A.*	*N.A.*	*N.A.*
1994	*83.2*	*7.7*	*0.0*	*5.3*	*3.7*
1995	*83.8*	*6.9*	*0.0*	*4.8*	*4.5*
1996	*83.5*	*7.4*	*0.0*	*6.8*	*2.3*
1997	*82.7*	*7.9*	*0.0*	*4.4*	*5.0*
1998	*83.9*	*7,0*	*0.0*	*3.8*	*5.3*
1999	*85.2*	*5.7*	*0.1*	*3.8*	*5.3*
2000	*85.5*	*5.5*	*0.2*	*4.6*	*4.2*
2001	*85.6*	*4.9*	*0.3*	*4.5*	*4.7*
2002	*85.5*	*4.8*	*0.3*	*3.0*	*6.4*
2003	*87.5*	*4.1*	*0.3*	*3.1*	*5.0*
2004	*83.2*	*5.3*	*0.5*	*4.5*	*6.6*
2005	*80.5*	*6.2*	*0.7*	*5.1*	*7.5*
2006	*80.0*	*4.8*	*1.1*	*4.2*	*9.9*
2007	*84.6*	*3.1*	*0.8*	*3.3*	*8.2*
2008	*83.0*	*4.5*	*1.6*	*5.1*	*5.8*
2009	*87.6*	*3.4*	*1.3*	*3.2*	*4.5*
2010	*91.0*	*2.8*	*1.0*	*1.9*	*3.4*
2011	*82.2*	*4.7*	*2.4*	*4.0*	*6.7*
2012	*82.9*	*4.3*	*2.9*	*3.3*	*6.6*
2013	*N.A.*	*N.A.*	*N.A.*	*N.A.*	*N.A.*
2014	*N.A.*	*N.A.*	*N.A.*	*N.A.*	*N.A.*

Note: the shares in apparent consumption for each year add up 100

When looking for trade creation, you have to consider domestic share in apparent consumption. A fall in this term means a decrease in the share of domestically produced and consumed goods in the apparent consumption. This implies that there is a "creation of trade", so the country will import more products from other countries that can produce these goods more efficiently. Not every Latin American country shows equally strong evidence for trade creation. Venezuela did experience trade creation to some extent, over the last twenty-five years, but the share of domestically produced and consumed goods was fluctuating. For Mexico, the evidence of trade creation is much stronger. When considering the values of the share of domestically produced and consumed goods, there is a clear downward trend. In summary, all of the Latin American countries show signs of trade creation, although countries differ in the extent to which trade creation is present.

Secondly, we considered trade diversion. Here, there is a case of trade diversion toward China if the share

of US, Latin American, and the rest of the world imports are decreasing at the same time that the share of Chinese imports is increasing. For the most countries, the share of US imports has stayed more or less constant the last twenty-five years. Only Mexico shows a clear increase in the share of US imports. When considering Chinese imports as a share of the apparent consumption for the Latin American countries, we found that although countries vary in the rate of growth in the share of Chinese imports, all countries experienced an increase. Chile has experienced the largest increase in the share of Chinese imports in apparent consumption. They started with a share close to zero percent in 1991, and in 2014, this share increased to 6 percent. Argentina, Brazil, and Venezuela did not experience an increase equal to Chile's, but their share of Chinese imports has grown from close to zero percent to a share of 2 percent. As for the share of imports from the other Latin American countries, these fluctuate over the years for all the countries. However, on average it stays more or less constant. In conclusion, we do not find strong evidence of trade diversion (decrease in share of US and Latin American imports, and increase in share of Chinese imports). We do find an increase in the share of Chinese imports for all countries. Due to the non-existing decrease of the share of US and Latin American imports, we cannot say that there is a case of trade diversion. What can be concluded is that there is a case for trade creation for all the Latin American countries, and China has benefited the most from this creation of trade in terms of the increase in Chinese imports as a part of apparent consumption of the Latin American countries. Therefore, there is no clear evidence that other countries have suffered under the rise of China as a world trading partner. This leads to the rejection of the third hypothesis: *There is evidence for trade diversion of US trade from Latin America to China.*

Looking at the fifth column of all the six tables, it is evident that the share of the trade with the rest of the world is relatively high. In order to explain this high share, we looked at Latin American trade with Europe and Australia. The results are presented in the Appendix, in Table B. These indicate that Europe, in particular, has a big share in the apparent consumption in Latin America. Australia has a relatively large share in the apparent consumption of Mexico. Considering the other Latin American countries, it is evident that Australia does not really have a significantly large share in their apparent consumption.

