Akerke Demeubayeva*

THE IMPACT OF BILATERAL TRADE BETWEEN THE US AND MEXICO ON THE US INDUSTRIAL PRODUCTION BEFORE AND UNDER THE PRESIDENCY OF DONALD TRUMP

DOI: 10.26399/meip.3(70).2020.18/a.demeubayeva

Introduction

Nowadays, the US president Donald Trump's protectionist policy is one of the most controversial topics for discussion in the world. The United States has guided the world into a rules-based system of trade-globalisation for the last 75 years, culminating in the creation of the World Trade Organisation (WTO) in 1995 and subsequent bilateral and multilateral trade agreements (Stiglitz 2018). However, Trump, being highly concerned about the effects of globalisation, entitled suggestions aimed at reversing the long-term trade liberalisation process initiated by his predecessors (Noland et al. 2016). In terms of reasoning, Trump claimed that trading partners, especially members of such regional trade partnerships as the Trans-Pacific Partnership (TPP) and the North American Free Trade Agreement (NAFTA), had been taking economic advantages over the US for decades (Donnan 2019). Donald Trump stated that Americans

> must protect our borders from the ravages of other countries making our products, stealing our companies and destroying our jobs. Protection will lead to great prosperity and strength (The White House 2017).

* Akerke Demeubayeva – graduate of Lazarski University & Coventry (BA in BE), e-mail: ukkakerke@gmail.com; ORCID: 0000-0003-2767-7305

Thus, in his electoral campaign, he pledged to abolish some of the existing free trade agreements, renegotiate the NAFTA agreement, and impose tariffs on imports from Mexico and China (Noland et al. 2016). This way, the decline in the volume of imports was expected to cause a rise in employment and wages of the US citizens (Stiglitz 2018: 515–528).

In November 2016, Hilary Clinton obtained 48.2% of the popular vote compared to 46.1% of votes for Donald Trump. However, there were 304 electoral votes for Trump in contrast to 227 electoral votes for Clinton, which resulted in his victory in the fifty eighths US presidential election (Federal Election Commission 2017).

> America is a nation of many economies, but those that produce real, tangible things – food, fiber, energy and manufactured goods – went overwhelmingly for Trump (Kotkin 2016).

The main motivation behind their support was a reasonable loss of manufacturing competitiveness under the process of globalisation. In response, Trump's Administration immediately started to work on implementing his pre-electoral promises. Thus, on the first day of Trump's presidency, the US pulled out of the Trans-Pacific Partnership. Initially, the TPP had a strategic aim of counteracting the economic influence of China (Lobosco 2018). Instead of the proposed deal, on 6 July 2018, the US imposed a 25% tariff on goods imported from China, which amounted for 34 billion in 2017 (Liu and Woo 2018: 319–340). Xi Jinping, the general secretary of the Chinese Communist Party, responded to the US in the form of tit for tat game strategy, by imposing reciprocal tariffs (Liu and Woo 2018). These actions triggered the ongoing trade war between the US and China.

The next major Trump's target was to restrict economic relations with Mexico for the following reasons. First, the American President has repeatedly expressed his hostile attitude towards Mexico and its citizens, claiming they are "rapists, criminals, and 'bad hombres'" (Klingner 2018). Second, he characterised NAFTA as the worst trade agreement that the US had ever signed (Klinger 2018). In 1994, this agreement (launched by President George H.W. Bush) established the trade union between the US, Mexico and Canada (Noland et al. 2016). Supporters of NAFTA stated that imports from Mexico would help US consumers and producers to purchase relatively inexpensive final goods and intermediate goods, respectively (Burfisher et al. 2001: 125–144). However, opponents of NAFTA, including President Trump, claimed that American manufacturers and blue-collar workers would lose their jobs because of both increasing imports from Mexico and capital flows to Mexico (Burfisher et al. 2001: 125–144). Therefore, in May 2018, the US imposed a 25% on steel and a 10% tariff on aluminium imported from the EU, Canada and Mexico (Edelman 2019). The Mexican President together with the Canadian Prime Minister profoundly regretted this decision and agreed to impose counteractive measures until the US government terminates tariffs on metals (Edelman 2019). A Mexican economist and politician, Ildefonso Guajardo, commented that the US is attempting to manipulate a "fully integrated" industrial sector (Edelman 2019). Hence, undervalued trade relations with Mexico are expected to result in significant retaliation against the US economy.

This paper aims to examine the effect of President Trump's political decisions on foreign trade with Mexico on the US manufacturing sector. The main research question is whether Trump's trade policies towards Mexico have a positive impact on the US industrial production. The main hypothesis of the research is that political factors influencing trade are significantly affecting industrial production. Moreover, it is expected that Trump would fail in his trade policies, bringing the US economy, particularly its industrial sector, irrecoverable losses, in contrast to previous mutually beneficial trade agreements. This article presents empirical findings of numerous researchers proving that there is a significant impact of trade openness on domestic production. However, they were mainly based on the cross section data, which raise doubts about the efficiency of employed models for a particular country. In contrast to the previous studies, the VAR estimation, based on time series data, has been found to be a proper econometric model in the context of current research.

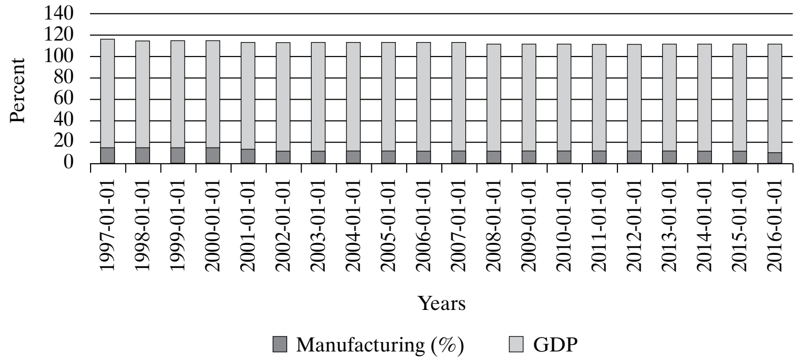
1. Theoretical Approach

Manufacturing sector of secondary production is one of the most significant sectors of the US economy. However, for the last 25 years, the US manufacturing sector has been experiencing two contradicting trends illustrated in Figure 1: a nearly stable manufacturing share of real GDP (measured in value added) and a gradually decreasing number of manufacturing employees (Baily and Bosworth 2014: 3–26).

Accounting for a relatively large proportion of tradable goods and services, the US manufacturing should potentially run a trade surplus (Baily and Bosworth 2014: 3–26). However, since the 2000s, there has been an increase in the US trade deficit, which in 2018 reached a peak of USD 891.3 billion

Figure 1

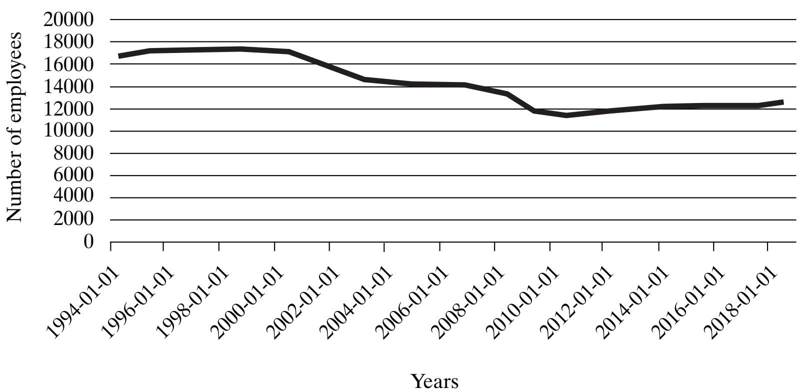
Manufacturing Value Added as a Percentage of GDP (USA, from 1997 to 2016)



Source: The World Bank Open Data 2019.

Figure 2

All employees: Manufacturing (USA, from 1994 to 2018)



Source: FRED Economic Data 2019.

(United States Census Bureau 2019). This tendency of import costs exceeding the value of American exports started from considerable trade imbalances with China, caused by the dramatic growth of Chinese economy in 2000s (Baily and Bosworth 2014). Hence, the majority of economists argue that trade imbalances with foreign countries are the main reason for a decline in the US manufacturing productivity (Baily and Bosworth 2014). On the other hand, some economists suggest that trade deficits are simply macroeconomic phenomena, reflecting the difference between national savings and domestic investments (Baily and Bosworth 2014: 3–26). As a result, the relationship between trade and the US manufacturing production appears to be more complex, rather than blaming other countries, such as Mexico, for unfair trade practices.

In contrast to his predecessors, President Donald Trump claims that nations should protect their domestic production by selling goods abroad and buying nothing in exchange (Stiglitz 2018: 515–528). This suggestion reflects the concept of absolute advantage, introduced by "The Father of Economics" – Adam Smith back in 1776. According to Smith's theory, a country must produce a greater quantity of goods in which it specialises, against an opponent, using an equal amount of resources; while labour "is the real measure of the exchange value of all commodities" (Smith 1776: 31–44). In other words, Smith suggests that a more efficient division of labour can accelerate economic growth, since specialisation in one task gives rise to innovation (Ades and Glaeser 1999: 1025–1045). However, although the concept of absolute advantage assumes 'the wealth of nations', it does not always imply mutually beneficial trade. Early in 1817, a politician and economist, David Ricardo, introduced the theory of comparative advantage, according to which nations may gain mutual benefits from trading with two commodities they specialise in (Ricardo 1817: 85–104). Neoclassical in nature, the Ricardian model of trade has the following limitations: it is restricted to two countries and two commodities; it assumes constant returns to scale; it is constrained by the labour factor only; it neglects transportation costs; it assumes perfect factor immobility; and it does not take into account sizes of trading countries (Akrani 2011). As a result, economists later moved from the Ricardian theory to more realistic assumptions about trade.

In 1933, Swedish economists Bertil Heckscher and Eli Ohlin initiated the so-called Heckscher-Ohlin model, which assumes two factors of the production function, namely labour and capital (Markusen, Melvin, Maskus, and Kaempfer 1995: 98–126). American economists Wolfgang Stolper and Paul Samuelson further develop the Heckscher-Ohlin model, showing that only the abundant factors gain from free trade (Markusen et al. 1995). Moreover, Stolper and Samuelson claim that tariffs on imports are expected to return a country to autarchy, protecting the real incomes of scarce factors (Markusen et al. 1995). Overall, the Stolper-Samuelson theorem explains why some factors of production require protection from import competition, while others require openness to trade (Markusen et al. 1995).

