UNIVERSITY OF HOHENHEIM

Hohenheim Discussion Papers in Business, Economics and Social Sciences

THE ROLE OF FDI IN STRUCTURAL CHANGE: EVIDENCE FROM MEXICO

Octavio Escobar
Paris School of Business

Henning Mühlen
University of Hohenheim

Institute of Economics

22-2018

Discussion Paper 22-2018

The Role of FDI in Structural Change: Evidence from Mexico

Octavio Escobar, Henning Mühlen

ISSN 2364-2084

The Role of FDI in Structural Change: Evidence from Mexico *

Octavio Escobar† Henning Mühlen‡
Paris School of Business University of Hohenheim

September 2018

Abstract

Foreign direct investment (FDI) flows to Mexico are substantial and play an important role in the Mexican economy since the mid-1990s. These investments reflect the activities of multinational firms that shape to some extent the economic landscape and sectoral structure in this host country. We illustrate that there is considerable variation in the amounts of FDI and structural change within the country and across time. Based on this, the paper's main purpose is to analyze whether there is a significant impact of FDI on structural change. We conduct an empirical analysis covering the period 2006-2016. We use the fixed-effects estimator where the unit of observation is a Mexican state for which we calculate structural change from the reallocation of labor between sectors. The results suggest that (if any) there is a positive effect from FDI on growth-enhancing structural change. This effect depends critically on the lag structure of FDI. Moreover, there is some evidence that the positive effect (i) arises from FDI flows in the industry sector and (ii) is present for medium- and low-skilled labor reallocation.

JEL-Classification: F21, F63, L16, O10, O54

Keywords: FDI, structural change, labor reallocation, Mexico, multinational firms, economic development

*Earlier versions of this paper were presented at various conferences under the title "Structural Transformation in Mexico: What is the Role of FDI?". We thank participants of the ETSG conference 2017 in Florence, the FDI Workshop 2017 in Mainz, the conference on Economics of Global Interactions in Bari, the XIX Conference on International Economics in Vila-real, the KCG Seminar at the Kiel Institute for the World Economy, and the INFER Annual Conference 2018 in Göttingen for useful suggestions. In particular, we are grateful to Farid Toubal, Konstantin Wacker, Dominik Boddin, and Klaus Prettner. All errors are our own.

†O. Escobar, Paris School of Business, 59 Rue Nationale, 75013 Paris, France; o.escobar@psbedu.paris

‡Corresponding author: H. Mühlen, University of Hohenheim, Institute of Economics (520E), Schloss Hohenheim, 70599 Stuttgart, Germany; LHenning.Muehlen@uni-hohenheim.de

1 Introduction

The activities of multinational enterprises (MNEs) have increased substantially worldwide in the recent past and are associated with considerable foreign direct investment (FDI) inflows in many destination countries. Between the years 2000 and 2016, world FDI inflows amount to an annual average of 1.28 trillion US dollars which corresponds to a ratio of 2.3 percent relative to world GDP (UNCTAD, 2018).

The backgrounds of these investments may be very different and, thus, the resulting picture may look quite heterogeneous across and within FDI host economies. In some countries FDI projects may be spatially distributed across the country and associated with activities in the manufacturing sector where numerous affiliates are integrated in global value chains and produce intermediate goods. In other countries there may be mainly large single direct investments in the resource sector where the activities are located in a few places. Whatever the differences in the motives and investment decisions are, there is a common aspect: FDI shapes to some extent the economic landscape and structure of the host countries. Given that MNEs shift economic activity to a particular sector and concentrate it in a specific location, this calls for the question whether FDI inflows have a significant impact on structural transformation – the process of a reallocation of economic activity across sectors.[1]

The direct relationship between FDI and structural change has been largely ignored in the literature so far, although it is likely to be of high relevance for many economies, in particular, for developing countries such as Mexico. Entering an economy and being active in a relatively productive sector, MNEs may pull economic activity away from low-productive sectors and, hence, contribute to effective structural transformation. In this context, MNEs may induce a reallocation of labor between sectors. Considering that MNEs are relatively productive firms that tend to pay relatively high wages (Mayer and Ottaviano, 2007; Bernard et al., 2012), there is a large potential that they attract labor to

