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Abstract

This paper examines the relationship between trade liberalisation and migration in the case of Mexico. The increasing bilateral trade between Mexico and the United States after signing the North American Free Trade Agreement (NAFTA) was supposed to stem the illegal Mexican migration flow by contributing to economic growth and job creation in both countries. Twelve years after the treaty has come into effect questions emerge to what extent NAFTA was able to reduce the migration pressure: are trade and migration substitutes like the policy-makers had assumed or are they complements? Using monthly data from 1966 until 2004 we estimate a distributed lag model with the number of apprehensions at the US-Mexican border as a proxy for illegal migration. The results indicate that increasing trade flows cause larger illegal migration from Mexico to the United States.

Keywords: Migration; International Trade; Distributed Lag Model; Mexico; NAFTA.
JEL Classification: C22; F00; F10; F22.

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1 Introduction

A reason for the USA to sign the *North American Free Trade Agreement* (NAFTA) in 1992 with Mexico and Canada was to reduce the illegal Mexican migration flow. This flow had increased steadily in the past decades in spite of restrictive US-immigration politics. Since the early 1980s the number of illegal entries per year estimated by the United States Department of Homeland Security (2006) exceeded 1,000,000 individuals: in 1983 the number of illegal migrants apprehended by the US Border Patrol was 1,172,000 individuals, in 1993 it was 1,230,124 and in 2004 it slightly decreased to 1,085,006. Part of the US-American public opinion was concerned about this development, as they believed that such influxes of Mexican workers could cause social and economic problems in the country. Even though the controversial problem of the illegal migration in the United States dominated the public discussion and the political rhetoric concerning NAFTA, this topic was not covered during the NAFTA-negotiations and no provision in the final version of the Agreement deals with it[1].

Questions emerge to what extent NAFTA is able to solve the migration problem and whether trade within a common free trade zone could help reducing the migration pressure from Mexico.

According to the theory of regional integration, increasing trade can contribute to economic growth and job creation in the involved countries (Markusen and Zahniser 1999: 264). By this means, the migrants from Mexico would not have an economic incentive to illegally cross the border to the USA looking for a job, but they would stay in their home country instead. The US and the Mexican government proceeded on this assumption of a substitution type relationship between trade and migration when they decided to negotiate NAFTA. During the signing of NAFTA side agreements in September 1993 in the White House former US President Bill Clinton declared: *"[NAFTA] means an even more rapid closing of the gap between our two wage rates. And as the benefits of economic growth are spread in Mexico to working people...they'll have more disposable income to buy more American products and there will be less illegal immigration because more Mexicans will be able to support their children by staying home"* (CIS 2000: 3). On the Mexican side, President Salinas de Gortari shared Clinton's opinion and often emphasised: *"More jobs will mean higher wages in Mexico, and this in turn will mean fewer migrants to the United States and Canada. We want*

[1] There are just some rules about the entry of business and high qualified people in the country (CCH 1994, Annex 1603: 315ff.).

to export goods, not people" (Martin and Taylor 1996: 45). Mexico should in his words export tomatoes and not tomato pickers (Cornelius and Philip 1993: 485).

Twelve years after NAFTA has come into effect it should be noticed that the trade volume between Mexico and the USA has indeed grown. According to the United States Census Bureau (2006) the total volume of trade between Mexico and the United States was USD 25,858 Mio. in 1983, in 1993 it increased to USD 81,497 Mio. and in 2005 it more than trebled to USD 290,245 Mio.

The aim of this paper is to identify the relationship between trade liberalisation and migration referred to the NAFTA case: are they substitutes like the policy-makers in the USA and Mexico assumed or are they on the contrary complements?

First, we will outline eight different models that deal with this question and that constitute the theoretical foundation of our analysis. Depending on the initial assumptions, the models come to different results concerning the relationship between trade liberalisation and factor mobility. In a next step, some empirical studies dealing with this problem are considered. Finally, we specify an econometric model and estimate multiple regression models by using distributed Almon lag models.

2 Theoretical framework

We initially consider the following set of assumptions following Markusen (1983: 342):

1) we regard 2 countries, 2 goods and 2 factors (labour and capital);
2) countries have identical relative factor endowments;
3) countries have identical technologies;
4) countries have identical homothetic demand;
5) production is characterized by constant returns to scale;
6) production is characterized by perfect competition; and
7) there are no domestic distortions within the countries.

If all of these assumptions hold, then the two countries have no incentives to trade. Relaxing some of the restrictions mentioned above, leads to the following models:

- **Model I: Heckscher-Ohlin-Samuelson**

If we relax assumption 2), we have the Heckscher-Ohlin-Samuelson model (HOS model). Trade arises because both countries have different factor endowments. If factor mobility reduces these differences, then there will be no incentive to trade. Therefore, trade and factor mobility would be substitutes. In the HOS model under trade liberalisation a country exports the good where it has a comparative advantage, i.e. it will export the good that uses its relatively more abundant factor relatively more intensively in the production (Feenstra 2004: 32). Liberalised trade increases the relative price of the good that uses a country's relatively more abundant factor relatively more intensively and leads to the convergence of the goods prices (Razin and Sadka 2001: 15ff.). If both countries produce both goods and there are no factor intensity reversals, the equalisation of goods prices implies factor price equalisation following Samuelson's Factor Price Equalisation Theorem (Feenstra 2004: 13). This can be explained intuitively by the fact that although the factors of production do not move from one country to the other, but they move indirectly because they are embodied in the traded goods. The labour-abundant country will implicitly export labour and import capital (Razin and Sadka 2001: 18f.). Trade in goods is then a perfect substitute for factor mobility.

By relaxing the remaining assumptions 3), 5), 6) or 7), Markusen (1983) shows that factor mobility and trade are rather complements.

- **Model II: Different technologies**

In this model assumption 3) is relaxed, and the difference in technology is considered as the basis for trade instead of the difference in relative factor endowments. It is assumed that one country has a more productive technology in one sector as the other one, e.g. in the labour-intensive sector. Under free trade it will then export the labour-intensive good and without factor mobility, it will have a higher wage. If factor mobility is allowed alongside trade, then there will be a factor inflow of the factor intensively used in the export sector, because of the higher wage in the sector with the higher productivity. The increase in the labour-capital ratio will through Rybczynski[2] effects strengthen the specialisation in the production of the labour-intensive good (Faini et al. 1999b: 9). Thus, factor mobility reinforces trade. In this setup factor mobility and trade complement each other.

[2] The Rybczynski theorem states that if relative good prices are constant and if both goods continue to be produced, an increase in the supply of a factor will lead to an increase in the output of the good using that factor intensively and a decrease in the output of the other good (Markusen et al. 1995: 119).

- **Model III: Increasing returns to scale**

Increasing returns to scale are considered in the standard model of the "new" trade theory with two countries and one factor, e.g. labour, as the only factor of production within two sectors. One sector of production has constant returns to scale and produces a homogeneous good. The other one has increasing returns to scale and produces a set of differentiated goods. Before trade liberalisation, the wage in each country is pinned down by the assumption of constant returns to scale in the homogeneous good sector (Faini et al. 1999b: 10). Thus, wages in both countries are equal. With free trade, monopolistic competition and increasing returns to scale the bigger economy will specialize and be a net exporter in the increasing-returns-to-scale sector (Krugman 1995). Consequently, wages may diverge (they will be higher in the specialised region) and labour will have an incentive to move. This movement makes the factor endowment in both countries more unequal, so that the basis for trade increases (Faini et al. 1999b: 10). Factor mobility and trade are in this case complements.