Unlike the Neoclassical models of trade, the New Trade Theory highlights the importance of increasing returns to scale. First, trade expansion allows firms to access lager markets with the corresponding greater level of competition. Second, trade allows for a diversification of the produced commodities, most evidently, in the manufacturing industry (Van Marrewijk 2012: 178–198). As a result, the extension of the market would still result in beneficial trade, even in case of two countries with homogeneous preferences and technologies (Krugman 1970). Later integration of markets throughout the world gave incentives for the so-called gravity model of international trade, observed in both trade and factor movements across countries (Anderson 2011: 133–160). Similar to the concept of Newton's law of universal gravitation, the volume of trade between two countries is linearly related to their gross domestic products (GDP) and inversely related to the distance between them (Tinbergen 1962, Beck 2017: 1–20). Moreover, other factors of trade such as the common language, currency, and ethnicity are taken into consideration (Anderson 2011, Beck 2018a: 118–126). Overall, gravity has been referred to as one of the most empirically successful models explaining the distribution of goods and a factor of production across neighbouring countries (Anderson 2011, Beck 2018b and 2020: 68–84).

However, trade is not the one and only source of economic growth. Any of the present growth theories suggests that an increase in the total output of goods and services (within a given period of time) entails growth of a given economy. Early studies of economists such as Roy Harrod and Evsey Domar (1) as well as Charles Cobb and Paul Douglas (2) denoted the following factors impacting the rate of a production (Y): capital (K) and labour (L) (Solow 1956: 65–94).

(1) Harrod-Domar Model: $Y = F(K,L) = \min\left(\frac{K}{a}, \frac{L}{b}\right)$

(2) Cobb-Douglas Production Function: $Y = K^{\alpha} L^{1-\alpha}$

Nevertheless, there was a question of what determines the volume of output, which can be produced with given quantities of capital and labour. In response, Robert Solow developed the Neoclassical Growth model (3) by emphasising the important role of a technological change in production growth. Thus, the production function was multiplied by an increasing scale of a technology factor A(t) (Solow 1956).

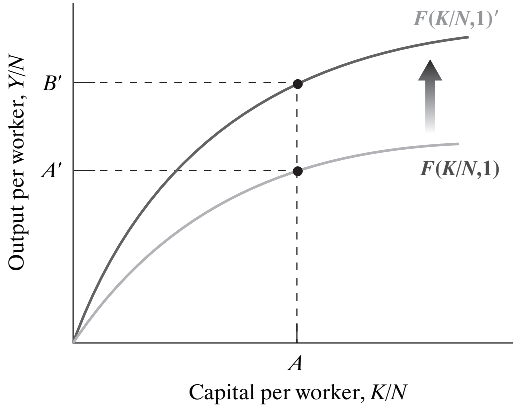
(3) Solow-Growth Model: $Y = A(t)F(K,L)$,

where t defines the continuous time

Figure 3 shows that the only shift in the production function appears due to the improvement in the state of technology (Blanchard 2009: 209–212).

Figure 3

The Effects of an Improvement in the State of Technology

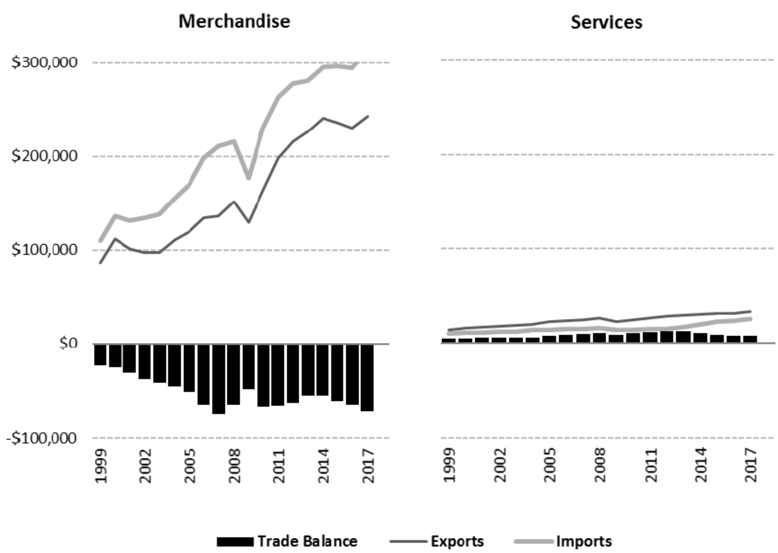


Source: Blanchard 2009.

Relying on the economic theory captured above, this part of the research briefly discusses general patterns of trade between the US and Mexico. According to Figure 4, bilateral trade between the United States and Mexico has tripled during the period from 1999 to 2017 (Villarreal 2019).

Figure 4

The US trade with Mexico between 1999 and 2017



Source: The United States International Trade Commission (USITC) 2019 cited in Villarreal 2019.

Moreover, the expansion of trade since NAFTA prompted the creation of vertical supply relationships along the US–Mexico borders (Villarreal 2019). According to Table 1, the US imports from Mexico increased from USD 295.7 billion in 2014 to USD 346.5 billion in 2018 (Villarreal 2019).

Table 1

The US Merchandise Imports from Mexico: 2014–2018 (nominal USD)

Items (NAIC 4-digit)	2014	2015	2016	2017	2018	% Total Imports from Mexico
Motor vehicles	46.2	50.0	49.3	57.4	64.5	19%
Motor vehicle parts	40.3	43.9	46.0	45.5	49.8	14%
Computer equipment	13.8	17.1	18.2	20.2	26.6	8%
Oil and gas	27.8	12.5	7.6	10.1	14.5	4%
Electrical equipment	10.1	10.5	10.5	11.1	11.9	3%
Other	157.5	162.4	162.3	170.0	179.2	52%
Total	295.7	296.4	293.9	314.3	346.5	100%

Source: the United States International Trade Commission (USITC) 2019 cited in Villarreal 2019.

Table 2, in turn, represents major American merchandise exports to Mexico during the period between 2014 and 2018.

Table 2

The U.S Merchandise Exports to Mexico: 2014–2018 (nominal USD)

Items (NAIC 4-digit)	2014	2015	2016	2017	2018	% Total Imports from Mexico
Petroleum and coal products	19.6	15.4	15.9	21.6	28.8	11%
Motor vehicle parts	18.4	20.8	19.8	19.8	20.2	8%
Computer equipment	15.9	16.2	16.5	15.7	17.4	7%
Semiconductors and other electronic components	10.9	11.4	12.0	12.2	13.1	5%

Table 2 (cont.)

Items (NAIC 4-digit)	2014	2015	2016	2017	2018	% Total Imports from Mexico
Basic chemicals	10.1	8.5	8.1	9.4	10.3	4%
Other	166.1	164.2	157.8	164.6	175.2	66%
Total	241.0	236.5	230.1	243.3	265.0	100%

Source: the United States International Trade Commission (USITC) 2019 cited in Villarreal 2019.

In general, the US exports to Mexico increased from USD 241 billion in 2014 to USD 265 billion in 2018 (Villarreal 2019). It is worth mentioning that the spectacular performance of American computers and electronics sub-sectors sustains a reputation of the entire US manufacturing (Baily and Bosworth 2014: 3–26). Moreover, US manufacturing industries, including motor vehicles, computers and electrical equipment, all rely on the assistance of Mexican manufacturers (Villarreal 2019).

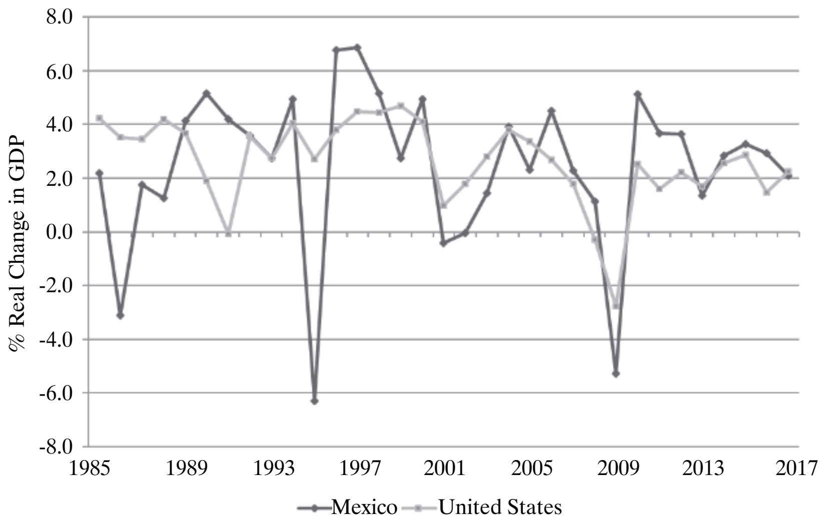
Overall, liberalisation of trade between the US and Mexico suggests economic benefits from both import and export flows between these countries (Beck et al. 2019: 7–25; Villarreal 2019; Gawrońska et al. 2019: 248–261). Figure 5 illustrates the growth rates, in terms of GDP, for the US and Mexico during the period from 1985 to 2017. It can be observed that Mexican growth rate of economy fluctuates substantially from 1985 to 1995, reaching the minimum level of negative 6%in 1995. After joining NAFTA in 1994, there is a sharp increase of real change in Mexican GDP to the record level of 7% in 1997. Lately (1995–2017), GDP growth in Mexico mainly replicates the US positive trends in economy (except the Global Crisis of 2008), with higher fluctuations.

However, the US Congress faces numerous problems related to present trade and investment relations with Mexico (Villarreal 2019). Indeed, it has to assess economic outcomes of the recently adopted US-Mexico-Canada Agreement, the proposed withdrawal from NAFTA, and the potential strategic response of Mexico's "anti-American" President Andrés Manuel López Obrador, who took office on 1 December 2018 (Villarreal 2019).

Finally, Mexicans have a reason to believe that they are being treated unfairly, while, in contrast to Trump and his followers, the majority of the US population understands that NAFTA was generally fair (Stiglitz 2018: 515–528). Thus, Pew Research Center survey showed the following results for 2017: 56% of Americans think that NAFTA has been good for the American economy (Tyson 2017). A potential withdrawal from NAFTA, in turn, has triggered an intention to strengthen, for instance, the Pacific Alliance (Villarreal 2019). As a result, Mexico will sign more sufficient trade agreements with other countries, relatively diminishing American competitiveness in the context of the global market.

Figure 5

GDP Growth Rates for the US and Mexico: 1985–2017



Source: The Economist Intelligence Unit 2019 cited in Villarreal 2019.