[1] We will use the terms “structural transformation” and “structural change” interchangeably in this paper.

move (also across sectors). Moreover, there is evidence that there are effects from FDI on employment (Hijzen et al., 2013; Jude and Silaghi, 2016). Yet, it is unclear whether aggregated multinational activity in an economy has a significant effect on a labor reallocation across sectors. Finally, the potential link between FDI and structural transformation is relevant from the development policy perspective since structural change has been identified as a key factor of productivity growth and economic development (see McMillan et al., 2014; Timmer et al., 2015). Hence, if FDI affects structural transformation positively, it also contributes to productivity growth and may promote economic development.

In this paper, we conduct a within country analysis and empirically investigate the impact of FDI inflows on growth enhancing structural change in Mexico. More specifically, we run regressions based on sub-national (i.e. state-level) panel data using the within estimator. We calculate structural transformation from the reallocation of the factor labor across sectors for the period 2006-2016. Technically, we take the inner product of productivity levels with the change in employment shares across sectors. This measure is taken from a decomposition framework used in the recent development literature (e.g. McMillan and Rodrik, 2011; Timmer et al., 2015). For our purpose, we also modify this measure and take into account different skill levels of labor. In addition to the state-level analysis, we conduct an investigation at the sector-state-level to analyze the mechanism of the potential effect of FDI on structural change. In this context, we use a probit model to check whether FDI is associated with sectoral employment share changes.

Mexico appears to be an appropriate country case for the given research objective for a couple of reasons. First, Mexico is a large country comprising 32 federative entities (states). Hence, there are sufficient units of observation to conduct panel data regressions. Such a within country analysis has some advantages compared to cross-country studies as the latter ones neglect within country heterogeneity which is likely to play a role for the given research question. Moreover, sub-national data at the sectoral level is typically much better comparable than sectoral data of different countries. Second, as we will show in the following section, Mexico received considerable FDI inflows (from various source countries) in the relevant time period. Although all Mexican states received FDI, there is a high variation in the amounts across states, sectors, and years. Third, there is notable structural change with considerable differences between and within Mexican states. Finally, given that these phenomena occur in the same time period, we take this as a motivation for our research objective where the (direction of the) potential effect of FDI is not ex ante clear.

The paper's contribution is characterized as follows. First, we empirically investigate the link between FDI and structural change which is widely neglected in the literature so far. There are only a few studies that address this economic relationship. For example, Amendolagine et al. (2017) investigate the impact of foreign investors on structural change in the form of linkages and knowledge diffusion using firm-level data from African economies. Second, the majority of studies examining structural change issues focuses on economy-wide structural change in the long-run. The respective investigations conduct mainly cross-country analyses and highlight the role of structural transformation for economy-wide productivity growth (e.g. Duarte and Restuccia, 2010; Herrendorf et al., 2014; Timmer et al., 2015). Investigating the case of Mexico and analyzing the impact of structural change on economic growth, the study by Padilla-Pérez and Villarreal (2017) is closely related to our paper. Yet, we take a different perspective as we focus on within-country variations taking into account a relatively short time period. Moreover, our goal is to examine the effects *on* structural change. One attempt of investigating the determinants of structural transformation in a cross-country setting can be found in McMillan et al. (2014). We explore the driving factors in more detail; in particular, we investigate the role of FDI. Third, the paper at hand contributes to the understanding of the consequences of FDI in a host country. There is a large associated literature that examines the effects of FDI. Yet, the particular focus is different to the one of our work. For example, one strand is interested in the effects of FDI on economic growth (e.g. Borensztein et al., 1998). Another main strand focuses on FDI spillovers (e.g. Javorcik, 2004; Görg and Strobl, 2005; Fons-Rosen et al., 2017), frequently addressing the effects of the presence of MNEs on domestic firm's productivity levels in FDI host countries. Our work complements the literature as we address the consequences of FDI for the sectoral composition of a particular host country.