- **Model IV: Ricardo-Viner specific factors**

In the model of specific factors some factors of production are specific or immobile to a given sector (e.g. land or capital), while other factors (e.g. labour) are fully mobile across sectors, this means that they can be used in the production of both goods. With liberalised trade a country will specialise in the production of the good that uses its abundant factor intensively and export it and it will import the good that uses its scarce factor intensively (Markusen et al. 1995: 139). The price of the imported good will decrease as production in the home country is substituted with more efficient foreign production. The assumption of increasing costs implies that the price of the exported good rises. The price of the immobile factor is determined by the value of its marginal productivity. Assuming that the productivity of one factor depends positively on the quantity of the other factor used in production, as the mobile factor moves out of production of the imported good and into production of the exported good, the price of the factor specific to the exported good will rise. The rise in the price of the exported good will also increase the value of this factor's marginal productivity. Thus, the owners of this factor will benefit of free trade. On the other side, the owners of the factor specific to the imported good will be worse off. The increased production of the exported good leads to an increase of the demand for the mobile factor. The decreased production of the imported good reduces the demand for the mobile factor. If the country is abundant in the mobile factor, there will be a net increase in the demand for the mobile factor. If the country is abundant in the immobile factor there will be a net decrease in the demand for the mobile factor. In the

former case, the price paid to the mobile factor will rise, but by less than the increase in the price of the exported good. In the latter case the price paid to the mobile factor will fall, but by less than the price of the imported good. The effect on the mobile factor is uncertain and depends on whether the country is abundant in the mobile or immobile factor and on the weight of importable goods in the consumption basket. Contrary to the results of the HOS-model, trade does not equalize factor prices across countries in the specific factor model. Thus, the effect of free trade on factor mobility cannot be determined a priori (Faini et al. 1999b: 9).

- **Model V: López-Schiff**

López and Schiff (1995: 3) add four further assumptions to the standard HOS-model: heterogeneity of labour skills, international labour mobility, migration costs and constraints on financing migration. Migration is assumed to take place from a labour-abundant sending country to a capital-abundant destination country, e.g. from a developing to a developed country. It is important to consider the migration costs and financing constraints because in developing countries some of the potential migrants in the poorer households of the sending country may be financially constrained. The migration costs often account for a large share of the income of would-be migrants, and in many cases they cannot obtain a credit in their country to finance these costs, so that they are not able to migrate. If trade liberalisation in the labour-abundant sending country increases the level of wages, like the HOS-model predicts, then the financial constraints will be relaxed and the migration will increase (Faini et al. 1999b: 10, López and Schiff 1995: 27). In this case trade and migration are complements.

- **Model VI: "Migration hump"**

The "Migration hump"-model distinguishes between the short and the long term effects of trade liberalisation on migration between countries with different economic conditions.

In the short-to-medium run, free trade is likely to increase pressures for migration from the developing country. Thus trade liberalisation and factor mobility are complements. The policies that accelerate economic growth through free trade, privatisation or land reform can lead to a temporarily increase in migration (migration hump) above the trend, because of the displacement and the disruptions that follow the economic development process (Martin and Taylor 1996: 43). A migration hump is a part of the economic take-off-process of a country when industrialisation occurs in a country that meets the following conditions: a long migration tradition, existence of migrant networks and programs for recruitment of migrant

workers (Martin 1996: 233). In the long run, if free trade brings an improvement of the economy in the developing country relative to the economy of the developed country, e.g. by narrowing the large wage and unemployment differentials, the economic incentives for migration will weaken and trade liberalisation and migration are then substitutes (Acevedo and Espenshade 1992: 740). The duration and amplitude of the migration hump are relatively small, i.e. when viewed over a long enough time period, there is less migration with free trade than without it (Martin and Taylor 1996: 44).
Although the idea behind the migration hump model has a lot of merit, no rigorous model is presented (López and Schiff 1995: 3).

Finally, there are two other models that question the wage convergence result of the HOS-model:

- **Model VII: Feenstra-Hanson**

Contrary to the HOS-model predictions, Feenstra and Hanson (1995, 1997) show that trade and investment liberalisation do not lead to the convergence of wages between the countries (a developing and a developed country), at least in the short or medium run. In their model they distinguish between skilled and unskilled labour and assume that less-skilled-labour goods are produced in the developing country, which is unskilled-labour-abundant, and skilled-labour-intensive goods are produced in the developed country, which is skilled-labour-abundant. The goods are ranked in a continuum by their intensity in skilled labour. Investment and trade liberalisation lead to a shift of investment towards the developing country. The effect of trade and investment liberalisation is to move to the developing country the production of goods that are skilled-labour-intensive from the developing country's standpoint but that are unskilled-labour-intensive from the point of view of the developed country. Thus, the demand for skilled labour increases in both countries and the wage gap widens[3]. Trade and investment liberalisation and factor movements can be complements.

- **Model VIII: Markusen-Venables**

Markusen and Venables (1998: 183-203) come to the same conclusion as Feenstra and Hanson concerning the widening of the wage-gap between skilled and unskilled labour under trade and investment liberalisation in the involved countries, but hey follow a quite different approach. The Markusen-Venables model deals with the role and structure of multinational

[3] Feenstra and Hanson (1997) show these results for the Mexican manufacture sector.

firms and plant locations. The "unbundling" of activities permitted by trade and investment liberalisation raises the relative demand for skilled labour in both countries. A complementary relationship between trade and investment liberalisation and migration is possible.

Table 1 Theoretical models

Model	Trade and Migration are...
Heckscher-Ohlin-Samuelson	substitutes
Different technologies	complements
Increasing returns to scale	complements
Ricardo-Viner-specific factors	complements or substitutes
López-Schiff	complements or substitutes
„Migration hump"	complements in the short term, substitutes in the long term
Feenstra-Hanson	may be complements, there is no factor price convergence
Markusen-Venables	may be complements, there is no factor price convergence

3 Empirical results

As we have seen, the theory regarding the relationship between trade and factor mobility is quite ambiguous. This ambiguity invites to empirical analysis, but surprisingly, only few econometric studies deal with the interaction of trade and factor mobility (Collins et al. 1999: 252).

In a descriptive approach, Richards (1994) examines the relationship between trade liberalisation and migration patterns in the experience of developing countries. She concludes that the more frequent relationship between freer trade regimes and migration flows is a complementary one, like in the case of South-east Asia (Taiwan, Singapore) or Latin America (Mexico).

Rotte and Vogler (1998) investigate empirically the link between trade, development and migration using a dataset based on total migration inflows from 86 African and Asian

countries to Germany in the period from 1981 to 1995 and on asylum migration from these countries to Germany between 1984 and 1995. The estimation results show the existence of a U-shaped relationship between development and migration, as well as a significantly positive correlation between the total migration variable (number of registrations at local authorities) and the trade variable (sum of exports to and imports from Germany). Surprisingly, the results indicate a negative effect of trade on the asylum migration variable (number of asylum applications) (Rotte and Vogler 1998: 20ff).