2. Literature Review

Numerous economists have conducted research into the relationship between foreign trade and economic growth. Thus, Bela Balassa investigated the relationship between exports and growth of the economy in eleven developing countries with an established industrial base. The main hypothesis of his research suggested that export-oriented countries are more successful in terms of their growth performance than closed economies (Balassa 1978: 181–189). The results obtained indicated greater statistical significance of estimates in open economies in comparison to countries favouring import-substitution during the period from 1960 to 1973 (Balassa 1978). An American economist, Alan Krueger, claims that free trade policies of a country result in productivity gains (1980). Moreover, a comparative advantage across countries results in greater profitability of labour-intensive industries (Krueger 1980: 288–292). Relying on the research papers by Balassa (1978: 181–189) and Krueger (1980), the dollar provided two additional arguments in favour of outward policy orientation: external factors, associated with exports, contribute to economic growth in open economy countries; and export activities, along with easily accessible import resources and equipment, accelerate technological progress in developing countries (1992).

However, the above literature exaggerates the influence of exports, when explaining the relation between trade and economic growth. According to the theory of comparative advantage mentioned before, efficiency of the usage of state resources is obtained through both exporting abundant and importing scarce goods and services. For instance, James Anderson and Peter Neary developed an index for trade, which incorporates several forms of domestic policy distortions: tariffs, subsidies, and quota regulations (1992: 57–76). The impact of restrictive trade policies on a given economy was, in turn, measured through the comparison of prices on goods and services in the domestic and international markets (Harrison 1995: 419–447). Nevertheless, there is a problem related to the availability of the information on these relative prices (Harrison 1995). As a result, the most common measure of trade orientation is openness to trade, which is the sum of exports and imports to the ratio of GDP (Harrison 1995).

First of all, it is crucial to address the issue of potential opposite causation of trade openness to productivity. In 1996, Jeffrey Frankel and David Romer employed different instrumental geographic variables, taken from the Gravity model of bilateral trade, in order to avoid the problem of endogeneity between trade openness and economic growth (Frankel and Romer 1996: 379–399). Obtained results indicated no evidence of countries with higher income trading more than the others (Frankel and Romer 1996). Moreover, gained results were further compared with Ordinary Least Squares (OLS) estimates of the same bilateral trade equations (Frankel and Romer 1996). The comparison of the results led to the conclusion that OLS estimation undervalues the effect of trade on income (Frankel and Romer 1996). Later in 1997, Alberto Alesina et al. (1997: 1276–1296) justified that trade openness determines the size of the domestic market, and, therefore, productivity level of a country. In terms of econometrics, seemingly unrelated regressions (SUR) were used in order to resolve the issue of correlated error terms across periods (Alesina, Spolaore and Wacziarg 1997). At the same time, 3 semiparametric least square (SLS) version of estimates was applied in order to control for endogeneity bias between openness and growth. The results obtained from both SUR and 3SLS estimations satisfied hypothetical expectations towards positive coefficients on size and trade openness of a country. As a result, an empirical evidence of a significant causal effect of trade openness on productivity growth was found.

Nevertheless, the research mentioned above was mainly based on the cross section data. In contrast, Endrik van den Berg and James Schmidt emphasised the importance of using time series evidence, while analysing the long-term relationship between trade and economic growth (Van den Berg and Schmidt 1994). The time series method, in turn, demands testing for the stationarity of the variables. Hence, several unit root tests were conducted, which indicated the presence of both stationary and non-stationary variables (Van den Berg and Schmidt 1994). This triggered the need of detecting cointegrated relationships among the variables, which occurred to be present (Van den Berg and Schmidt 1994). Afterwards, an error correction model was applied in order to distinguish between the short-term and long-term characteristics of the regression (Van den Berg and Schmidt 1994). The results obtained indicated a positive long-term relationship between trade growth and economic growth variables (Van den Berg and Schmidt 1994). Moreover, Dani Rodrik argues that trade is not a significant determinant of productivity when geographic variables are included in the empirical analysis (2000). The reason is that geography may determine income through a variety of channels, whereas trade is only one of them (Rodríguez and Rodrik 2001: 261–338). This way, trade becomes a statistically insignificant determinant of productivity in the presence of geographical controls.

On the other hand, researchers extensively used the factors of aggregate production function to determine productivity growth. Thus, Roy Harrod (1939: 14–33) and Evsey Domar (1946: 137–147) developed a growth model where rapid capital accumulation is the fundamental determinant of economic growth. Furthermore, Solow developed the Solow-Growth model, where capital to output ratio changes in response to variations in saving behaviour of a nation (1956: 65–94). Based on the US data over the 1950s and 1960s, Solow found that only a small fraction of the US production growth could be explained by an increase in capital per worker (1957: 312–320). Similarly, Edward Denison (1967) and Angus Maddison (1982) prove that this finding is also applicable to various industrialised European countries. As a result, Solow-Denison-Maddison growth accounting framework suggests that the growth rate of capital accumulation has an insignificant, but still certain impact on the overall production output.

Furthermore, Adam Smith investigates the relationship between the division of labour and economic growth (1776). According to Smith, a more precise division of labour can accelerate the growth of an economy, since specialisation in a single task of production fosters an innovation sector of a country (1776: 31–44). Thus, Gary Becker and Kevin Murphy found that the division of labour plays an important role in increasing both the level and the growth rate of income over time. This way, an increase in benefits from specialisation stimulates economic development (Becker and Murphy 1994: 299–322). Overall, division of labour theories emphasise the importance of a complex production task's participation in achieving productivity growth.

Finally, productivity growth is assumed to result from the choice of policies. Thus, vid Coe and Elhanan Helpman show that accumulation of expenditures on research and development (R&D) activities helps to foster growth in total productivity between the OECD countries (1995: 859–887). This reflects the endogenous theory of growth, which suggests a range of possible variables explaining productivity growth, where the R&D sector is, inter alia, one of the most important factors. This way, knowledge-based growth theories may predict that access to information spurs economic growth (Romer 1986: 1002–1037). Thus, using the US data, Solow showed that 87.5% of the US productivity relies on technological progress (1957: 312–320). Years later, Baily and Bosworth showed that the 'spectacular performance' of computer and electronics subsector plays an important role in the sustainabíility of US manufacturing over the last 50 years (2014: 3–26). As a result, there is a significant impact of technological developments on productivity growth.

Summarising the review of economic papers on the current research topic, it can be concluded that productivity growth is largely dependent on policies towards the openness of trade and the state of technology, while the impact of labour and capital inputs was found to be insignificant.

3. Methodology

The current research sample is represented by the industrial sector of the US economy. The period of observation covers 34 years (1985–2018 years inclusively) with quarterly frequency, which implies a number of

136 observations. This time frame was chosen based on the data availability for all of the variables involved in the current research. The following variables were included in the regression:

- The Industrial Production Index (INDPRO) – which measures real output of the following facilities located in the US: manufacturing, mining, and electric and gas utilities; where the unit of measurement is Index 2012 = 100;
- Trade Openness ratio (TRADE) – a measure of the US openness to trade with Mexico. It was calculated by taking the sum of the volume of exports (the US–Mexico) and the volume of imports (Mexico-the US) and dividing it by the US nominal GDP. The volume of exports and the volume of imports were, in turn, represented by the US Imports of Goods by Customs Basis from Mexico and US Exports of Goods by F.A.S. Basis to Mexico respectively; denominated in millions of the USD.

In terms of control variables, the following proxies for the factors of the production function were used (relying on the availability of data):

- The US Civilian Labor Force Participation Rate (LFPR) (25 to 54 years) – a measure of the US labour participants (out of total) at the age between 25 and 54; expressed as a percentage;
- Gross Fixed Capital Formation (GFCF) – a measure of the US capital accumulation, denominated in the USD;
- Real Gross Private Domestic Investment: Fixed Investment: Non-residential: Intellectual Property Products: Research and Development (chain-type quantity index) (GPDIRD) – a measure of real gross private domestic (non-residential) investments in such intellectual property products as research and development, where the unit of measurement is Index 2012 = 100.

All of the data were extracted from FRED Economic Data base (2019).

Finally, the main aim of this paper is to examine the US industrial productivity under the presidency of Trump, in particular, under the frame of his restricted trade policies towards Mexico. Thus, the dummy variable TRUMP was introduced to the regression. The US President Trump entered the office on the 20th of January 2017. Hence, the period from the first quarter of 2017 to the last quarter of 2018 (according to the latest available data) is marked as "1", while the remaining quarter periods are marked as "0". As a result, the dummy variable TRUMP was introduced in the regression.

4. Econometric Approach

In contrast to research papers mentioned above, the vector autoregressive (VAR) model was selected for analysis under the current research. The main reason is that it is commonly used for the time series data analysis. Moreover, the VAR model allows for avoidance of a potential issue of endogeneity in the relationship between the variables by treating all of the variables present in model as endogenous (Gujarati 2003: 715–835). Furthermore, the VAR model is primarily used for the purpose of macro-econometric analysis. Thus, it is mainly focused on forecasting the reaction of macroeconomic variables to various policy shocks. This way, it draws expectations towards the future values of estimates on the basis of their (and of the other variables') lagged or past values. At the same time, the VAR allows for an inclusion of exogenous variables into the model. This way, the dummy variable TRUMP was primarily introduced in the equation for the purpose of improving the quality of the proceeding tests and estimations.

The constructed econometric model is presented below:

$$INDPRO_t = \beta_0 + \beta_1 TRADE_t + \beta_2 GFCF_t + \beta_3 LFPR_t + \\ + \beta_4 GPDIRD_t + \beta_5 TRUMP_t + u_t,$$

where u_t stands for the residuals and t stands for the time period

First of all, all the variables involved in the model have to be examined for the presence of a unit root. This way, the Dickey-Fuller (DF) unit root test has been conducted under the current research.

Table 3

Dickey-Fuller Test (Levels): Results

Variable	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
INDPRO	-1.114	-3.498	-2.888	-2.578
TRADE	-1.004	-3.498	-2.888	-2.578
GFCF	2.103	-3.498	-2.888	-2.578
LFPR	-1.531	-3.498	-2.888	-2.578
GPDIRD	1.602	-3.498	-2.888	-2.578
TRUMP	-0.233	-3.498	-2.888	-2.578

Source: author's own elaboration.

According to the results of the DF test for unit root presented above, all the listed variables are non-stationary in levels, which implies the acceptance of a null hypothesis. However, the VAR model demands stationarity of the involved variables. Hence, the first difference of a non-stationary time series was taken, as it is shown in Table 4.

Table 4

Dickey-Fuller Test (1st difference): Results

Variable	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
d(INDPRO)	-4.707	-3.499	-2.888	-2.578
d(TRADE)	-12.336	-3.499	-2.888	-2.578
d(GFCF)	-5.215	-3.499	-2.888	-2.578
d(LFPR)	-11.621	-3.499	-2.888	-2.578
d(GPDIRD)	-10.646	-3.499	-2.888	-2.578
d(TRUMP)	-11.576	-3.499	-2.888	-2.578

Source: author's own elaboration.