Our empirical results suggest that if any there is a positive effect from FDI on (productivity) growth-enhancing structural change. This effect depends critically on the lag structure of FDI. Moreover, there is evidence that the positive effect arises from FDI flows in the industry sector and is present for medium- and low-skilled labor reallocation.

The rest of this paper is structured as follows. In Section 2, we use descriptive figures to present a detailed portrait of FDI inflows and sectoral patterns in Mexico. This is followed by Section 3 where we investigate the relationship between FDI and structural change at the state-level. In Section 4 we extend the analysis and investigate if and how FDI affects employment changes at the sectoral level. In both sections 3 and 4, we discuss the methodology first and then present the related results of the regression analysis. Finally, we provide concluding statements in Section 5.

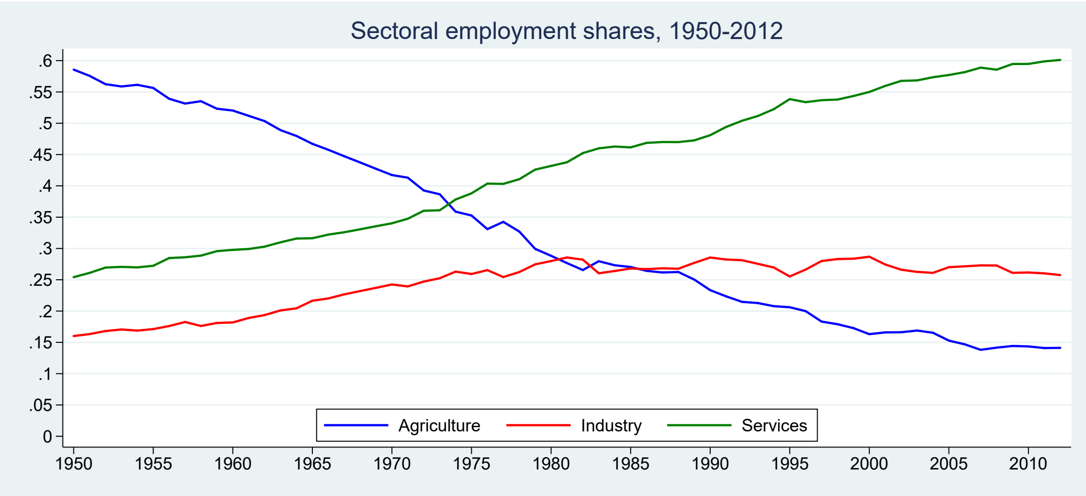
2 FDI and sectoral patterns in Mexico

First, we show long-run paths of structural change indicators for the Mexican economy as a whole using data from the GGDC 10-Sector Database (Timmer et al., 2015). Based on these observations, we are able to extract some relevant insights about the development process of the economy. In this context, we apply the common distinction between the broad sectors agriculture, industry, and services as it provides an appropriate overview. Moreover, we present inward FDI numbers for Mexico using data from the UNCTAD (2018) and place our research question in the long-run context.

Second, we change to a sub-national perspective and illustrate sectoral patterns as well as FDI inflows related to the Mexican states. This view highlights substantial differences within Mexico. We make use of data from the Instituto Nacional de Estadítica y Geografía (INEGI; `http://www.inegi.org.mx/`). These data are available at different sectoral aggregation levels and offer valuable information. In this regard, we explicitly use data at the two-digit sectoral level in our following empirical investigation since we expect this to be relevant in the context of FDI and structural change. Finally, the descriptive figures serve as a motivation for the regression analysis in the subsequent sections.