The empirical findings of Collins et al. (1999) show that factor flows were rarely substitutes and often complements in the history of the Atlantic economy looking at data from 1870 to 1940.

Girma and Yu (2002) investigate the link between migration and trade in the United Kingdom (UK) during the period from 1981 to 1993. They analyse the immigration to the UK from 48 countries, classified in Commonwealth (CW) and non-Commonwealth (NCW) countries. They show that immigration from CW-countries has a significant export-enhancing effect. If the stock of migration increases by 10 per cent, then UK's exports to those countries also increase by 1.6 per cent (Girma and Yu 2002: 117). In contrast, the effect of migration from the CW-countries on the exports from the UK to them is statistically insignificant. Regarding the imports, the study shows that migration from the NCW-countries has a pro-imports effect. A 10 per cent increase in the migrant stock from the NCW-countries is estimated to increase the UK imports from those countries by 1 per cent. However, immigration from the CW-countries seems to reduce the imports, a 10 per cent increase in the CW-migration stock reduces UK's imports by 1 per cent (Girma and Yu 2002: 126). This result reveals a "trade-substitution" effect of migration possibly due to migrants´ import-substituting activities.

Bowen and Wu (2004) examine empirically in a panel of OECD countries from 1980 to 2001 changes in either exports or services output in relation to changes in total migration and alternatively in net migration (immigration minus emigration). The results indicate that the output of services rises with the level of migration. In addition, they show that trade (exports) and migration are complements. However, they find out that this complementary relationship can be reduced by migration policies like guest-worker programs, the likelihood that exports and immigration are substitutes is increased in this case (Bowen and Wu 2004: 23f.).

Bruder (2004: 2ff.) also analyses the relationship between labour migration and trade in Germany in the period from 1970 to 1998 using data from the main source countries for foreign workforce in the country, namely Greece, Italy, Portugal, Spain and Turkey. The results indicate that there is a substitution type relationship between trade and the foreign labour force. Labour migration has no significant impact on trade (exports and imports), but an increasing trade volume has significantly negative effects on labour migration.

Bryant et al. (2004) use a panel data model within the framework of a standard gravity model of trade including an average of over 170 countries for the years 1981 to 2001 in order to examine the hypothesis that a greater stock of migrants in New Zealand from a particular country leads to more trade between that country and New Zealand. Their results suggest that larger migrant stocks lead to higher trade flows.

Mundra (2005: 75ff.) examines the effect of migration from 47 countries to the USA on the bilateral trade flows between them and the USA in the period from 1973 to 1980 using a semiparametric dynamic panel model. The empirical study shows that the migration effect on imports is positive for both finished and intermediate goods, but the effect on exports is positive only for finished goods. Thus, migration and trade seem to be complements.

To sum it up, most of the studies lead to the result that migration and trade are complements, but broader analysis is needed to come to a conclusion.

Table 2 Existing studies and their results

Empirical study	Trade and Migration are...
Richards (1994)	complements
Rotte and Vogler (1998)	complements for total migration, substitutes for asylum migration
Collins et al. (1999)	mostly complements, rarely substitutes
Girma and Yu (2002)	complements for non-Commonwealth sender countries, partly substitutes for Commonwealth sender countries
Bowen and Wu (2004)	complements, perhaps substitutes in the case of guest-worker programs in the destination country
Bruder (2004)	substitutes
Bryant et al. (2004)	complements
Mundra (2005)	complements

4 Econometric model

We use monthly data from 1966 to 2004 to determine the relationship between illegal migration and economic and social factors, whereas the number of apprehensions at the US – Mexican border is used as a proxy for illegal migration[4]. Since monthly data on legal migration was not available and the NAFTA treaty mainly addresses the reduction of illegal migration, using only the amount of the illegal influx seems quite appropriate. Trade data was received by the US Department of Commerce and the Federal Reserve Economic Database. For sources of all variables see Table 3.

4.1 Description of variables

The main problem is how to measure illegal immigration. Since the number of undocumented migrants crossing the US-Mexican border in a given period is not observable, the number of *border apprehensions* by the US Border Patrol is used as a proxy variable for illegal

[4] Data on a monthly basis which are collected by the US Department of Homeland Security were kindly provided by Pia M. Orrenius and Gordon H. Hanson.

immigration.[5] This indicator is not a perfect measure of the number of undocumented migrants successfully entering the US or even the number attempting to enter because in addition to counting the number of failed attempted crossings instead of the number of successful crossings, the data includes repeated apprehensions for the same individual. Furthermore, illegal aliens who enter legally and then overstay their visas are not taken into account by the apprehension data. Since they represent approximately one-quarter of illegal immigrants present in the United States, this also yields to a bias of this proxy (Orrenius and Coronado 2005: 4). Nevertheless, the apprehension data was proved to be appropriate in several recent empirical studies (Bean et al. 1990, Borjas and Fisher 2001, Hanson and Spilimbergo 1999, Hanson 2005, Orrenius and Coronado 2005). Espenshade (1995: 545) found an overall linear correlation of 0.90 between apprehensions and the volume of illegal immigration. His results also suggested that the estimated gross volume of undocumented migration exceed the level of the amount of apprehensions by a factor of 2.2. We assume that all apprehended individuals are of Mexican origin. Over the period 1977-1996, 99.2 per cent of apprehensions occurred at the US-Mexican border and the vast majority of those apprehended were Mexican residents (over a period of 1988-1996 this applied to 96.1 per cent). The same applies accordingly for the linewatch enforcement hours (see next paragraph), since in the same period 91.6 per cent occurred at the US-Mexican border (Hanson and Spilimbergo 1999: 1339).

To control the effect of Border Patrol enforcement on the illegal migration flow, we use Border Patrol *linewatch hours* as a proxy variable for enforcement intensity. In this connection linewatch hours are the number of hours the Border Patrol officers spend each month patrolling the US-Mexican border. It is expected that increasing linewatch hours deter illegal immigrants from entering the United States.

The *US unemployment rate* is implemented as a proxy for employment opportunities for migrants upon crossing the border. We do not include the Mexican unemployment rate since

[5] There are different approaches how to estimate the number of illegal Mexican migrants in the USA. One of them is the calculation of the demographic development in Mexico in a certain year (population – deaths + births – legal emigrants + legal immigrants) and compare it with the Mexican National Population Council population data for that year. The difference gives an approximation for the illegal Mexican emigration from and the illegal immigration to Mexico. This method is however not appropriate, since data availability is problematical. Another approach is to consider the number of remittances sent from the Mexican migrants in the USA to their families in Mexico. This could give an approximation for the number of migrants living and working in the USA. But data concerning the remittances also may not be an appropriate proxy variable for the influx of illegal migrants, because many of them send the money through informal ways that cannot be registered (e.g. with the help of friends or relatives) and there are also legal migrants that send remittances to Mexico.

there is limited availability for monthly data on this variable. Additionally, data concerning the unemployment rate is not very reliable because the informal sector's share of employment is not considered.