The idea behind the Dickey-Fuller test is to include enough difference terms so that the error term is serially uncorrelated (Gujarati 2003: 715–835). However, unit root tests are commonly characterised by their low power, which implies a bias towards rejecting the null hypothesis when it is false. Since the Dickey-Fuller type tests cannot be trusted in the presence of autocorrelation, the Durbin-Watson test statistic is, therefore, used to detect the presence of autocorrelation in the residuals from a regression analysis (Durbin and Watson 1950).

Table 5

Durbin's alternative test for autocorrelation: Results

Variable	d(INDPRO)	d(TRADE)	d(GFCFC)	d(LFPR)	d(GPDIRD)	d(TRUMP)
p-value	0.1363	0.0976	0.1529	0.2864	0.1507	0.9020

Source: author's own elaboration.

According to the data in the table above, p-values of the variables are higher than the critical value at 5% significance level. Therefore, the null hypothesis of the Durbin-Watson test is rejected: there is no autocorrelation.

Furthermore, before the VAR estimation, the maximum lag length criteria must be determined. Thus, including too many lagged terms implies the issue of multicollinearity, while including too few lags may lead to specification errors (Gujarati 2003).

Table 6

Selection-order criteria: Results

- **varsoc d.TRADE d.INDPRO d.LFPR d.GFCF d.GPDIRD, exog (d.TRUMP)**

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-677.7				.024969	10.4992	10.58840	10.7187
1	-589.434	176.53	25	0.000	.009509	9.53334	9.84549*	10.3015*
2	-551.595	75.678	25	0.000	.007832	9.33733	9.87244	10.6542
3	-517.544	68.103	25	0.000	.006854	9.19914	9.95721	11.0647
4	-471.458	92.17*	25	0.000	.005011*	8.87723*	9.85826	11.2915

Endogenous: D.TRADE D.INDPRO D.LFPR D.GFCF D.GPDIRD
Exogenous: D.TRUMP_cons,
where * indicates lag order selected by the criterion.

Source: author's own elaboration.

According to the data output presented above, Likelihood Ratio (LR), Final Prediction Error (FPE) and Akaike (AIC) lag length criteria indicate that 4 lags are the best option for the proceeding VAR estimation. Thus, the VAR system of simultaneous equations is modified in terms of lag length criteria:

- $d(INDPRO)_t = \beta_0 + a_{11} * d(INDPRO_{t-1}) + b_{11} * d(INDPRO_{t-2}) + g_{11} * d(INDPRO_{t-3}) + h_{11} + * d(INDPRO_{t-4}) + a_{12} * d(TRADE_{t-1}) + b_{12} * d(TRADE_{t-2}) + g_{12} * d(TRADE_{t-3}) + h_{12} * d(TRADE_{t-4}) + a_{13} * d(GFCF_{t-1}) + b_{13} * d(GFCF_{t-2}) + g_{13} * d(GFCF_{t-3}) + h_{13} * d(GFCF_{t-4}) + a_{14} * d(LFPR_{t-1}) + b_{14} * d(LFPR_{t-2}) + g_{14} * d(LFPR_{t-3}) + h_{14} * d(LFPR_{t-4}) + a_{15} * d(GPDIRD_{t-1}) + b_{15} * d(GPDIRD_{t-2}) + g_{15} * d(GPDIRD_{t-3}) + h_{15} * d(GPDIRD_{t-4}) + m_1 * d(TRUMP_t) + u_{1t}$
- $d(TRADE)_t = \beta_1 + a_{21} * d(TRADE_{t-1}) + b_{21} * d(TRADE_{t-2}) + g_{21} * d(TRADE_{t-3}) + h_{21} + * d(TRADE_{t-4}) + a_{22} * d(INDPRO_{t-1}) + b_{22} * d(INDPRO_{t-2}) + g_{22} * d(INDPRO_{t-3}) + h_{22} * d(INDPRO_{t-4}) + a_{23} * d(GFCF_{t-1}) + b_{23} * d(GFCF_{t-2}) + g_{23} * d(GFCF_{t-3}) + h_{23} * d(GFCF_{t-4}) + a_{24} * d(LFPR_{t-1}) + b_{24} * d(LFPR_{t-2}) + g_{24} * d(LFPR_{t-3})$

$+ h_{24} * d(LFPR_{t-4}) + a_{25} * d(GPDIRD_{t-1}) + b_{25} * d(GPDIRD_{t-2}) + g_{25} * d(GPDIRD_{t-3}) + h_{25} * d(GPDIRD_{t-4}) + m_2 * d(TRUMP_t) + u_{2t}$

- $d(GFCF)_t = \beta_2 + a_{31} * d(GFCF_{t-1}) + b_{31} * d(GFCF_{t-2}) + g_{31} * d(GFCF_{t-3}) + h_{31} + * d(GFCF_{t-4}) + a_{32} * d(INDPRO_{t-1}) + b_{32} * d(INDPRO_{t-2}) + g_{32} * d(INDPRO_{t-3}) + h_{32} * d(INDPRO_{t-4}) + a_{33} * d(TRADE_{t-1}) + b_{33} * d(TRADE_{t-2}) + g_{33} * d(TRADE_{t-3}) + h_{33} * d(TRADE_{t-4}) + a_{34} * d(LFPR_{t-1}) + b_{34} * d(LFPR_{t-2}) + g_{34} * d(LFPR_{t-3}) + h_{34} * d(LFPR_{t-4}) + a_{35} * d(GPDIRD_{t-1}) + b_{35} * d(GPDIRD_{t-2}) + g_{35} * d(GPDIRD_{t-3}) + h_{35} * d(GPDIRD_{t-4}) + m_3 * d(TRUMP_t) + u_{3t}$
- $d(LFPR)_t = \beta_3 + a_{41} * d(LFPR_{t-1}) + b_{41} * d(LFPR_{t-2}) + g_{41} * d(LFPR_{t-3}) + h_{41} + * d(LFPR_{t-4}) + a_{42} * d(INDPRO_{t-1}) + b_{42} * d(INDPRO_{t-2}) + g_{42} * d(INDPRO_{t-3}) + h_{42} * d(INDPRO_{t-4}) + a_{43} * d(TRADE_{t-1}) + b_{43} * d(TRADE_{t-2}) + g_{43} * d(TRADE_{t-3}) + h_{43} * d(TRADE_{t-4}) + a_{44} * d(GFCF_{t-1}) + b_{44} * d(GFCF_{t-2}) + g_{44} * d(GFCF_{t-3}) + h_{44} * d(GFCF_{t-4}) + a_{45} * d(GPDIRD_{t-1}) + b_{45} * d(GPDIRD_{t-2}) + g_{45} * d(GPDIRD_{t-3}) + h_{45} * d(GPDIRD_{t-4}) + m_4 * d(TRUMP_t) + u_{4t}$
- $d(GPDIRD)_t = \beta_4 + a_{51} * d(GPDIRD_{t-1}) + b_{51} * d(GPDIRD_{t-2}) + g_{51} * d(GPDIRD_{t-3}) + h_{51} + * d(GPDIRD_{t-4}) + a_{52} * d(INDPRO_{t-1}) + b_{52} * d(INDPRO_{t-2}) + g_{52} * d(INDPRO_{t-3}) + h_{52} * d(INDPRO_{t-4}) + a_{53} * d(TRADE_{t-1}) + b_{53} * d(TRADE_{t-2}) + g_{53} * d(TRADE_{t-3}) + h_{53} * d(TRADE_{t-4}) + a_{54} * d(GFCF_{t-1}) + b_{54} * d(GFCF_{t-2}) + g_{54} * d(GFCF_{t-3}) + h_{54} * d(GFCF_{t-4}) + a_{55} * d(LFPR_{t-1}) + b_{55} * d(LFPR_{t-2}) + g_{55} * d(LFPR_{t-3}) + h_{55} * d(LFPR_{t-4}) + m_5 * d(TRUMP_t) + u_{5t}$

where d is the difference operation needed to transform the series into stationary; β-s are the intercepts; a, b, g, h, m are the coefficients to be estimated; u-s are the error terms that are uncorrelated with own lagged values and right-hand side variables.

After setting the number of lags, which is 4, the VAR model is regressed, keeping the dummy variable TRUMP as exogenous.

Table 7

Vector Autoregression: Results

- **varsoc d.TRADE d.INDPRO d.LFPR d.GFCF d.GPDIRD, dfk exog (d.TRUMP) lags (1/4)**

Vector autoregression
Sample: 1986q2-2018q4 No. of obs = 131
Log likelihood = –471.4584 AIC = 8.877228
FPE = .0050111 HQIC = 9.858261
Det (Sigma_m1) = .0009196 SBIC = 11.29152

Equation	Parms	RMSE	R-sq	chi2	P > chi2
D_TRADE	22	.064629	0.4838	102.1562	0.0000
D_INDPRO	22	.700448	0.6474	200.1457	0.0000
D_LFPR	22	.168824	0.3301	53.70132	0.0001
D_GFCF	22	6.711590	0.6471	199.8649	0.0000
D_GPDIRD	22	1.302630	0.3397	56.08101	0.0000

Where dfk option indicates small-sample corrections to the large-sample statistics.

Source: author's own elaboration.

According to the above figures, the values of R-sq show that the model has a relatively strong explanatory power (64%) of both D_INDPRO and D_GFCF variables. The rest of the variables have weaker explanatory power, but still describe 30–50% of the model.

However, before interpreting the empirical results, post-estimation tests have to be used in order to assess the reliability of the VAR's output.

This way, the normality test was conducted, where the most important values for the analysis are Jarque-Bera test estimates shown below.

Table 8

Jarque-Bera normality test: Results

- **varnorm**

D_TRADE	6.261	2	0.04369
D_INDPRO	3.992	2	0.13586
D_LFPR	8.084	2	0.01756
D_GFCF	4.222	2	0.12113
D_GPDIRD	0.571	2	0.75159
ALL	23.131	10	0.01027

Source: own elaboration.

Joint probability of all equations, namely ALL equation, is 0.01027, which is lower than the critical value of 0.05. Hence, the null hypothesis of normal distribution is rejected, or, in other words, the residuals have no normal distribution. Separately, only D_INDPRO (0.13586 > 0.05), D_GFCF (0.12113 > 0.05), D_GDIRD (0.75159 > 0.05) equation residuals passed the normality test, while the residuals in D_TRADE (0.04369 < 0.05) and D_LFPR (0.01756 < 0.05) equations did not.