When considering the entrance of China to the WTO, it is important to consider the year 2001. For some countries, there is clear growth in the share of Chinese imports, as seen in apparent consumption from 2001 onwards. For example, before 2001, Chile's share of Chinese imports in the apparent consumption was growing, but this share was still around zero percent. After 2001, Chile's share of Chinese imports started growing more rapidly, from 1.5% in 2001 to 6% in 2014. Thus, after 2001, the share of Chinese imports in the apparent consumption started to grow faster, and the same holds for Mexico. Other countries also show signs of this phenomenon. It could be possible that the entrance of China to the WTO has contributed to an

increase in Chinese imports in Latin America and this will be pursued further in the section regarding the gravity model.

6.2 Gravity model

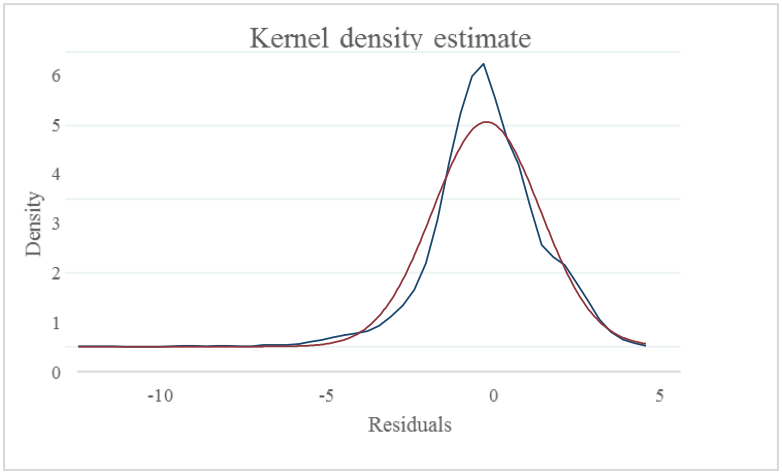
Using Stata, we estimated the gravity model in the form of an Ordinary Least Squares (OLS) regression. In order to safely interpret the coefficients, we needed to test for the assumptions regarding OLS. The econometric theory gives us three important conditions that the data needs to fit in order to say that our OLS estimators are consistent, unbiased, and efficient:

1. the errors must be normally distrusted and have zero mean;
2. there must be homoscedasticity of the error terms;
3. there must be an absence of collinearity between the explanatory variables.

(United Nations ESCAP, 2012)

For our data, we tested for all three conditions. The first condition was tested using the graph below.

Figure 6.1: Kernel density estimate



The red line represents the normal distribution and the blue line represents our residuals. Considering the graph, we can see that the blue and the red lines follow a quite similar path. This means that the residuals are more or less normally distributed and have a zero mean. For the assumption regarding heteroscedasticity, we used the Breush-Pagan test. The Breush-Pagan test formulates a null hypothesis of constant variance, which means homoscedasticity. Since the Breush-Pagan test came produced a P value of 0.000, we have rejected the null hypothesis of constant variance for the residuals have supported the hypothesis of no constant variance among the residuals. Supporting the alternative hypothesis means that we have a case of heteroscedasticity. This means that the second condition regarding OLS is violated, but when considering the existing literature on estimating gravity models, we can see that heteroscedasticity is not uncommon. Although heteroscedasticity is common in gravity models, this does not mean we can ignore it. We have corrected for heteroscedasticity using the robust option in Stata. When using the robust option, the coefficients are calculated the same as is done in Ordinary Least Squares, but Stata will take in account the presence of heteroscedasticity and the possibility of small deviations from a normal distribution of the

error terms. The last condition of OLS refers to the absence of collinearity between the explanatory variables. To test for this condition, we used the VIF option of Stata. VIF stands for Variance Inflation Factor. The VIF tests base its value, in terms of the extent to which the variance of one of the estimated coefficients is increased due to collinearity. An VIF value higher than ten indicates an increased probability of collinearity between the variables.

Table 6.2: Variance Inflation Factor values

Variable	*VIF*
LN population partner country	14.43
Ln population reporter country	14.26
Ln GDP partner country	13.97
Ln GDP reporting country	13.88
Common Language Dummy	2.90
Ln distance	2.33
Common border dummy	1.46
RTA dummy	1.18
China WTO member dummy	1.14
Mean VIF	**7.28**

Four out of five explanatory variables have a VIF value higher than 10. A possible explanation for these values is that we have considered bilateral trade flows. This means a reporting country is somewhere else in our databank than the partner county, or vice versa. We needed to keep in mind that these VIF values do not imply collinearity. A VIF value above 10 means the possibility of collinearity increases. This left us somewhat in the dark when considering the third condition of OLS. We still decided to use OLS for our regression because we cannot say for certain we have collinearity. In considering heteroscedasticity, we have corrected for it in the way we explained above, but we still need to keep in mind that there is a possibility of collinearity.