Due to our theoretical framework, a *trade* variable is included to analyse the impact of trade liberalisation on the migration flow from Mexico to the United States. According to the Heckscher-Ohlin model, trade has a substitutional effect on migration flows due to factor price equalisation. However, as we have already shown in chapter 2, relaxing the assumptions of the neoclassical trade model lead to a complementary relationship between trade and migration. Furthermore, intensive bilateral trade indicates strong ties between two countries which could lead to a reduction of immigrants' transaction costs and therefore promote migration. It is expected that the latter two effects dominate the Heckscher-Ohlin assumption, since it rests on a set of narrow assumptions that are rarely satisfied in the real world (Martin 1996).

To account for the impact of the *NAFTA* agreement on the migration flow, a Dummy variable is included. Since Mexico has already joined the General Agreement on Tariffs and Trade (GATT) in August 1986 which formed another milestone in the bilateral US-Mexican trade relationship, we also included a dummy variable for *GATT*.

A core conclusion of the neoclassical migration theory is that higher *wage differentials* result in a higher emigration from the low-wage into the high-wage countries. If free trade leads to factor price equalisation between Mexico and the USA following the HOS-theorem, i.e. wage difference equals zero, then people would not have the incentive to migrate according to this theory. If otherwise there is no wage convergence induced by free trade like Feenstra and Hanson (1995, 1997) and Markusen and Venables (1998) state for the NAFTA region, then people would continue to migrate looking for higher wages. Since it seems quite obvious that illegal migrants, after crossing the border successfully, will receive work only in the low-skill sector, the US average wage is not an appropriate measure for prospective earnings of undocumented immigrants. Although most illegal immigrants are earning even less than the federal minimum wage this seems to be a highly appropriate measure and therefore monthly US minimum wage as well as the Mexican minimum wage are used to calculate the wage differential between the two countries.

The massive Mexican Peso crisis, also known as the so-called Tequila crisis, which occurred shortly after the NAFTA treaty became effective in 1994 led to a sharp spike in unemployment and a 25 per cent drop in wages. These likely have induced migration flows to the United States that complicate modest effects that the NAFTA treaty might have had in the opposite direction (Aroca and Maloney 2005: 450). To account for this effect, the *exchange rate of pesos per dollar* is included in the estimation equation. This variable also reflects the effect of the different crisis Mexico went through in 1973, 1976 and 1982, where the Peso was strongly devaluated. It is expected that this variable has a positive impact on the illegal migration flow.

As Massey et al. (1998: 42) suggest, migrant networks are sets of interpersonal ties that connect migrants, former migrants, and non-migrants in origin and destination areas through ties of kinship, friendship, and shared community origin. Hence, it is expected that migration networks have a positive effect on migration. To account for this effect, the stock of *Mexican-born population* in the USA is implemented in the model. Since data is only available on a yearly basis, monthly values have to be constructed. Our theory that the stock of Mexican-born population may have the same trend as the total population of the United States is verified by the high correlation coefficient of 0.97 between these two variables. Observing monthly data of total US population leads to the conclusion that this time series tends to be linear. Therefore, a linear interpolation of missing values for the stock of Mexican-born population variable seems to be adequate and reasonable.

The USA has made several attempts to control the influx of illegal immigrants from Mexico (see Table 4). To account for this effect, a dummy variable is included which equals 1, if *immigration policy* becomes more restrictive.

Another dummy variable included in the model accounts for the *Immigration Act* of 1990. It equals 1 after October 1990 when the law was implemented. The law recognizes the growing internationalisation of the world's labour market and it facilitates employment-related immigration in order to enable US employers to hire more experts in such fields as science, engineering, systems analysis or computer programming. The Immigration Act continued to favour people with family members already living in the United States and it provided for the admission of immigrants from "underrepresented" countries to increase the diversity of the immigrant flow.

The *Immigration Reform and Control Act (IRCA)* was passed in order to reduce illegal immigration to the United States. The law established a one-year amnesty program for illegal migrants who had already worked and lived in the US since January 1982. They could apply for the regularization of their status and eventually for full citizenship. Family reunification was also established as a key priority. Furthermore, the law mandated the intensification of Border Patrol activities. Under IRCA over 2.7 Mio. illegal aliens and others not qualifying for visas were legalized. We include a dummy variable to account for this effect which equals 1 after May 1987, when IRCA was launched.

The inclusion of the *maquila(dora)*[6] *employment* variable draws upon two theoretical arguments which regard the relationship between employment in the Mexican maquila industry and the amount of illegal migration. Due to the first approach, employment creation along the US-Mexican border reduces undocumented immigration to the United States since potential migrants are more likely to find work in the area, thus decreasing the excess supply of border workers. By contrast, the second view suggests that increasing levels of employment in the maquiladora result in heavy internal migration movements from the interior of Mexico to the border region, some of which spill into the US as some migrants are unable to find full time employment (Davila and Saenz 1990: 97). According to Rivera-Batiz (1986), workers in the interior of Mexico expect opportunities of being employed in the maquila sector and therefore migrate to the Mexican border area. This will also lead to undocumented migration movements in the US, since some of them are not able to find full time employment there. Hence, maquila employment initially represents a "pull" variable, but then becomes a "push" variable. Due to the dual character of these two theoretical approaches the influence of the maquila variable is therefore uncertain.

The descriptive Statistics of these variables are shown in Table 8.

4.2 Empirical Model

First it has to be considered whether the time series are stationary, i.e. they do not contain unit roots. To test this hypothesis the augmented Dickey-Fuller test is carried out. Regarding the ADF test the apprehensions time series follows a deterministic as well as a stochastic trend. The test result also indicates a stationarity around a deterministic trend. To obtain a stationary

[6] Maquiladora or maquila are assembly plants in Mexico, especially along the border to the United States, that imports materials and equipment on a duty-free and tariff-free basis for manufacturing and then re-exports the assembled product usually back to the USA.

time series the apprehension variable is therefore regressed on a time trend. The obtained residuals will be stationary and are known as the (linearly) detrended time series. The ADF test (without trend) is also conducted for the other time series and in all cases the hypothesis is not rejected which means that they are not stationary (see Table 9).

The time series of the Pesos-Dollar exchange rate variable shows a structural break at the middle 1990s which makes the Dickey-Fuller test not an appropriate method for detecting a unit root and therefore could lead to a wrong test result (see Perron 1989). Zivot-Andrews (1992) provide a solution with their unit root test which takes into account the existence of potential structural break in the data. Their procedure enables to test the Null hypothesis of a unit root against the alternative hypothesis of a stationary process that allows for a one-time unknown break in the trend. The Zivot-Andrews unit root test is applied and indicates that this time series is stationary.