One of the possible reasons for non-normal distribution of the residuals in D_LFPR equation is that there are too many extreme values in its data set. It can be observed in the graphical representation (Figure 6) of D_LFPR time series. In terms of D_Trade (Figure 7), the possible reason for the non-normal distribution of its residuals is the presence of outliers in 2008, as it is shown below. It may be explained by the Global Financial Crisis of 2007–2008, when the U.S international trade experienced various difficulties. As a result, the VAR model may not follow a normal distribution for particular equations: D_LFPR, D_TRADE.

The next post-estimation test is the Lagrange-multiplier test, which states the null hypothesis of no autocorrelation at lag order.

Table 9

Lagrange-multiplier test: Results

• varlmar

lag	chi2	df	Prob > chi2
1	31.9142	25	0.16051
2	43.2009	25	0.01330

Source: author's own elaboration.

The results of the Lagrange-multiplier test presented above show there is an autocorrelation at lag order 2 (0.01330 < 5%). Nevertheless, there is no autocorrelation at lag order 1 (0.16051 > 5%), which is good.

According to the data in Table 9, which shows the results of Eigenvalue stability condition, all the eigenvalues lie inside the unit circle. Therefore, the VAR model satisfies the stability condition.

Table 10

Eigenvalue stability condition: Results

- varstable

Eigenvalue	Modulus
-.9404402	.94044
.06802441 + .8786028*i*	.881232
.06802441 - .8786028*i*	.881232
.8572397 + .1255651*i*	.866387
.8572397 - .1255651*i*	.866387
.6804469 + .367376*i*	.773287
.6804469 - .367376*i*	.773287
.4635535 + .5624719*i*	.728873
.4635535 - .5624719*i*	.728873
-.6272761 + .1372232*i*	.64211
-.6272761 – .1372232*i*	.64211
.07983887 + .6302238*i*	.635261
.07983887 - .6302238*i*	.635261
-.250721 + .5750767*i*	.627355
-.250721 - .5750767*i*	.627355
-.5818435 + .211819*i*	.6192
-.5818435 - .211819*i*	.6192
-.0169474 + .5990737*i*	.599313
-.0169474 - .5990737*i*	.599313
.5808304	.58083

All the eigenvalues lie inside the unit circle.
VAR satisfies stability condition.

Source: author’s own elaboration.

At last, the post-estimation test determining the significance of the dummy variable TRUMP is conducted since it is crucial under the research of this thesis.

Figure 6

Test parameter (d. TRUMP)

(1) [D_TRADE]D.TRUMP = 0
(2) [D_INDPRO]D.TRUMP = 0
(3) [D_LFPR]D.TRUMP = 0
(4) [D_GFCF]D.TRUMP = 0
(5) [D_GPDIRD]D.TRUMP = 0
chi2(5) = 10.75
Prob > chi2 = 0.0566

Source: author's own elaboration.

According to the test parameter illustrated above, the dummy variable d. TRUMP is statistically significant for the model, and thus, has incentives to be included in the model.

5. Empirical Results

The output of VAR organises its results in an equation, which is identified with its dependent variable: INDPRO, TRADE, GFCF, LFPR, GPDIRD. Table 11, containing all of the relevant coefficients, standard errors, *t* statistics, and *p*-values, is rather extensive. Only the significant results are going to be briefly discussed below.

Table 11

VAR Results: Extensive

Variable	Coef.	Std. Err.	z	P > |z|	[95% Conf. Interval]	
D_TRADE						
TRADE						
LD.	–.1436896	.1006922	–1.43	0.154	–.3410427	.0536634
L2D.	–.0936709	.0972418	–0.96	0.335	–.2842614	.0969195
L3D.	–.2654425	.0980020	–2.71	0.007	–.4575229	–.0733621
L4D.	.3651202	.0978416	3.73	0.000	.1733541	.5568863
INDPRO						
LD.	.0413969	.0101623	4.07	0.000	.0214791	.0613147
L2D.	.0089503	.0125717	0.71	0.477	–.0156899	.0335904
L3D.	.0058008	.0125389	0.46	0.644	–.0187750	.0303766
L4D.	–.0199675	.0098138	–2.03	0.042	–.0392022	–.0007328

Table 11 (cont.)

Variable	Coef.	Std. Err.	z	P > |z|	[95% Conf. Interval]	
LFPR						
LD.	.0226386	.0341362	0.66	0.507	–.0442670	.0895443
L2D.	–.0416292	.0342326	–1.22	0.224	–.1087239	.0254655
L3D.	.0260042	.0346338	0.75	0.453	–.0418768	.0938852
L4D.	–.0604184	.0365660	–1.65	0.098	–.1320865	.0112496
GFCF						
LD.	–.0002815	.0011242	–0.25	0.802	–.0024849	.0019219
L2D.	–.0013449	.0011317	–1.19	0.235	–.0035630	.0008731
L3D.	–.0016467	.0011133	–1.48	0.139	–.0038286	.0005353
L4D.	.0011431	.0010636	1.07	0.283	–.0009416	.0032278
GPDIRD						
LD.	–.0037363	.0045520	–0.82	0.412	–.0126580	.0051854
L2D.	.0034463	.0042077	0.82	0.413	–.0048007	.0116932
L3D.	.0011880	.0045507	0.26	0.794	–.0077312	.0101072
L4D.	–.0035945	.0049912	–0.72	0.471	–.0133770	.0061881
TRUMP						
D1.	.0473432	.0720496	0.66	0.511	–.0938715	.1885579
_CONS	.0167118	.0085959	1.94	0.052	–.0001360	.0335595
D_INDPRO						
TRADE						
LD.	–1.189062	1.091299	–1.09	0.276	–3.327969	.9498443
L2D.	–1.959390	1.053904	–1.86	0.063	–4.025004	.1062244
L3D.	–1.000350	1.062143	–0.94	0.346	–3.082111	1.0814120
L4D.	–.2912572	1.060405	–0.27	0.784	–2.369613	1.7870980
INDPRO						
LD.	.8153315	.1101390	7.40	0.000	.5994630	1.0312000
L2D.	.0092453	.1362523	0.07	0.946	–.2578042	.2762949
L3D.	.0236571	.1358963	0.17	0.862	–.2426946	.2900089
L4D.	–.1400893	.1063617	–1.32	0.188	–.3485544	.0683757
LFPR						
LD.	.9831849	.3699668	2.66	0.008	.2580633	1.7083070
L2D.	–.7918030	.3710121	–2.13	0.033	–1.5189730	–.0646326
L3D.	.1901850	.3753603	0.51	0.612	–.5455076	.9258776
L4D.	–.0809348	.3963014	–0.20	0.838	–.8576714	.6958017

Table 11 (cont.)

Variable	Coef.	Std. Err.	z	P > |z|	[95% Conf. Interval]	
GFCF						
LD.	.0171750	.0121840	1.41	0.159	–.0067052	.0410552
L2D.	–.0047153	.0122651	–0.38	0.701	–.0287545	.0193239
L3D.	–.0135866	.0120655	–1.13	0.260	–.0372345	.0100614
L4D.	.0076778	.0115278	0.67	0.505	–.0149162	.0302719
GPDIRD						
LD.	–.0357775	.0493342	–0.75	0.456	–.1334707	.0599157
L2D.	–.0567656	.0456030	–1.24	0.213	–.1461459	.0326147
L3D.	.0605328	.0493204	1.23	0.220	–.0361334	.1571989
L4D.	–.0825467	.0540943	–1.53	0.127	–.1885696	.0234762
TRUMP						
D1.	–.1233099	.7808719	–0.16	0.875	–1.6537910	1.407171
_CONS	.2212998	.0931626	2.38	0.018	.0387045	.4038951
L_LFPR						
TRADE						
LD.	–.3908937	.2630283	–1.49	0.137	–.9064198	.1246323
L2D.	–.0043619	.2540153	–0.02	0.986	–.5022228	.4934990
L3D.	.3953955	.2560010	1.54	0.122	–.1063572	.8971483
L4D.	–.8123812	.2555822	–3.18	0.001	–1.3133130	–.3114494
INDPRO						
LD.	.0374064	.0265460	1.41	0.159	–.0146229	.0894357
L2D.	–.0207422	.0328400	–0.63	0.528	–.0851073	.0436229
L3D.	–.0005477	.0327541	–0.02	0.987	–.0647446	.0636493
L4D.	.0214606	.0256356	0.84	0.403	–.0287843	.0717056
LFPR						
LD.	–.0016385	.0891706	–0.02	0.985	–.1764097	.1731326
L2D.	–.1273971	.0894225	–1.42	0.154	–.3026620	.0478678
L3D.	.0701375	.0904705	0.78	0.438	–.1071815	.2474565
L4D.	.2338080	.0955178	2.45	0.014	.0465965	.4210195
GFCF						
LD.	–.0018050	.0029366	–0.61	0.539	–.0075607	.0039507
L2D.	–.0013949	.0029562	–0.47	0.637	–.0071889	.0043991
L3D.	.0000569	.0029081	0.02	0.984	–.0056428	.0057566
L4D.	.0034048	.0027785	1.23	0.220	–.0020408	.0088505

Table 11 (cont.)