2.1 Economy-wide indicators in the long-run

FIGURE 1: **Long-run structural change in terms of sectoral employment**



Data source: GGDC 10-Sector Database

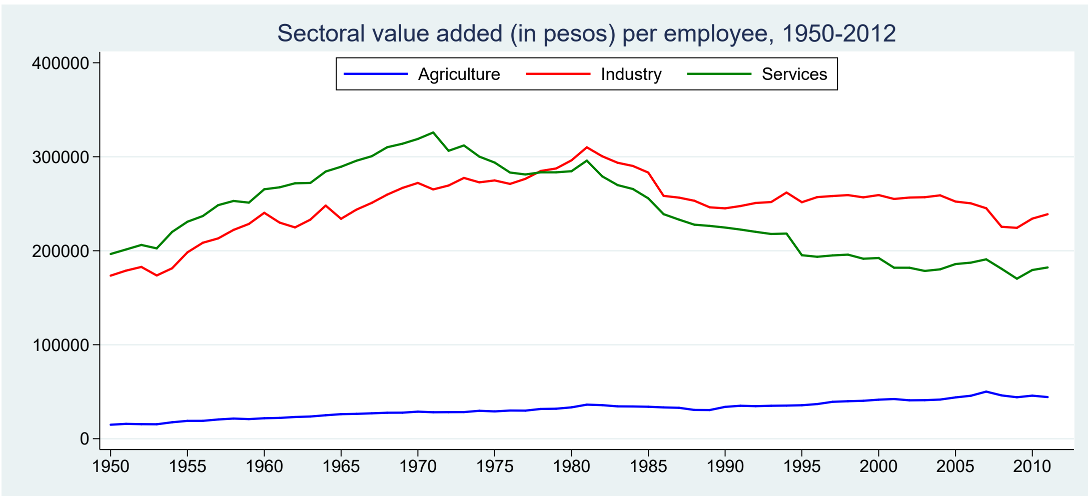
In Figure 1 there are undeniable signs for long-run structural change. Most notably, the agricultural employment share decreases significantly over time. Starting in 1950 with almost 60 percent, the share of agricultural employment relative to total employment goes down to about 14 percent in 2012.[2] Contrary to this observation, the share of services increases constantly over time and is dominant since the 1970s. The subsector "wholesale and retail trade, hotels and restaurants" makes up the largest fraction in services and grows from ten percent to 22 percent (not reported in the figure). Interestingly, the share of industry sectors (including manufacturing) first increases until 1980, but then remains relatively constant over time ranging between 25 and 30 percent. Concluding, we note that Mexico appears to be a relatively services oriented economy in terms of sectoral employment shares since the 1980s.

[2] Data points after 2012 were not available at the time of data extraction.

Overall, the long-run picture mirrors to some extent the rationale of dual economy approaches (e.g. Lewis, 1954; Temple and Wößmann, 2006) where labor moves from a "traditional" sector (agriculture) to "modern" sectors (such as manufacturing or services). In these approaches the traditional sector is typically characterized by low productivity levels relative to the modern sectors. Especially, in early stages of a country's development process these productivity gaps between sectors can be observed in the data. Given that in this setting labor moves out of the traditional sector towards modern sectors, it is likely to be employed more effectively on average. Such a reallocation of economic activity reflects positive structural change.

However, this story only holds as long as productivity levels remain lower in agriculture than in non-agricultural sectors. Moreover, the marginal effect of positive structural change is supposed to diminish over time. With ongoing labor reallocation towards modern sectors, the labor productivity in agriculture should increase and, other things equal, productivity gaps should tend to decrease in the long-run.

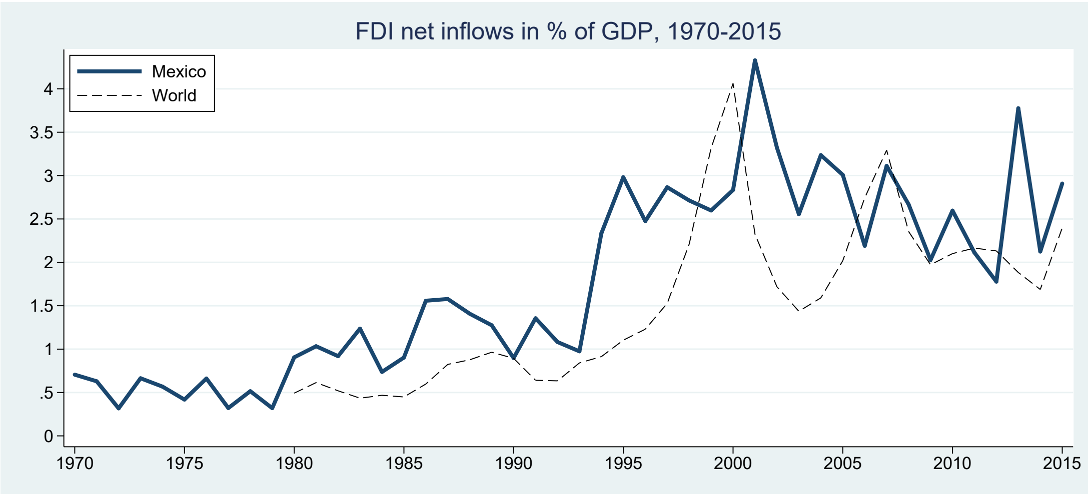
FIGURE 2: **Long-run path of sectoral labor productivity levels: Productivity gaps between agriculture and non-agriculture**