The time series suffering from a random walk are integrated of order 1 and consequently enter the regression as first differeneces. Since the dependent variable is trendstationary and is therefore not integrated of any order, testing for a cointegration relationship is not necessary. For our estimations we used multiple regression models with lagged independent variables. In general, lagged explanatory variables can be included explicitly in the model when a substantial period of time may pass between the economic decision-making period and the final impact of a change in a policy variable. More generally, one would specify that economic changes can be distributed over a number of time periods which provides the basis for the distributed lag model, in which the series of lagged explanatory variables accounts for the time-adjustment process (Pindyck and Rubinfeld 2000). The estimation equation takes the following form:

$$Y_t = \beta_0 + \beta_1 \Delta LW_{t-1} + \sum_{q=0}^{m} \alpha_q \Delta T_{t-q} + \sum_{q=0}^{m} \delta_q \Delta WD_{t-q} + \sum_{q=0}^{m} \gamma_q \Delta UR_{t-q} + \sum_{q=0}^{m} \lambda_q EXR_{t-q} + \beta_2 \Delta MN_t + \sum_{i=1}^{n} \mu_i D_{i,t} + \varepsilon_t \quad (1)$$

where Y_t describes the apprehensions at the US-Mexican border attempted by the US Border Patrol at time t. ΔLW_{t-1} are the first differences of linewatch hours. Since they may be simultaneously determined with apprehensions (for a detailed discussion see Hanson and Spilimbergo 1999: 1350) the linewatch hours variable enters the estimation equation with a

one-period-lag. ΔT_{t-1} is the distributed lag of trade which also enters the equation as first differences. This also accounts for ΔWD_{t-1} which is the distributed lag for the wage differential. ΔUR_{t-1} is the distributed lag of the US unemployment rate and EXR_{t-1} is the distributed lag for the US Dollar-Pesos exchange rate. Since the latter contains no unit root it has not been differenced. A next issue is ΔMN_t which is a proxy variable for the migrant networks. We assume that the networks have already been so expanded since the beginning of the Mexican migration process to the USA in the middle of the 19th century that the new migrants do no longer (strongly) react to past increasing or decreasing stocks of Mexicans in the USA. Therefore, the variable is not lagged. $D_{i,t}$ stands for a vector of five dummy variables, namely NAFTA, GATT, policy, IRCA and Immigration Act which also enter the equation without any lags since they do not receive a value of one until their point of implementation. Thus, it can be assumed that they affect the apprehension variable immediately. $\beta_0, \beta_1, \beta_2, \alpha_q, \delta_q, \gamma_q, \lambda_q$ and μ_i are the estimation coefficients, where β_0 is the intercept.

Our main hypothesis is that trade, wage differential, unemployment rate and exchange rate affect illegal migration in the long run. To reduce the effect of multicollinearity a rather popular method is proposed by Almon (1965). In this technique it is assumed that the q coefficients of the regressor lie on a polynomial curve. In this paper the finite distributed lags are restricted to lie on a 2nd degree polynomial[7]. Across time, the estimated lag coefficients may foster (positive lag coefficient) or hinder (negative lag coefficient) illegal migration. The long-run effect is calculated as the sum of the statistically significant lag coefficients.

In a next step the appropriate lag length is determined by using an iterative process with the Akaike (1974) and the Schwarz (1978) information criterion where we allowed for a maximum lag length as proposed by Schwert (1989) by $q_{max} = int\left[12\left(T/100\right)^{1/4}\right]$ = 17 months prior to the apprehension variable (see Table 6).

Since autocorrelation in the residuals was detected through the Durbin-Watson Statistic, Ordinary Least Squares does not lead to efficient estimators. A solution is provided by Newey and West (1987) who developed an estimator whose standard errors are robust to autocorrelation as well as to heteroskedasticity.

[7] Higher order polynomial terms did not lead to different results regarding the sign and the significance of the exogenous variables.

In order to also account for the effect of the maquiladora employment, the procedure was repeated since data on maquila employment is only available since 1990. As the maquila variable suffers from a unit root it also has to be differenced and finally enters the equation as a distributed lag with first differences. This leads to:

$$Y_t = \beta_0 + \beta_1 \Delta LW_{t-1} + \sum_{q=0}^{m} \alpha_q \Delta T_{t-q} + \sum_{q=0}^{m} \delta_q \Delta WD_{t-q} + \sum_{q=0}^{m} \gamma_q \Delta UR_{t-q} + \sum_{q=0}^{m} \lambda_q EXR_{t-q} + \sum_{q=1}^{m} \theta_q \Delta ME_{t-q} + \beta_2 \Delta MN_t + \sum_{i=1}^{n} \mu_i D_{i,t} + \varepsilon_t \quad (2)$$

whereas ΔME_{t-q} is the distributed lag of the Maquiladora variable. The estimation procedure is the same as already described above, thus an Almon distributed lag model with a second-degree polynomial is applied and estimated with Newey-West standard errors. The hypothesis is again that maquila employment affects migration in the long-run. The maximum lag length which is also selected by the same procedures as already mentioned above is set up to 13 month prior to the apprehension variable.

4.3 Estimation Results

Table 9 presents the regression results for the period from 1966 until 2004 and Table 10 shows the estimates during the period 1990 until 2004.

Regarding the results of the linewatch hours neither the results of the specifications during the period of 1966 until 2004 nor during the 1990 until 2004 period have any significant effect on the border apprehensions.

As expected we found a negative significant relationship between US unemployment rate and apprehensions in specifications 2 - 5. Specifications 6, 7, 9 and 10 have also the negative sign, but show no significant relationship between the two variables.

The wage differential has a significant positive effect on the influx of illegal migrants. These results confirm one of the basic neoclassical theories regarding migration behaviour. Hicks (1932: 76) already stated in 1932: „….. differences in net economic advantages chiefly in wages are the main cause of migration.“ Thus, the larger the wage difference, the more people migrate.

The effect of the dummy for GATT on the apprehensions is found to be positive significant in four out of five specifications, contrary to the NAFTA-dummy, which is never significant. In Mexico trade liberalisation began after the severe debt crisis in 1982, which led to a shift in the development strategy in the country from an import-substitution industrialisation to a neoliberal market-oriented strategy. During the 1980s the Mexican economy underwent a profound transformation and several economic reforms like privatisations, elimination of import licences and tariffs, deregulation of the market etc. were introduced. In order to restore the confidence of the international institutions and investors and to anchor the undertaken reforms, Mexico joined the GATT in August 1986. Therefore, Mexico's so-called "silent integration" (Schirm 1997: 49ff.) to the US-market has already begun at that time. Between 1988 and 1993 bilateral trade between the two countries has really blossomed. An average of already 71.8 per cent of total Mexican exports went to the USA and inversely the share of total Mexican imports coming from the US was rather high with 66.2 per cent (Melchor del Río 2006). It is quite obvious that trade liberalisation and dependency on the US economy have already begun with the GATT membership. Despite the increasing bilateral trade volume since NAFTA came into effect in January 1994 (e.g. in 2005 it reached 85.8 per cent of Mexican total trade), the treaty just confirmed and speeded up the neoliberal economic strategy of the country. To some extent it seems that NAFTA has more political than economic relevance for the USA and Mexico (Melchor del Río 2006).