Now we move on to the interpretation of the results regarding our gravity model. First, we considered the R-squared and the P-values of the model. The R-squared of our model has a value of 0.7979, and this implies that 79.79 percent of the variance in the dependent variable can be explained by the independent variable. The R-squared is often used to express how well the model fits the data. An R-squared of 1 is the most desirable. Our R-squared is relatively high, so this means that we have a relatively well-fitted model.

Table 6.3: Gravity model output

	Coëfficient	***t-value***	***p-value***
Constant	8.587759	0.490	0.627
Ln GDP Reporting country	0.6094675	3.72***	0.000
Ln GDP Partner counrty	1.403859	30.69***	0.000
Ln population reporting country	-0.9312071	-1.24	0.231
Ln population partner country	-0.5844831	-11.21***	0.000
Ln distance	-1.475608	-29.29***	0.000
Dummy common border	0.1606225	2.31**	0.021
Dummy common Language	-0.0437862	-0.49	0.623
Dummy RTA	0.5453768	11.47***	0.000
Dummy China entering the WTO	-0.1059472	-0.41	0.679

Notes: *** P<0.01, ** P<0.05, * P<0.10

Considering the P values of our explanatory variables, and disregarding the fixed effects of time and country, we see that six out of the nine coefficients are significant, at a significance level of five percent. The coefficients representing the population of the reporting country, a common language, and China entering the WTO are insignificant. This means that the population of the reporting country, a common language, and China entering the WTO do not have a significant effect on the bilateral trade flows used in our databank. The GDP of the reporting and the partner countries both have a positive effect on the bilateral trade flows. We expected the effect of the GDP of the partner country to be negative, because when they produce more, they are more self-sufficient and need to import less. On the other hand, since we were considering bilateral trade flows, we saw that when a country produces more than domestic demand, it could export its surplus. In this case, the GDP of the partner country would have a positive effect on the bilateral trade flows. Most likely, the effect described last dominates the effect described first. The effect of the GDP of the reporter county is in line with our expectations, and the coefficient takes on a positive sign. Thus, the more the country produces, the higher the bilateral trade of this country. We have not interpreted the coefficient regarding the population of the reporting country, because it is highly insignificant. On the contrary, if the coefficient regarding the population of the partner country has a P value of zero, the size of the population of the reporting country has a negative influence on the bilateral trade. A one percent increase in the size of the population of the partner country will decrease the bilateral trade by 0.58 percent. This can be explained as follows. A large population can lead to a large work force. The more people work, the more a country can produce, and when a country can fulfil the domestic demand for goods, there is no need to fill gap using trade. Next to the population of the partner country, distance also has a negative effect on bilateral trade flows. This is not surprising, because countries closer to each other usually have higher trade flows between them. Trading with a country further away usually comes with higher trading costs. The coefficient of the dummy variable regarding the existence of a common border supports this. This dummy has a positive value, which means that the existence of a common border has a positive influence on the bilateral trade

flows between countries. Next to the dummy regarding common border, the dummy regarding the existence of a RTA also has a positive effect. This is not very surprising, since an RTA has the purpose of promoting trade. It would be quite disturbing if the dummy regarding RTA would have a negative influence. The dummy regarding the existence of a common language has not been interpreted because it is highly insignificant. Our subject of interest here was the dummy regarding the entrance of China to the WTO. However, this dummy turned out to have an insignificant effect on the bilateral trade flow between the countries in our data sat. This mean we cannot say that China entering the WTO in 2001 had a significant influence on the bilateral trade flow between these countries. This leaves us with Hypothesis 1: *The Entrance of China to the WTO had a significant positive influence on the bilateral trade between the US and Latin America.* We have to reject this hypothesis, due to the high insignificance of the coefficient of the dummy variable regarding China entering the WTO. Considering the insignificance of the dummy regarding China entering the WTO, we support the second hypothesis: *There is no significant data break in the year 2001, regarding the trade between Latin America and the United States*.