Data source: GGDC 10-Sector Database

Such productivity gaps between sectors are also observable for Mexico. Although employment in agriculture between 1950 and 1970 is considerably high, value added in absolute terms is very low. Moreover, in the full time period 1950-2012 the share of agricultural value added ranges between five and ten percent only. Figure 2 illustrates labor productivity levels (in terms of value added per employee) for the three broad sectors over time. Obviously, there are large productivity gaps between the "traditional" sector and the two "modern" sectors. Other things equal, a labor reallocation from agriculture towards industry and/or services should lead to positive structural change and contribute to aggregate productivity growth in the economy.[3] In the end, the figure indicates a slight tendency for convergence of sectoral productivity levels since the 1980s.

FIGURE 3: **The relevance of FDI inflows in the Mexican economy**



Data source: UNCTAD (2018)

Next, we briefly characterize Mexico as a destination country for FDI. Ratios of net FDI inflows relative to gross domestic product (GDP) are depicted in Figure 3 for the period 1970-2015.[4] FDI became increasingly important over time for Mexico indicated by the solid line. We can observe three periods with different levels of the FDI-GDP ratio. The first period is 1970-1979 when the ratio was always lower than one percent. Then, there is a little jump to ratios of around one percent in the years 1980-1993. This is followed by a further jump to FDI-GDP ratios of on average 2.75 percent in the years

[3] Indeed, structural change appeared to be positive in the past and contributed to aggregate productivity growth in Mexico. Timmer et al. (2014) show this for the period 1975-1990 and McMillan et al. (2014) demonstrate this for the period 1990-2005.

[4] Note that there are no data on FDI available for Mexico before 1970 (and for the world as an aggregate before 1980, respectively).

1994-2015.[5] As a reference, we take into account the world ratio (dashed line). Overall, the numbers for Mexico are somewhat comparable to those of the world, although there deviations in some years. We note that FDI inflows play a significant role in the Mexican economy recently.

Finally, we can draw an important conclusion from this subsection and put our analysis in a long-run perspective. Considering the role of the "traditional" sector agriculture over time, the Mexican economy has already experienced a typical first step of structural transformation between 1950 and the mid-1980s. As illustrated in Figure 1, the employment share of agriculture has substantially decreased indicating that economic activity has been shifted towards other "modern" sectors.[6] Since our following analysis is dedicated to recent years starting in the early 2000s, the overall context of our investigation is a relatively service-oriented economy. It is a fact that activities in the "modern" sectors (industry and services) are much more diversified than in agriculture. Thus, we investigate the role of FDI in a setting where potential structural change should be characterized by a reallocation of economic activity between the three broad sectors *and* between subsectors – especially subsectors of industry or services. Since the latter phenomenon appears to be relevant in Mexico, we employ relatively disaggregated data to compute structural change.

2.2 Within country perspective: State-level figures

Mexico is officially divided into 32 federative entities, 31 states and the capital – Mexico City. Since the level of autonomy is similar for all federative entities, we consider 32 Mexican "states" in the following. Each state is free and sovereign, and has its own congress and constitution (SCJN, 2010).