The trade variable has a significant positive impact on the illegal migration contrary to the results of the neoclassical trade theory. This can be traced back to the different technologies in both countries. In the presence of free trade the labour intensive production in Mexico (e.g. crop production) cannot compete with the capital intensive US production that holds a comparative advantage. Thus, employees in the labour intensive sector of Mexico were laid off which lead to rise of migration pressure (Martin and Taylor 1996: 50). Furthermore, the different factor productivity in both countries may lead to an increase of migration. If labour is more productive in the US due to better infrastructure and qualification then manufacturing of labour intensive goods can decline in Mexico and raise in the US. Consequently, Mexican migration would also increase. An example is the enlargement of the shoe industry by hiring Mexican workers in Los Angeles in the 1980s, whereas production of shoes suffered from heavy losses in Mexico (Martin and Taylor 1996: 51). Hence, the big supply of labour as well as the wage gap between Mexico and the US is not sufficient for obtaining a comparative advantage in the labour intensive sector (Martin and Taylor 1996: 56). Returns to scale which

arise in the production of labour intensive goods in the US mainly manufactured by Mexican migrants lead to declining marginal costs with increasing production. Since more employees are needed for the expanding industry migration is rising (Martin and Taylor 1996: 52). The negative effects on formerly protected sectors such as agriculture occur immediately, whereas positive effects need time for adaptation. For example, there is a time lag between the made investments and the creation of jobs. Furthermore, some production factors are specific for one sector and cannot be used immediately in another sector. In this adaptation period an increase of migration can happen in terms of a migration hump (Martin and Taylor 1996: 52f.). A further reason for the complementary between free trade and migration could be the market failure in Mexico; there is no credit- and social insurance system. According to the theory of new migration economics, migration means a risk diversity strategy for lots of Mexican families, since they can secure their income in the case of unemployment, diseases, poor harvest, etc. by obtaining remittances from Mexican emigrants (Martin and Taylor 1996: 57).

The trade variable seems quite robust for every specification, however in the period of 1990 until 2004 it is only significant in 2 out of 5 specifications which could be due to the high correlation with the maquila variable.

The Immigration Act variable has a positive effect on the apprehensions variable. Although the law only concerned legal immigration to the United States (it was primarily thought to attract qualified migrants that where needed in the US-market), it may also have had a "call-effect" on the illegal migrants.

The policy variable remains insignificant in every specification. This seems to be revealing of the fact that illegal immigration has not declined as a result of tighter border controls.

The exchange rate of pesos per dollar also had no significant impact on the illegal migration in any specification.

The maquila variable is significant in every specification. The positive coefficient indicates that employment in the maquiladora industry at the Mexican border region leads to an increase of undocumented migrants from Mexico to the US. This confirms the assumptions made by Davila and Saenz (1990) and Rivera-Batiz (1986).

Finally, the remaining variables (stock of Mexicans in US and IRCA) are found to be insignificant in every specification.

Regarding the specification during the period 1966 – 2004 and 1990 – 2004 it can be observed that some variables, namely trade, unemployment rate and Immigration Act which seem to be quite robust in the 1966 – 2004 period still keep their algebraic sign in the 1990 – 2004 period, however, they loose their significance. This could be due to the smaller sample which leads to higher standard errors and therefore results in insignificant variables. It should also be taken into account that the effect of the trade variable seems rather small compared to the other significant economic effects.

5 Concluding Remarks

This theoretical and empirical analysis makes a contribution in helping to understand the link between trade and migration in Mexico. To our knowledge, this is the first paper which investigates the effect of trade on migration in the US – Mexican case that uses time series data for such a long period.

Our results indicate that increasing bilateral trade flows cause larger illegal migration from Mexico to the United States. Therefore, trade and migration are complements in the Mexican case. Surprisingly, the US immigration policy seems to have no effect on the illegal migrant flow. To stem the illegal migration, it would rather be necessary to create more jobs and to reduce the prevailing poverty and high income inequality in Mexico, which are not adequate for a middle-income country.

However, this analysis also has some constraints. In order to empirically prove the validity of some of the theoretical models (e.g. López-Schiff, different technologies or increasing returns to scale), it would be necessary to consider variables for the skills of the Mexican workforce, the migration costs and for the productivity in both countries. It would also be interesting to investigate the effect of the US-Official Development Assistance in Mexico and of the number of young Mexicans in working age on the Mexican migration to the USA. But again, missing monthly data from 1966 onwards did not allow us to extend the analysis in this paper. Another problem was the data aggregation of the trade variable (exports and imports). It might have some important heterogeneity that should be considered.

In future research it may be interesting to investigate the effect of the trade flows by commodity groups on illegal migration.

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Figure 1 Apprehensions at the US-Mexican border (not seasonally adjusted)

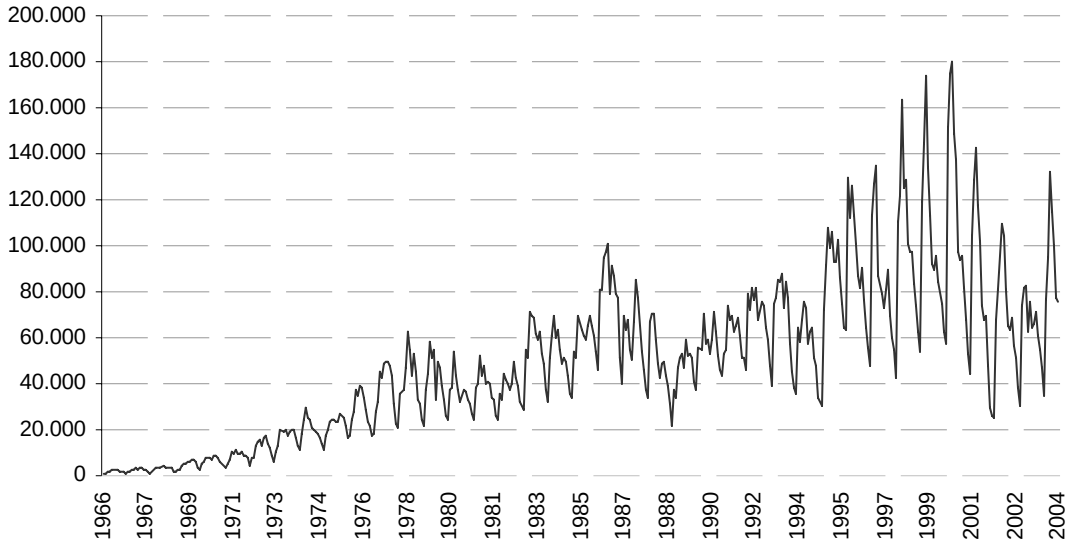

Table 3 Definition and Source of variables

Variable	Definition	Source
Border Apprehensions	Apprehensions by the US Border Patrol attempting to cross US-Mexican border illegally	Hanson (2006), Orrenius (2006)
Trade	Trade volume (Exports + Imports) between Mexico and the United States in Millions of US Dollar	US Department of Commerce (1966 – 1973), Federal Reserve Economic Data (2006)
Mexican-born population	Mexican-born population of the US in thousands	Mexican Migration Project (2006), Current Population Survey - CPS (1999-2005)
Linewatch hours	Linewatch hours spent by the US Border Patrol policing US border.	Hanson (2006), Orrenius (2006)
US unemployment	US unemployment rate	Bureau of Labor Statistics (2006)
Pesos-Dollar exchange rate	Pesos for one US Dollar (old and new pesos)	INEGI (2006), Banco de México (2006)
Maquila employment	Employees in the Mexican maquiladora industry	INEGI (2006)
Wage Differential	(US federal minimum wage/US CPI) – (Mexican minimum wage/Mexican CPI)	US Bureau of the Census (2006), Banco de México (2006)
NAFTA	Dummy = 1, if NAFTA treaty became effective, otherwise = 0	
GATT	Dummy = 1, if GATT became effective, otherwise = 0.	
IRCA	Dummy=1, if IRCA is enacted, otherwise =0.	
IMACT	Dummy=1, if the Immigration Act of 1990 is enacted, otherwise =0.	
Policy	Dummy = 0, if immigration policy becomes less restrictive and 1, if immigration laws are tightened.	Melchor del Río (2006)