Variable	Coef.	Std. Err.	z	P > |z|	[95% Conf. Interval]	
GPDIRD						
LD.	.0081883	.0118907	0.69	0.491	–.0151170	.0314936
L2D.	.0351416	.0109914	3.20	0.001	.0135989	.0566843
L3D.	–.0093495	.0118874	–0.79	0.432	–.0326483	.0139492
L4D.	.0116267	.0130380	0.89	0.373	–.0139273	.0371807
TRUMP						
D1.	–.0760764	.1882082	–0.40	0.686	–.4449578	.2928049
_CONS	–.0317432	.0224543	–1.41	0.157	–.0757529	.0122665
D_GFCF						
TRADE						
LD.	–6.441382	10.45667	–0.62	0.538	–26.936080	14.053320
L2D.	–33.96488	10.09836	–3.36	0.001	–53.757300	–14.172460
L3D.	–12.13939	10.17730	–1.19	0.233	–32.086530	7.807753
L4D.	11.61691	10.16065	1.14	0.253	–8.297594	31.531420
INDPRO						
LD.	3.317469	1.055336	3.14	0.002	1.2490480	5.3858900
L2D.	2.509560	1.305550	1.92	0.055	–.0492704	5.0683900
L3D.	.0368425	1.302139	0.03	0.977	–2.5153020	2.5889870
L4D.	–2.162340	1.019143	–2.12	0.034	–4.1598230	–.1648573
LFPR						
LD.	3.816542	3.544969	1.08	0.282	–3.13147	10.764550
L2D.	–9.495947	3.554985	–2.67	0.008	–16.46359	–2.528304
L3D.	–8.586467	3.596649	–2.39	0.017	–15.63577	–1.537165
L4D.	–5.439045	3.797304	–1.43	0.152	–12.88162	2.003634
GFCF						
LD.	.2871384	.1167453	2.46	0.014	.0583219	.5159549
L2D.	.1354612	.1175227	1.15	0.249	–.0948791	.3658014
L3D.	.0139042	.1156098	0.12	0.904	–.2126869	.2404953
L4D.	.1679464	.1104574	1.52	0.128	–.0485462	.3833390
GPDIRD						
LD.	–.3426352	.4727130	–0.72	0.469	–1.2691360	.5838652
L2D.	.6178031	.4369616	1.41	0.157	–.2386260	1.4742320
L3D.	–.0134092	.4725807	–0.03	0.977	–.9396503	.9128320
L4D.	.0117098	.5183242	0.02	0.982	–1.0041870	1.0276070

Variable	Coef.	Std. Err.	z	P > |z|	[95% Conf. Interval]	
TRUMP						
D1.	16.29434	7.482204	2.18	0.029	1.629487	30.959190
_CONS	1.4333707	.8926706	1.61	0.108	–.315895	3.183309
D_GPDIRD						
TRADE						
LD.	3.6905060	2.029505	1.82	0.069	–.28872501	7.668263
L2D.	2.4126820	1.959961	1.23	0.218	–1.428771	6.254136
L3D.	.4733809	1.975283	0.24	0.811	–3.398102	4.344864
L4D.	1.6555020	1.972051	0.84	0.401	–2.209646	5.520651
INDPRO						
LD.	.2682343	.2048271	1.31	0.190	–.1332194	.6696881
L2D.	.0106668	.2533903	0.04	0.966	–.4859691	.5073028
L3D.	–.1262270	.2527283	–0.50	0.617	–.6215654	.3691114
L4D.	–.1955338	.1978024	–0.99	0.323	–.5832194	.1921518
LFPR						
LD.	.4298195	.6880328	0.62	0.532	–.9187000	1.7783390
L2D.	–.5261531	.6899767	–0.76	0.446	–1.8784830	.8261765
L3D.	.8582398	.6980631	1.23	0.219	–.5099387	2.2264180
L4D.	–1.224959	.7370077	–1.66	0.096	–2.6694680	.2195405
GFCF						
LD.	–.0189953	.0226587	–0.84	0.402	–.6340560	.0254150
L2D.	–.0340881	.0228096	–1.49	0.135	–.0787942	.0106180
L3D.	.0058870	.0224384	0.26	0.793	–.0380914	.0498654
L4D.	.1018784	.0214384	4.75	0.000	.0598600	.1438969
GPDIRD						
LD.	.0278791	.0917475	0.30	0.761	–.1519427	.2077008
L2D.	.1153421	.0848086	1.36	0.174	–.0508797	.2815639
L3D.	–.2941678	.0917218	–3.21	0.001	–.4739393	–.1143964
L4D.	–.0188293	.1006000	–0.19	0.852	–.2160018	.1783431
TRUMP						
D1.	2.579107	1.452199	1.78	0.076	–.267151	5.425365
_CONS	.4266929	.1732558	2.46	0.014	.081177	.7662681

Source: author's own elaboration.

In the first equation, three-period TRADE lag, four-period lag TRADE and one-period lag INDPRO are the only significant variables at 5% level. Three-period TRADE lag has a negative coefficient, while the four-period TRADE lag has a positive coefficient. Thus, a change in three-period TRADE inflow will give a negative change of trade openness. At the same time, change in four-period TRADE inflow will increase openness to trade. As a result, the impact of changes in trade openness on itself worsens with time. In terms of one-period INDPRO lag, it has a positive impact on TRADE. It, therefore, means that positive changes in the industrial productivity lead to the greater willingness of a country to trade.

The second equation shows how chosen variables affect INDPRO changes. One-period INDPRO lag, one-period and two-period LFPR lag are significant variables. According to the results, changes in the industrial production imply a meaningful positive change in the industrial production. Thus, policies towards the development of the industrial productivity foster industrial productivity itself. In terms of labour force participation, it can be observed that the significance of LFPR increases from the second lag period to the lag period one. Moreover, changes in LFPR have a negative and meaningful positive impact on changes in the industrial productivity at lag period 2 and at lag period 1 respectively. It can be explained by the fact that labour inputs require time to influence the productivity.

In the third equation, three-period TRADE lag, four-period lag TRADE, four-period lag LFPR and two-period lag GPDIRD are the only significant variables. The change in three-period TRADE lag has a strong negative impact on the labour force participation rate. It can be explained by the fact that trade openness under the process of globalisation allows for a free movement of labour across countries. Thus, a country may lose a decent portion of its labour force. The change in four-period LFPR lag has a minor positive impact on the labour force participation rate itself. In real life, a higher rate of labour force participation initially accelerates its growth. However, with time it has no impact on labour force at all. From the perspective of greater investments in research in development at lag 2, they have an incremental positive impact on the labour force participation. Thus, a technological change has almost no impact on the US labour force participation rate.

In the fourth equation for the independent variable GFCF, only one- and two-period lag TRADE, two- and three-period lag LFPR, one-period lag GFCF and exogenous dummy variable TRUMP are significant among the others. According to the coefficients, greater openness to trade implies moderate negative growth in capital formation. It can be explained by the fact that globalisation is characterised by the free movement of capital across countries. A positive change in labour force participation, in turn, has an incremental negative impact on the US capital formation. Thus, more workers in the labour force imply a slowdown in the capital accumulation, which becomes more significant from lag period 3 to lag period 2. The change in the capital formation, in turn, implies a slight positive change in the capital formation itself. At last, in terms of the exogenous variable, Trump has a significant positive impact on the US capital formation, which suits the aims of his political campaign.

Finally, only four-period lag GFCF and three-period lag GPDIRD are significant variables among the others. According to the results, a change in the capital formation implies an initial positive change in research and development investments. At the same time, a change in GPDIRD has a minor negative impact on GPDIRD itself. However, a change in both GPDIRD and GFCF does not cause a change in GPDIRD. The remaining coefficients are found to be insignificant at 5% significance level.

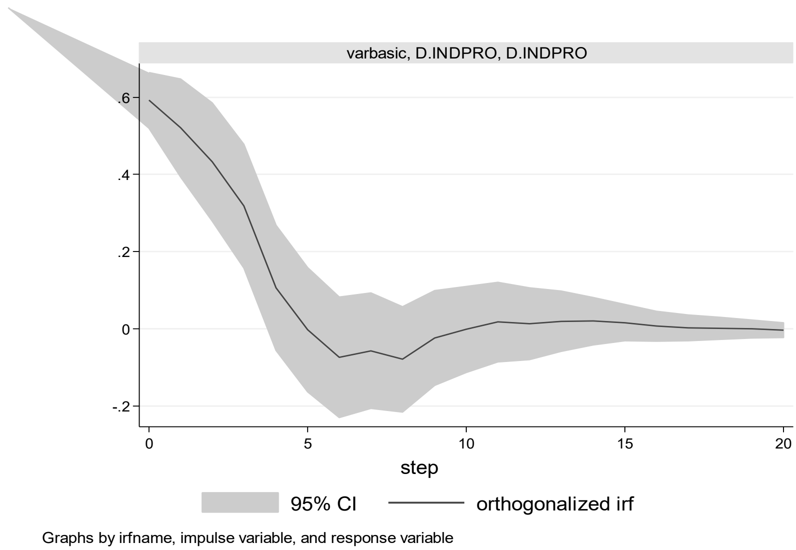
Furthermore, it is typical to evaluate the VAR coefficients using the impulse response function. Impulse responses, in turn, describe how an unexpected change, or shock, in one variable impacts another variable over time. The most important impulse responses for this research are described below.

Figure 7 illustrates the forecast-error variance decompositions with a time period of 20 quarters. Precisely, it shows the response of D_INDPRO toward shocks in D_INDPRO. The blue line represents the impulse response function (IRF) and the grey area is the 95% confidence interval for the IRF. It can be observed that the response line is decreasing dramatically during the first 5 quarters. Then, starting from period 6, it slightly increases and remains stable at zero level until the last quarter. Thus, an increase in D_INDPRO by one standard deviation leads to the negative reaction of D_INDPRO along the first 5 periods, and stabilises after the shock from the period 6 to the period 20.

The response of D_INDPRO to D_GFCF (Figure 8) looks quite stable. In the beginning, one standard deviation increase in the capital formation causes a positive response of the industrial production. Then, it fluctuates between 1 and 0 during the next 9 periods. Starting from period 10, the line goes closer to zero and transforms into a straight line. Thus, the insignificant relationship between the parameters is proved: an increase in GFCF generally leads to no change in the industrial productivity, which, in turn, meets the expectations towards the insignificant impact of capital input on the aggregate productivity.

Figure 7

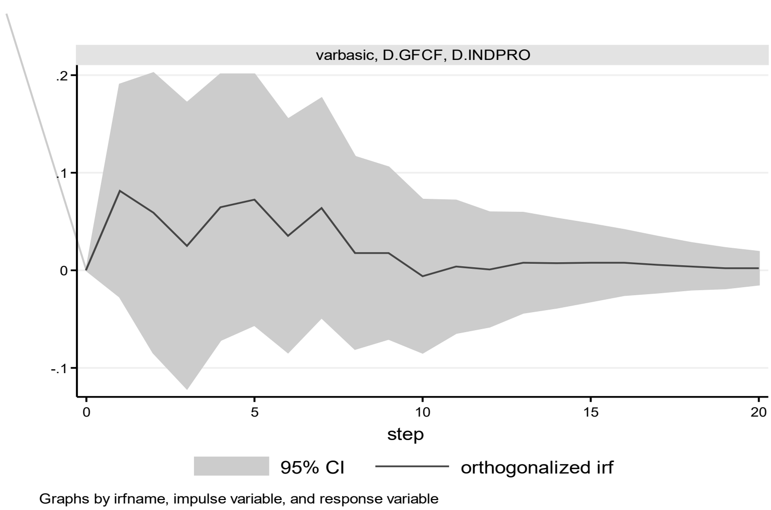
Impulse-Response Function (D.INDPRO, D.INDPRO)



Source: author's own elaboration.