During the 1990s, Mexico's authorities have been working on major structural reforms. First, Mexico undertook important trade liberalization efforts, which transformed the

[5] In absolute numbers, net FDI inflows in Mexico make up 33 billion US dollars in 2015 (UNCTAD, 2018).

[6] A similar picture can be observed in many developing countries in this period. See Timmer et al. (2015) for an overview.

country from a relatively closed economy to one of the most open in the world. The most important structural reforms included a government-wide deregulation program, a new competition law, the elimination of price controls, and the negotiation of free trade agreements (Gurría, 2000). In 1993, Mexico was the first developing country to sign a free trade agreement with developed countries concluding the North American Free Trade Agreement (NAFTA) with Canada and the United States (Escobar Gamboa, 2013). In addition, the authorities eliminated important restrictions on capital inflows, such as limitations on commercial borrowing from abroad, foreign investment in Mexican securities, and foreign participation in domestic money markets (Gurría, 2000).

Second, Mexico's authorities implemented a far-reaching fiscal reform to embrace fiscal discipline. Finally, in 1994, the Central Bank of Mexico (Banxico) became independent, and at the end of that year the exchange rate regime passes from exchange rate bands with managed slippage to free float (Carstens and Werner, 2000).

During the legislative periods between 2000 and 2012, the authorities failed to pass any economic structural reform. However, the process of structural reforms accelerated significantly since 2012 with the Pact for Mexico (OECD, 2015). Indeed, an important set of structural reforms including energy, fiscal, financial, telecommunications, competition, education, and labor reforms were approved by the Mexican Congress between 2012 and 2014. Hence, in this paper we focus on a period of legislative stagnation in terms structural reforms. This is important to note, since most of the reforms in Mexico are also oriented to improve Mexico's FDI attractiveness (Escobar Gamboa, 2013).

2.2.1 FDI inflows

FDI data by state are available on an annual basis. We consider data from 1999 to 2015 and present descriptive numbers in Table 1.[7] In columns (1) and (2), it can be seen that there is a large variation among Mexican states. The average annual inflows between 1999 and 2015 range from roughly 1.3 billion pesos in Chiapas to more than 63 billion pesos

[7] Since we employ FDI indicators in lags in the following analysis, the period 1999-2015 in Table 1 deviates from the period 2006-2016 used to calculate structural transformation.