Table 4 Implementation date and possible effects on migration of policy variables

Date	Policy	Possible effect on migrants
May 1987	Immigration Reform and Control Act (IRCA) was implemented	positive
October 1991	Immigration Act was launched	positive
September 1993	"Hold the line"	negative
October 1994	"Gate-keeper"	negative
April 1997	Illegal Immigration Reform and Immigrant Responsibility Act (IIRIRA) became law	negative
August 1997	"Rio Grande"	negative
February 1999	"Saveguard"	negative
October 2001	US Patriot Act	negative
December 2001	US Canada Smart Border Declaration	negative
March 2002	US Mexican Smart Border Action Plan	negative
May 2002	Enhanced Border Security and Visa Entry Reform Act	negative
December 2004	Intelligence Reform and Terrorism Prevention Act	negative

Source: Melchor del Río 2006.

Table 5 Results obtained by checking for unit roots with the (augmented) Dickey Fuller Test

Level			***Difference***		
Variable	**T-Statistic**	**Lag Length #**	**Variable**	**T-Statistic**	**Lag Length #**
Border apprehensions	-3.8374 [b]	14			
Linewatch Hours	1.1035	5	*Δ(Linewatch Hours)*	-7.5661 [a]	4
Wage Differential	0.0969	1	*Δ (Wage Differential)*	-15.0146 [a]	2
Trade	2.2036	16	*Δ (Trade)*	-4.9066 [a]	15
Unemployment Rate	1.5910	16	*Δ(Unemployment Rate)*	-4.0756 [a]	13
Mexicans in US	2.3013	1	*Δ(Mexicans in US)*	-2.7797 [c]	0
Maquila Employment	-1.0112	2	*Δ(Maquila Employment)*	-3.6623 [a]	1
US – Pesos Exchange Rate *	5.772	0			

The optimal number of lagged differences is based on the Schwarz Information Criterion
* Values obtained by Zivot-Andrews unit root test. Critical Values: 1%: -5.43, 5%: -4.80
[c]significant at 10 %; [b]significant at 5 %; [a]significant at 1 %.

Table 6 Selection of appropriate lag length for Almon distributed lag model with Akaike's (AIC) and Schwarz' (BIC) information criterion (Equation 1)

	(1)		(2)		(3)		(4)		(5)	
Lags	***AIC***	***BIC***	***AIC***	***BIC***	***AIC***	***BIC***	***AIC***	***BIC***	***AIC***	***BIC***
1	-	-	-	-	-	-	-	-	-	-
2	8.5195	8.6722	8.5024	8.7629	8.4955	8.7649	8.5043	8.7737	8.4998	8.7782
3	8.5070	8.6599	8.4668	8.7277	8.4599	8.7298	8.4667	8.7366	8.4639	8.7428
4	8.5040	8.6572	8.4510	8.7123	8.4426	8.7129	8.4488	8.7191	8.4457	8.7250
5	8.5063	8.6598	8.4517	8.7135	8.4432	8.7140	8.4490	8.7198	8.4460	8.7257
6	8.5085	8.6622	8.4597	8.7219	8.4504	8.7216	8.4572	8.7284	8.4535	8.7337
7	8.5182	8.6722	8.4660	8.7286	8.4596	8.7312	8.4644	8.7361	8.4631	8.7438
8	8.5293	8.6835	8.4883	8.7514	8.4826	8.7547	8.4883	8.7604	8.4865	8.7677
9	8.5564	8.7108	8.5143	8.7778	8.5116	8.7842	8.5162	8.7888	8.5160	8.7977
10	8.5167	8.6714	8.4696	8.7335	8.4708	8.7438	8.4732	8.7463	8.4752	8.7573
11	8.4422	8.5972	8.3849	8.6493	8.3893	8.6628	8.3894	8.6629	8.3932	8.6758
12	**8.4267**	**8.5820**	**8.3644**	**8.6292**	**8.3686**	**8.6426**	**8.3689**	**8.6428**	**8.3729**	**8.6560**
13	8.4338	8.5893	8.3668	8.6321	8.3711	8.6455	8.3710	8.6454	8.3755	8.6590
14	8.4806	8.6364	8.4034	8.6691	8.4079	8.6828	8.4076	8.6825	8.4122	8.6962
15	8.4866	8.6426	8.4109	8.6771	8.4153	8.6906	8.4154	8.6907	8.4190	8.7035
16	8.4780	8.6342	8.3953	8.6619	8.3997	8.6755	8.3996	8.6754	8.4031	8.6881
17	8.5065	8.6630	8.4297	8.6967	8.4342	8.7104	8.4340	8.7102	8.4385	8.7240

Table 7 Selection of appropriate lag length for Almon distributed lag model with Akaike's (AIC) and Schwarz' (BIC) information criterion (Equation 2)

	(6)		(7)		(8)		(9)		(10)	
Lags	***AIC***	***BIC***	***AIC***	***BIC***	***AIC***	***BIC***	***AIC***	***BIC***	***AIC***	***BIC***
1	-	-	-	-	-	-	-	-	-	-
2	8.9814	9.2707	9.0309	9.5192	8.6533	9.2183	8.8820	9.4470	8.6644	9.2477
3	8.9828	9.2722	8.9981	9.4864	8.6339	9.2011	8.8253	9.3926	8.6454	9.2310
4	8.9903	9.2797	8.9739	9.4622	8.6138	9.1833	8.7748	9.3444	8.6254	9.2134
5	8.9824	9.2718	8.9470	9.4352	8.6104	9.1822	8.7437	9.3155	8.6221	9.2124
6	8.9589	9.2482	8.9362	9.4244	8.6258	9.1999	8.7279	9.3020	8.6376	9.2302
7	8.9243	9.2137	8.9061	9.3944	8.6353	9.2117	8.7101	9.2865	8.6471	9.2421
8	8.8810	9.1703	8.8756	9.3639	8.6166	9.1954	8.6659	9.2447	8.6283	9.2257
9	8.8910	9.1803	8.8799	9.3681	8.6033	9.1844	8.6394	9.2205	8.6151	9.2150
10	8.8530	9.1423	8.8573	9.3455	8.5837	9.1672	8.6060	9.1896	8.5957	9.1981
11	8.7983	9.0877	8.8022	9.2905	8.5508	9.1368	8.5681	9.1540	8.5608	9.1656
12	8.8027	9.0921	8.7777	9.2660	8.4958	9.0842	8.5151	9.1034	8.5081	9.1154
13	**8.7641**	**9.0534**	**8.6881**	**9.1764**	**8.4838**	**9.0747**	**8.4906**	**9.0815**	**8.4947**	**9.1045**