7. Concluding Remarks

After years of lobbying and negotiations, China entered the WTO in 2001. China's economy was already growing before entering the WTO, and many countries feared that when China entered the world trade organisation, its growth would be harmful for their own economies. When China became a big player in international trade, some countries feared they would lose trade to them. Years later, we can determine whether or not their fears were grounded. We focused here on the effect on the trade between Latin America and the US of China entering the WTO. We found that there is no significant evidence that the entrance of China to the WTO had an influence on the trade between Latin America and the US. This can be attributed to the difference in the export structures between Latin America and China, since Latin America's primary export products are commodities, and China's are mainly labour-intensive goods. This actually can lead to an advantage for Latin America, since China does not have commodities of its own, and has to depend on other countries when it comes to commodities. However, there was no significant effect found in our model. What we did find was that there is an overall increase in trade among Latin American countries. Initially, we were looking for a possible trade diversion toward China, but we could not find strong evidence of this. However, we found that the growth in trade is especially favourable for China. To answer our research question: there were no significant consequences for the trade between Latin America and the United States, following from the entrance of China to the WTO in 2001. China did gain an increased share of their exports to Latin American as seen in their apparent consumption but this was not a disadvantage for other Latin American countries or the United States.

8. Limitations and Recommendations

In this section, we discuss the limitations of our research and give some recommendations for further research on this topic.

Our first limitation regards the data we used. We used the data regarding a selection of Latin American countries. Using all Latin American countries would provide more observations with which to work, resulting in more representative findings. Furthermore, we found evidence of heteroscedasticity in our data. This is not desirable when running an OLS regression, and we solved it using robust standard errors. However, there are better, but more complex ways to tackle the problem of heteroscedasticity. The same holds for the collinearity between some of the independent variables. The probability of collinearity was higher for some of our independent variables, but we did not really correct for this, since it concerned an increase in the probability of collinearity. Ideally, we should have corrected for this.

In our research, we did not distinguish between the trade in different export and import goods. Distinguishing between the types of goods a country exports you provide a clearer view of the influence that the entrance of China to the WTO had on the trade between Latin America and the US. The literature claims that the import structure of the countries contributes to whether or not they have to fear for their position in world trade when a new player enters the world trade arena. Finally, it would also be interesting to conduct this research replacing trade flows by Foreign Direct Investment (FDI) flows.

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Appendix

Table A. List of Latin America countries

Trade diversion and trade creation analysis	**Gravity model**
Argentina	*Argentina*
Brazil	*Bolivia*
Chile	*Brazil*
Colombia	*Chile*
Mexico	*Colombia*
Venezuela	*Costa Rica*
	Dominican Republic
	Ecuador
	Guatemala
	Mexico
	Panama
	Uruguay
	Venezuela

Table B. Australian and European share in apparent consumption of the Latin America countries

Argentina			***Brazil***			***Chile***		
Year	**Maus/d**	**Meu/d**	**Year**	**Maus/d**	**Meu/d**	**Year**	**Maus/d**	**Meu/d**
1991	*0.0*	*N.A.*	**1991**	*0.1*	*N.A.*	**1991**	*0.2*	*N.A.*
1992	*0.0*	*N.A.*	**1992**	*0.0*	*N.A.*	**1992**	*0.2*	*N.A.*
1993	*0.0*	*N.A.*	**1993**	*0.0*	*N.A.*	**1993**	*0.2*	*N.A.*
1994	*0.0*	*N.A.*	**1994**	*0.0*	*N.A.*	**1994**	*0.2*	*N.A.*
1995	*0.0*	*N.A.*	**1995**	*0.0*	*N.A.*	**1995**	*0.2*	*N.A.*
1996	*0.0*	*N.A.*	**1996**	*0.0*	*N.A.*	**1996**	*0.2*	*N.A.*
1997	*0.0*	*N.A.*	**1997**	*0.0*	*N.A.*	**1997**	*0.1*	*N.A.*
1998	*0.0*	*N.A.*	**1998**	*0.0*	*N.A.*	**1998**	*0.1*	*N.A.*
1999	*0.0*	*N.A.*	**1999**	*0.0*	*N.A.*	**1999**	*0.1*	*N.A.*
2000	*0.1*	*2.0*	**2000**	*0.0*	*2.4*	**2000**	*0.1*	*4.1*
2001	*0.1*	*1.7*	**2001**	*0.1*	*3.0*	**2001**	*0.1*	*4.8*
2002	*0.0*	*2.5*	**2002**	*0.1*	*3.0*	**2002**	*0.2*	*4.3*
2003	*0.1*	*2.7*	**2003**	*0.1*	*2.6*	**2003**	*0.1*	*4.4*
2004	*0.1*	*2.7*	**2004**	*0.1*	*2.8*	**2004**	*0.2*	*4.2*
2005	*0.1*	*2.4*	**2005**	*0.1*	*2.3*	**2005**	*0.2*	*4.2*
2006	*0.1*	*2.5*	**2006**	*0.1*	*2.1*	**2006**	*0.2*	*4.0*
2007	*0.1*	*2.6*	**2007**	*0.1*	*2.2*	**2007**	*0.1*	*4.3*
2008	*0.1*	*2.3*	**2008**	*0.1*	*2.3*	**2008**	*0.2*	*4.2*
2009	*0.1*	*1.9*	**2009**	*0.1*	*1.8*	**2009**	*0.2*	*4.0*
2010	*0.0*	*2.2*	**2010**	*0.1*	*1.9*	**2010**	*0.2*	*4.0*
2011	*0.0*	*2.1*	**2011**	*0.0*	*1.9*	**2011**	*0.1*	*4.4*
2012	*0.0*	*1.9*	**2012**	*0.0*	*2.1*	**2012**	*0.1*	*4.0*
2013	*N.A.*	*2.2*	**2013**	*N.A.*	*2.2*	**2013**	*N.A.*	*N.A.*
2014	*N.A*	*2.0*	**2014**	*N.A.*	*2.1*	**2014**	*N.A.*	*N.A.*