Figure 8

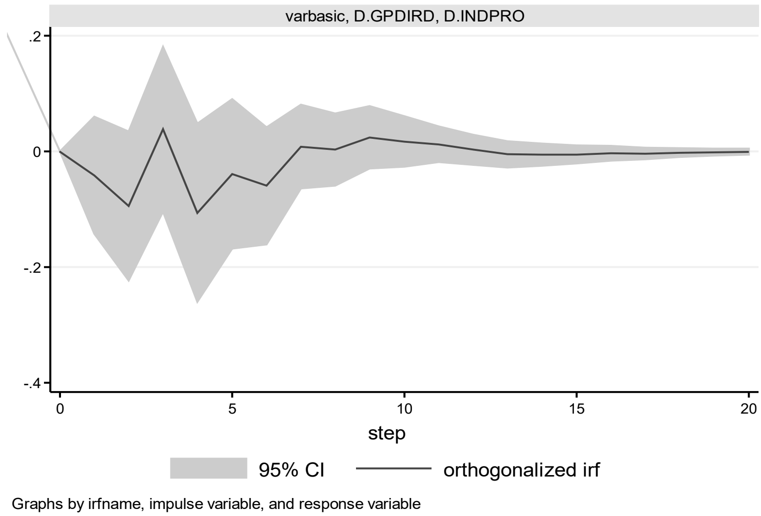
Impulse-Response Function (D.GFCF, D.INDPRO)



Source: author's own elaboration.

Figure 9

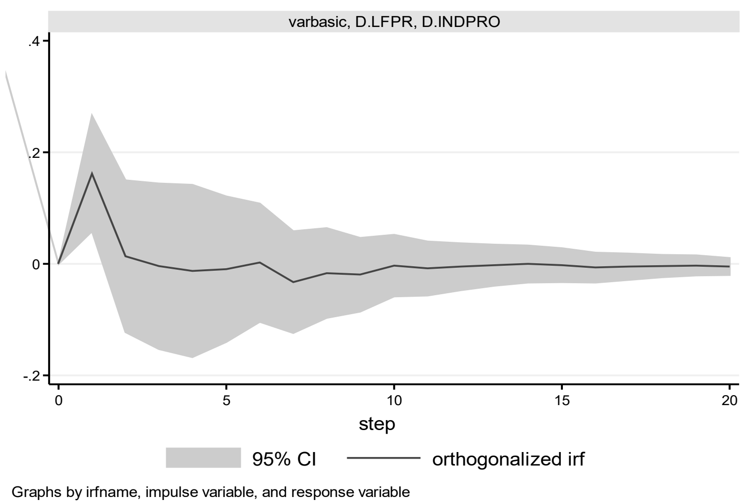
Impulse-Response Function (D.GPDIRD, D.INDPRO)



Source: author's own elaboration.

Figure 10

Impulse-Response Function (D.LFPR, D.INDPRO)



Source: author's own elaboration.

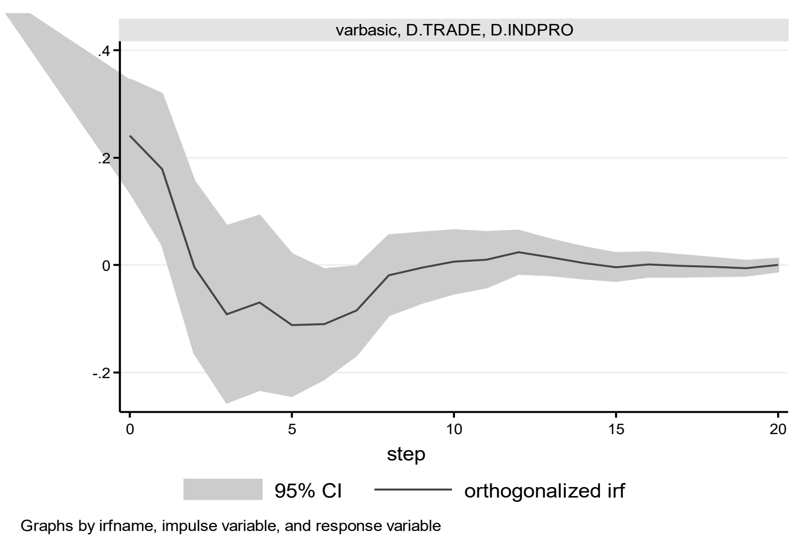
Figure 9 illustrates how changes in D_GPDIRD impact D_INDPRO expectations. Within the first 7 quarter-periods, the response line of the expectations fluctuates around zero. However, then it goes slightly above zero and becomes rather stable. Therefore, technological changes bring incremental positive effects to the industrial output expectations, which does not meet expectations towards the outstanding effect of technological development on productivity growth.

Figure 10 shows how D_INDPRO reacts to changes in D_LFPR. The response line of the expectations increases during the first two periods. However, it decreases during period 3 and remains stable around zero until period 20. As a result, changes in labour force participation bring almost no effects on industrial productivity, which meets the expectations towards the insignificant impact of labour input on productivity.

Finally, the most important relation of this study is represented by Figure 11: how changes in G_TRADE impact D_INDPRO expectations. During the first 5 quarter-periods, the response line of the expectations goes below zero. However, then this line gradually increases and becomes rather stable slightly above zero from period 6 to period 20. As a result, changes in trade openness bring initially negative outcomes to the productivity growth, which, in turn, accepts the main hypothesis of this research paper.

Figure 11

Impulse-Response Function (D.TRADE, D.INDPRO)



Source: author’s own elaboration.

Overall, impulse response functions show how changes in the industrial production, labour force participation, gross fixed capital formation and gross domestic investments in research and development influence US industrial production during the next 20 quarters. According to the results, changes in the industrial productivity bring negative outcomes on the industrial productivity itself. In terms of labour and capital inputs, obtained results prove that they do not affect productivity growth. Technological developments (GPDIRD), in turn, violate expectation towards their positive impact on productivity, indicating vulnerable negative response. At last, shock in US trade openness with Mexico caused by policies of Trump implies negative outcomes for the US industrial production within the next 20 quarters' period.

Conclusion

The relationship between international trade and industrial production is always attractive to economists. Trump's protectionist policies towards Mexico are of special interest, since the economic relationship between the two neighbouring countries is crucial for both of them, and the world as well. The exploration of this relationship lies in the following theories: Neoclassical Theories of Trade, New Trade Theory, Gravity Model of International Trade, and Solow-Growth Model. Trade openness is found to be an efficient way of increasing productivity growth. However, when the government intervenes in the relation between trade and productivity of a country by establishing trade barriers, an inverse relationship between the parameters emerges. These situations imply numerous empirical studies, where productivity growth is estimated with the use of various methods and numerous econometric models. The majority of researchers point out that trade openness is crucial for the expansion of domestic production; however, control factors, such as labour, capital and state of technologies, are found to be essential as well. Moreover, the previous studies were mainly based on cross-section data. Thus, they may have obtained biased results, struggling with the selection of proper instruments for their multi-stage least square models. This study, in turn, is based on time series data, which demands VAR estimation. Numerous pre-estimation and post-estimation tests proved the efficiency of the constructed model, except for the normality test and the Lagrange multiplier test at the second lag, which may be explained by outliers present in some of the data. The results derived from the impulse-response functions indicate a significant positive relation between trade openness and industrial production. Inversely, barriers to trade have a negative impact on the industrial productivity growth. Furthermore, the results obtained indicate an insignificant effect of both capital input and technological development on productivity growth. It, therefore, violates the expectations that capital input and technological development have a strong impact on productivity. Insignificant results for labour force participation rate, in turn, meet expectations towards the insignificant impact of labour input on the aggregate productivity. Most importantly, the presidency of Trump expressed in the form of exogenous dummy variable is found to be a significant negative factor for the constructed model. Thus, the main hypothesis of the paper has been proved: political decisions of President Trump towards foreign trade with Mexico have a substantial negative effect on the US manufacturing sector.

At last, it is worth mentioning that this research discusses the problem in less detail, relying on the availability of data, especially in the quarterly frequency. Thus, the most appropriate variables were taken into consideration. As far as suggestions for the future economic papers are concerned, the best option for investigations of similar macroeconomic issues is to use the VAR model, elaborating on different effects, the number of lags and specification tests, since this model brings the most accurate results.

List of References

Ades, A., Glaeser, E. (1999) 'Evidence on Growth, Increasing Returns, and the Extent of the Market'. *The Quarterly Journal of Economics* 114(3), 1025–1045.

Akrani, G. (2011) 'Criticism Limitations of Ricardian Comparative Cost Theory'. Kalyan City Blog. [online] available from <https://kalyan-city.blogspot.com/2011/02/criticism-limitations-of-ricardian.html> [02 March 2019].

Alesina, A., Spolaore E., and Wacziarg, R. (1997) 'Economic Integration and Political Disintegration'. *American Economic Review* 90(5), 1276–1296.

Anderson, J. (2011) 'The Gravity Model'. *Annual Review of Economics* 3(1), 133–160.

Anderson, J., Neary, P. (1992) 'Trade Reform with Quotas, Partial Rent Retention, and Tariffs. *Econometrica* 60(1), 57–76.

Baily, M., Bosworth, B. (2014) 'US Manufacturing: Understanding Its Past and Its Potential Future'. *Journal of Economic Perspectives* 28(1), 3–26.

Balassa, B. (1978) ‘Exports and economic growth: Further evidence’. *Journal of Development Economics* 5(2), 181–189.
Beck, K. (2017) ‘Bayesian Model Averaging and Jointness Measures: Theoretical Framework and Application to the Gravity Model of Trade’. *Statistics in Transition new series* 8(3), 1–20.
Beck, K. (2018) ‘Intra- vs Inter-Industry Trade: A Robust Analysis of The Determinants of the Different Trade Types’. in: 33rd International scientific Conference on Economic and Social Development – “Managerial Issues in Modern Business”, 118–126.
Beck, K. (2018) ‘Determinants of Intra-Industry Trade: An Investigation with BMA for the European Union’ in: ‘CBU International Conference. Innovation in Science and Education’.
Beck, K. (2020) ‘What Drives International Trade? Robust Analysis for the European Union’. *Journal of International Studies* 13(2), 68–84.
Beck, K., Gawrońska-Nowak, B., Valdivieso, P. (2019) ‘Public and Expert Opinions on Free Trade Agreements in South America’. *Entrepreneurial Business and Economics Review* 7(2), 7–25.
Becker, G., Murphy, K. (1994) ‘The Division of Labor, Coordination Costs, and Knowledge’. The National Bureau of Economic Research, 299–322.
Blanchard, O. (2009) *Macroeconomics*. New Jersey: Prentice Hall, 209–212.
Burfisher, M., Robinson, S., and Thierfelder, K. (2001) ‘The Impact of NAFTA on the United States’. *Journal of Economic Perspectives* 15(1), 125–144.
Coe, D., Helpman, E. (1995) ‘International R&D spillovers’. *European Economic Review* 39(5), 859–887.
Denison, E. (1967) *Why Growth Rates Differ.* Brookings Institution, Washington D.C.
Dollar, D. (1992) ‘Outward-Oriented Developing Economies Really Do Grow More Rapidly: Evidence from 95 LDCs, 1976–1985’. *Economic Development and Cultural Change* 40(3), 523–544.
Domar, E. (1946) ‘Capital Expansion, Rate of Growth, and Employment’. *Econometrica* 14(2), 137–147.
Donnan, S. (2019) ‘Globalization Is Surviving Trump’. *Bloomberg Businessweek*. [online] available from <https://www.bloomberg.com/news/articles/2019-01-18/globalization-is-surviving-trump> [18 February 2019].
Edelman, D. (2019) ‘Steel and Aluminum Tariffs Imposed. US imposes tariffs to Mexico, Canada, and the European Union’. Edelman Holdings. [online] available from <https://www.edelman.be> [23 February 2019].
Edwards, S. (1997) ‘Trade Policy, Growth, and Income Distribution’. *The American Economic Review* 87(2), 205–210.