Table 8 Descriptive Statistics

Variable	Pre-NAFTA (1966M01-1993M12)							
	Mean	Median	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis	Observations
Border apprehensions (in thousands)	36.39	37.47	100.48	0.974	24.61	0.26	2.12	336
Linewatch Hours	159,526.3	167,029.5	300,629.0	67,949.0	55,237.25	0.01	2.05	336
Wage Differential (per day)	45.46	46.01	57.70	25.30	5.65	-1.21	6.64	336
Trade (in Mio US-Dollar)	2,099.53	1,909.80	7,731.00	145.90	1,942.34	0.96	3.00	336
US Unemployment Rate	6.30	6.30	11.40	2.90	1.69	0.24	2.92	336
Exchange Rate Peso/US-Dollar	589.07	22.80	3,119.80	3.10	1,046.98	1.55	3.66	336
Mexicans in USA (in thousands)	2,251.92	1,986.64	5,357.80	662.95	1,381.54	0.56	2.10	336
Maquiladora Employment	490,389.9	494,145.0	550,457.0	424,652.0	39,505.62	0.07	1.66	48
Variable	Post-NAFTA (1994M01-2004M07)							
	Mean	Median	Maximum	Minimum	Standard Deviation	Skewness	Kurtosis	Observations
Border apprehensions (in thousands)	85.22	80.45	179.74	24.89	32.56	0.64	3.23	127
Linewatch Hours	597,261.8	708,960.0	870,500.0	258,593.0	207,431.6	-0.38	1.46	127
Wage Differential (per day)	36.32	37.01	40.80	24.46	4.16	-1.50	4.66	127
Trade (in Mio US-Dollar)	15,474.83	16,213.90	23,305.90	7,295.20	4,677.94	-0.18	1.70	127
US Unemployment Rate	5.16	5.30	7.30	3.60	0.82	0.01	2.29	127
Exchange Rate Peso/US-Dollar	8.48	9.17	11.51	3.11	2.12	-1.14	3.75	127
Mexicans in USA (in thousands)	7,629.27	7,137.00	10,376.75	5,391.84	1,499.06	0.45	1.89	127
Maquiladora Employment	974,249.2	1,057,709	1,247,803	546,433.0	226,126.1	-0.41	2.04	127

Table 9 Regression Results (Equation 1)

	(1)	*(2)*	*(3)*	*(4)*	*(5)*
Dependent variable	**1966 - 2004** **Border apprehensions/1000**				
ΔLinewatch hours$_{t-1}$	-	-	0.0001 (1.6095)	-	0.0001 (-1.6261)
ΔWage differential $_{t-q}$	-	9.2373 [c] (1.7264)	9.2134 [c] (1.7323)	9.3081 [c] (1.6848)	9.3742 [c] (1.7010)
ΔTrade $_{t-q}$	0.0677 [a] (2.6839)	0.0642 [b] (2.5359)	0.0648 [b] (2.5558)	0.0646 [b] (2.2101)	0.0655 [b] (2.2423)
ΔUS unemployment rate $_{t-q}$	-	-25.6583 [b] (-2.4687)	-24.8567 [b] (-2.4261)	-24.7486 [b] (-2.5600)	-25.9794 [b] (-2.5132)
Dollar/Pesos exchange rate $_{t-q}$	-	-0.0020 (-0.4346)	-0.0023 (-0.4814)	-0.0021 (-0.4370)	-0.0023 (-0.4881)
ΔStock of Mexicans in US$_t$	-	-	-	0.0089 (0.0693)	0.0127 (0.0998)
NAFTA$_t$	-1.6084 (-0.3340)	-11.5788 (-0.8074)	-12.6557 (-0.8800)	-11.8315 (-0.7690)	-13.0217 (-0.8473)
GATT$_t$	-6.0290 [b] (-1.9989)	13.8565 [c] (1.6488)	13.9381 [c] (1.6451)	13.8251 [c] (1.6487)	13.8942 [c] (1.6422)
IRCA$_t$	-	-18.9967 (-1.3947)	-18.6280 (-1.3575)	-18.9836 (-1.3932)	-18.6069 (-1.3557)
Immigration Act$_t$	-	8.2690 [c] (1.6806)	8.4323 [c] (1.6610)	8.2303 [c] (1.6501)	8.3784 (1.6295)
Policy$_t$	-	-2.9335 (-0.4514)	-1.4444 (-0.2176)	-3.0172 (-0.4493)	-1.5529 (-0.2278)
Constant	1.9324 (0.6468)	6.3881 (1.3838)	5.9003 (1.2977)	6.3547 (1.3633)	5.8496 (1.2726)
Newey-West truncation parameter	5	5	5	5	5
Max. number of q lags included	12	12	12	12	12
Seasonal Dummies	Yes	Yes	Yes	Yes	Yes
Observations	450	450	450	450	450
Adjusted R-Squared	0.4073	0.4570	0.4596	0.4558	0.4584

Newey-West estimates. T-values in parentheses.
[c]significant at 10 %; [b]significant at 5 %; [a]significant at 1 %.

Table 10 Regression Results (Equation 2)

	(6)	*(7)*	*(8)*	*(9)*	*(10)*
Dependent variable	**1990 - 2004** **Border apprehensions/1000**				
ΔLinewatch hours $_{t-1}$	-	-	0.0001 (1.4141)	-	0.0001 (1.4238)
ΔWage differential $_{t-q}$	-	24.4189 [b] (2.5237)	40.7327 [a] (3.2955)	38.2790 [a] (3.3532)	37.5459 [a] (3.2442)
ΔTrade $_{t-q}$	0.0870 [a] (4.3066)	0.0839 [a] (2.6901)	0.0191 (0.3930)	0.0007 (0.0138)	-0.0045 (-0.0888)
ΔUS unemployment rate $_{t-q}$	-	-15.0672 (-0.2107)	2.9320 (0.0340)	-19.4154 (-0.2046)	-6.1418 (-0.0659)
Dollar/Pesos exchange rate $_{t-q}$	-	0.0086 (0.7965)	0.0131 (1.5924)	0.0120 (1.4182)	0.0124 (1.4605)
ΔStock of Mexicans in US$_t$	-	-	-	0.0757 (0.4801)	0.0774 (0.4990)
ΔMaquila Employment$_{t-q}$		-	0.0001 [b] (2.3937)	0.0001 [b] (2.4311)	0.0001 [b] (2.2955)
NAFTA$_t$	4.1841 (0.9143)	24.0255 (0.7812)	15.3482 (0.7731)	13.2582 (0.6437)	15.9006 (0.7791)
Immigration Act$_t$	-	6.3599 (0.7641)	15.3988 [b] (1.9540)	14.6544 [b] (1.8203)	14.7389 [b] (1.8378)
Policy$_t$	-	1.4872 (0.2373)	3.9221 (0.5076)	2.4059 (0.3256)	3.3537 (0.4660)
Constant	3.6434 (0.5589)	-16.0375 (-0.5888)	-40.0915 [c] (-1.7796)	-36.3144 (-1.5965)	-38.8403 [b] (-1.7209)
Newey-West truncation parameter	4	4	4	4	4
Max. number of q lags included	13	13	13	13	13
Seasonal Dummies	Yes	Yes	Yes	Yes	Yes
Observations	175	175	162	162	162
Adjusted R-Squared	0.6043	0.6525	0.7404	0.7389	0.7404

Newey-West estimates. T-values in parentheses.
[c]significant at 10 %; [b]significant at 5 %; [a]significant at 1 %.