Colombia			***Mexico***			***Venezuela***		
Year	**Maus/d**	**Meu/d**	**Year**	**Maus/d**	**Meu/d**	**Year**	**Maus/d**	**Meu/d**
1991	*0.0*	*N.A.*	**1991**	*N.A.*	*0.0*	**1991**	*N.A.*	*N.A.*
1992	*0.1*	*N.A.*	**1992**	*N.A.*	*0.1*	**1992**	*0.0*	*N.A.*
1993	*0.0*	*N.A.*	**1993**	*N.A.*	*0.1*	**1993**	*0.0*	*N.A.*
1994	*0.0*	*N.A.*	**1994**	*N.A.*	*0.1*	**1994**	*0.0*	*N.A.*
1995	*0.1*	*N.A.*	**1995**	*N.A.*	*0.2*	**1995**	*0.0*	*N.A.*
1996	*0.0*	*N.A.*	**1996**	*N.A.*	*0.2*	**1996**	*0.0*	*N.A.*
1997	*0.0*	*N.A.*	**1997**	*N.A.*	*0.3*	**1997**	*0.0*	*N.A.*
1998	*0.0*	*N.A.*	**1998**	*N.A.*	*0.3*	**1998**	*0.0*	*N.A.*
1999	*0.0*	*N.A.*	**1999**	*N.A.*	*0.3*	**1999**	*0.0*	*N.A.*
2000	*0.0*	*1.8*	**2000**	*1.9*	*0.4*	**2000**	*0.0*	*3.0*
2001	*0.1*	*2.0*	**2001**	*1.9*	*0.5*	**2001**	*0.0*	*3.0*
2002	*0.0*	*1.8*	**2002**	*1.9*	*0.8*	**2002**	*0.0*	*3.7*
2003	*0.0*	*2.4*	**2003**	*2.3*	*1.3*	**2003**	*0.0*	*2.9*
2004	*0.0*	*2.1*	**2004**	*2.4*	*1.8*	**2004**	*0.0*	*3.3*
2005	*0.0*	*2.1*	**2005**	*2.4*	*2.0*	**2005**	*0.0*	*3.2*
2006	*0.0*	*2.1*	**2006**	*2.5*	*2.5*	**2006**	*0.0*	*2.9*
2007	*0.0*	*2.0*	**2007**	*2.7*	*2.8*	**2007**	*0.0*	*2.0*
2008	*0.0*	*2.1*	**2008**	*2.9*	*3.1*	**2008**	*0.0*	*2.3*
2009	*0.0*	*2.0*	**2009**	*2.5*	*3.6*	**2009**	*0.0*	*1.7*
2010	*0.0*	*1.8*	**2010**	*2.7*	*4.3*	**2010**	*0.0*	*1.5*
2011	*0.0*	*2.1*	**2011**	*2.8*	*4.5*	**2011**	*N.A.*	*N.A.*
2012	*0.0*	*1.9*	**2012**	*3.0*	*4.8*	**2012**	*N.A.*	*N.A.*
2013	*N.A.*	*N.A.*	**2013**	*2.9*	*4.9*	**2013**	*N.A.*	*N.A.*
2014	*N.A.*	*N.A.*	**2014**	*2.9*	*5.1*	**2014**	*N.A.*	*N.A.*

Note: all numbers are expressed in percentages