Federal Election Commission (2017) *FEDERAL ELECTIONS 2016. Election Results for the U.S. President, the U.S. Senate and the U.S. House of Representatives*, 5–6. [online] available from <https://transition.fec.gov/pubrec/fe2016/federalelections2016.pdf> [09 March 2019].

Federal Reserve Bank of St. Louis (2019) *Economic Data.* [online] available from <https://fred.stlouisfed.org/> [15 February 2019].

Frankel, J., Romer, D. (1996) 'Trade and Growth: An Empirical Investigation'. *American Economic Review* 89(3), 379–399.

Gawrońska-Nowak, B., Beck, K., Valdivieso, P. (2019) 'Expert knowledge *status quo* in the Internet provided public debate on Free Trade Agreements. Meta Analysis of Polish Literature'. *Economics and Sociology* 12(1), 248–261.

Gujarati, D. (2003) *Basic Econometrics*. 4th edition, New York: McGraw-Hill/lrwin, 715–835.

Harrison, A. (1995) 'Openness and Growth: A Time-Series, Cross-Country Analysis for Developing Countries'. *Journal of Development Economics* 48(2), 419–447.

Harrod, R.F. (1939) 'An Essay in Dynamic Theory'. *The Economic Journal* 49(193), 14–33.

Kotkin, J. (2016) 'The Improbable Demographics Behind Donald Trump's Shocking Presidential Victory'. *Forbes.* [online] available from <https://www.forbes.com/sites/joelkotkin/2016/11/09/donald-trumps-presidenti-victory-demographics/#39320c9d3b96> [21 February 2019].

Krueger, A.O. (1980) 'Trade Policy as an Input to Development.*The American Economic Review* 70(2), 288–292.

Krugman, P. (1979) 'Increasing Returns, Monopolistic Competition, and International Trade'. *Journal of International Economics* 9, 469–479.

Liu, T., Woo, W.T. (2018) 'Understanding the U.S.-China Trade War'. *China Economic Journal* 11(3): Special Issue on Forty Years' Economic Reform in China, 319–340.

Lobosco, K. (2018) 'Trump Pulled out of a Massive Trade Deal'. Cable News Network. [online] available from <https://edition.cnn.com/2018/12/29/politics/tpp-trade-trump/index.html> [21 February 2019].

Maddison, A. (1982) *Phases of Capitalist Development*. Oxford University Press, Business & Economics, 1–274.

Markusen, J.R., Melvin, J.R., Maskus, K.E., and Kaempfer, W. (1995.) 'International Trade: Theory and Evidence'. Munich Personal RePEc Archive, 98–126. [online] available from <https://mpra.ub.uni-muenchen.de/id/eprint/21989> [03 March 2019].

Marrewijk, C. (2012) *International Economics: Theory, Application, and Policy*. Oxford University Press, 178–198.

Noland, M., Hufbauer, G.C., Robinson, S., and Moran, T. (2016) 'Assessing Trade Agendas in the US Presidential Campaign'. Peterson Institute for International Economics, 5–17. [online] available from <https://piie.com/system/files/documents/piieb16-6.pdf> [15 February 2019].

Ricardo, D. (1817) *On the Principles of Political Economy and Taxation*. London: Batoche Books, 85–104. [online] available from <https://socialsciences.mcmaster.ca/econ/ugcm/3ll3/ricardo/Principles.pdf> [02 March 2019].

Rodríguez, F., Rodrik, D. (2001) 'Trade Policy and Economic Growth: A Skeptic's Guide to the Cross-National Evidence'. *NBER Macroeconomics Annual* 15, 261–338.

Rodrik, D. (2000) 'Comments on Frankel and Rose, "Estimating the Effects of Currency Unions on Trade and Output"'. [online] available from <https://drodrik.scholar.harvard.edu/files/dani-rodrik/files/estimating--effects-of-currency-unions.pdf> [19 March 2019].

Rodrik, D., Subramanian, A. and Trebbi, F. (2002) 'Institutions Rule: The Primacy of Institutions over Geography and Integration in Economic Development'. *Journal of Economic Growth* 9(2), 131–165.

Romer, P. (1986) 'Increasing Returns and Long-Run Growth'. *Journal of Political Economy* 94(5), 1002–1037.

Smith, A. (1776) 'An Inquiry into the Nature and Causes of the Wealth of Nations'. An Electronic Classics Series Publication, Chapter 5, 31–44. [online] available from <https://eet.pixel-online.org/files/etranslation/original/The%20Wealth%20of%20Nations.pdf> [27 February 2019].

Solow, R. (1956) 'A Contribution to the Theory of Economic Growth'. *The Quarterly Journal of Economics*, 70(1).

Solow, R. (1957) 'Technical Change and the Aggregate Production Function'. *The Review of Economics and Statistics* 39(3), 312–320.

Stiglitz, J. (2018) 'Trump and Globalization'. *Journal of Policy Modeling* 40(3), 515–528.

The White House (2017) 'Remarks of President Donald J. Trump.' The Inaugural Address. [online] available from <https://www.whitehouse.gov/briefings-statements/the-inaugural-address/> [19 February 2019].

Tinbergen, J. (1962) 'Shaping the World Economy; Suggestions for an International Economic Policy'. Twentieth Century Fund, New York. [online] available from <http://hdl.handle.net/1765/16826> [6 March 2019].

Tyson, A. (2017) 'Americans generally positive about NAFTA, but most Republicans say it benefits Mexico more than U.S.' Pew Research

Center. [online] available from <https://www.pewresearch.org/fact--tank/2017/11/13/americans-generally-positive-about-nafta-but-most-republicans-say-it-benefits-mexico-more-than-u-s/> [8 March 2019].

United States Census Bureau (2019) *U.S. International Trade Data*. [online] available from <https://www.census.gov/foreign-trade/data/index.html> [25 February 2019].

U.S. Bureau of Economic Analysis (2018) *U.S. International Trade in Goods and Services*. [online] available from <https://www.bea.gov/> [8 March 2019].

Van den Berg, H. and Schmidt, J.R. (1994) 'Foreign trade and economic growth: time series evidence from Latin America'. *The Journal of International Trade & Economic Development: An International and Comparative Review* 3(3), 249–268.

Villarreal, A.M. (2019) 'U.S.-Mexico Economic Relations: Trends, Issues, and Implications'. *Congressional Research Service*. [online] available from <https://fas.org/sgp/crs/row/RL32934.pdf> [7 March 2019].

The Impact of Bilateral Trade Between the US and Mexico on the US Industrial Production Before and Under the Presidency of Donald Trump

Abstarct

The main goal of this research is to discover the relation between the US–Mexico bilateral trade and the US industrial production, where the presidency of Donald Trump is treated as an exogenous factor. The paper is going to uncover some of the empirical studies, where economists estimate the productivity growth under different barriers to trade. With the use of the VAR model based on time series data, the impact of trade openness on productivity growth was assessed. The US industrial output during the period from 1985 to 2018 was taken as a sample for the purpose of analysis. Control variables, such as proxies of the aggregate production function, were also taken into consideration. Numerous pre-estimation and post-estimation tests were conducted in order to assess the reliability of the constructed model. In accordance with the results, the VAR estimations proved that there is a significant impact of Trump's trade policies towards Mexico on the US industrial production.

Key words: the US, Mexico, Donald Trump, bilateral trade, industrial production, econometrics

Wpływ dwustronnej wymiany handlowej między USA i Meksykiem na amerykańską produkcją przemysłową przed i w trakcie prezydentury Donalda Trumpa

Streszczenie

Głównym celem przeprowadzonego badania jest wykrycie związku pomiędzy dwustronną wymianą handlową USA z Meksykiem a amerykańską produkcją przemysłową przy założeniu, że prezydentura Donalda Trumpa miała charakter egzogeniczny. Praca przedstawi wyniki badań empirycznych, w których ekonomiści szacują wzrost produkcyjności w obliczu różnych barier handlowych. Wpływ otwartości handlowej na wzrost produktywności został oceniony przy zastosowaniu modelu wektorowej autoregresji (VAR) opartym na danych szeregu czasowego. Na potrzeby tej analizy jako próbkę przyjęto amerykańską produkcję przemysłową w okresie 1985–2018. Uwzględniono również zmienne kontrolne takie jak zmienne proxy funkcji produkcji. W celu oceny wiarygodności skonstruowanego modelu przeprowadzone zostały testy wstępnego szacunku i oszacowania końcowego. Zgodnie z wynikami, szacunki wektorowej autoregresji wykazały, że polityka handlowa Trumpa wobec Meksyku miała znaczący wpływ na amerykańską produkcję przemysłową.

Słowa kluczowe: USA, Meksyk, Donald Trump, dwustronna wymiana handlowa, produkcja przemysłowa, ekonometria

Cite as:

Demeubayeva, A. (2020) 'The impact of bilateral trade between the US and Mexico on the US industrial production before and under the presidency of Donald Trump'. *Myśl Ekonomiczna i Polityczna* 3(70), 138–175. DOI: 10.26399/meip.3(70).2020.18/a.demeubayeva

Cytuj jako:

Demeubayeva A., *The impact of bilateral trade between the US and Mexico on the US industrial production before and under the presidency of Donald Trump* [Wpływ dwustronnej wymiany handlowej między USA i Meksykiem na amerykańską produkcją przemysłową przed i w trakcie prezydentury Donalda Trumpa]. „Myśl Ekonomiczna i Polityczna" 2020 nr 3(70), s. 138–175. DOI: 10.26399/meip.3(70).2020.18/a.demeubayeva