Table 1: **FDI inflows by state**

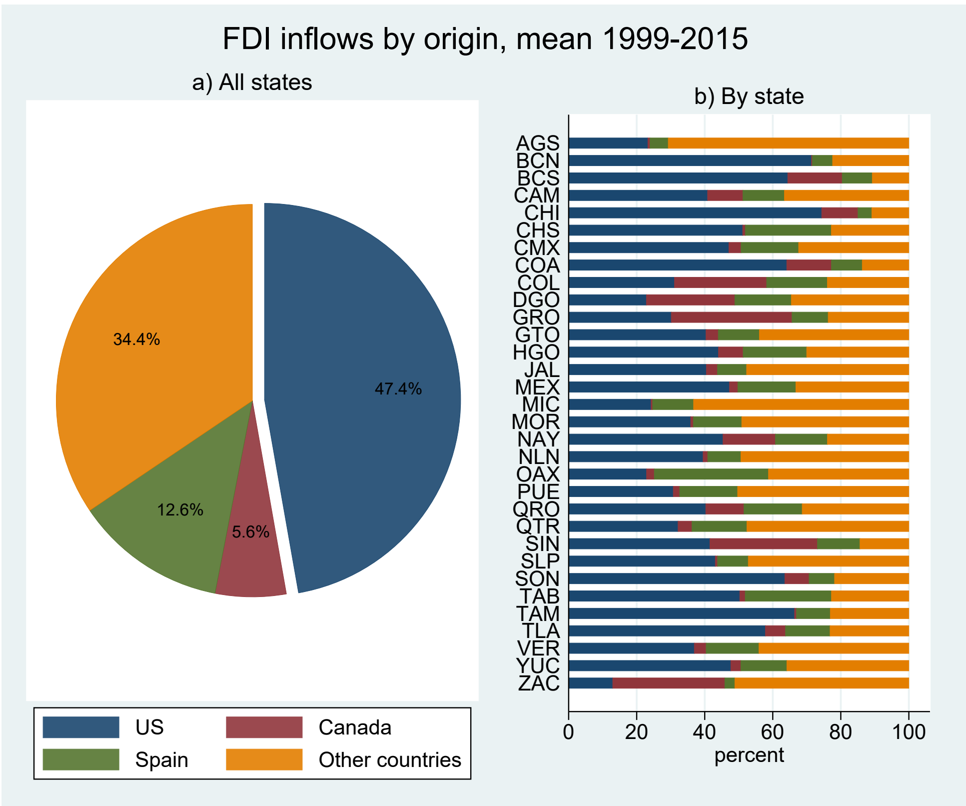
State	All sectors				AGR	IND	SER
	(1) 1999-2015 (bn.MXN)	(2) 2003-15 (% of GDP)	(3) 2003-09 (% of GDP)	(4) 2010-15 (% of GDP)	(5) 1999-2015 (share, %)	(6) 1999-2015 (share, %)	(7) 1999-2015 (share, %)
Aguascalientes	4.09	2.49	2.27	2.67	.01	79.61	20.39
Baja California	14.37	3.17	3.64	2.79	.22	69.36	30.43
Baja California Sur	6.711	6.29	8.25	4.67	.02	24.87	75.12
Campeche	1.691	.227	.117	.319	0	33.56	66.44
Chiapas	1.381	.518	.551	.491	3.49	53.82	42.69
Chihuahua	22.02	4.99	5.71	4.38	.03	85.03	14.94
Coahuila de Zaragoza	9.738	1.88	1.48	2.21	.3	77.31	22.39
Colima	1.619	1.95	1.89	1.99	1.51	27.97	70.52
Distrito Federal (Mexico City)	63.69	2.56	3.24	1.99	.15	40.73	59.12
Durango	2.811	1.62	1.6	1.64	0	57.74	42.26
Guanajuato	12.67	2.29	1.87	2.65	.22	65.53	34.25
Guerrero	3.514	1.64	1.43	1.82	0	62.44	37.56
Hidalgo	2.526	1.16	.771	1.48	0	46.03	53.97
Jalisco	18.21	1.88	1.54	2.16	.65	63.85	35.5
Michoacán de Ocampo	6.16	1.79	1.82	1.76	1.26	34.39	64.35
Morelos	3.206	1.82	1.62	1.98	0	66.34	33.66
México	30.72	2.43	2.34	2.51	0	68.62	31.38
Nayarit	2.204	2.24	2.32	2.18	.84	22.16	77
Nuevo León	29.39	2.88	3.32	2.52	.01	69.64	30.35
Oaxaca	4.262	1.78	.929	2.49	0	72.71	27.29
Puebla	7.934	1.63	1.33	1.87	.90	64.98	34.12
Querétaro de Arteaga	10.17	3.44	3.98	2.98	12.5	325.2 †	-237.7 †
Quintana Roo	5.696	2.84	3.2	2.54	0	17.64	82.36
San Luis Potosí	8.352	2.81	1.61	3.82	2.07	71.34	26.59
Sinaloa	3.283	1.01	.674	1.29	.49	24.28	75.24
Sonora	10.46	2.26	2.22	2.29	0	71.34	28.65
Tabasco	2.585	.494	.34	.622	1.43	47.3	51.26
Tamaulipas	11.12	2.4	2.25	2.53	.26	74.98	24.75
Tlaxcala	1.542	1.83	2.22	1.51	0	87.87	12.13
Veracruz de Ignacio de la Llave	10.46	1.4	.857	1.86	.31	60.02	39.67
Yucatán	1.847	.903	.778	1.01	.59	42.28	57.14
Zacatecas	9.526	6.87	5.7	7.84	.05	97.55	2.403
State average	10.1	2.3	2.25	2.34	.853	65.8	33.3

Notes: In all columns we refer to the mean of the indicated time period. Absolute numbers in column (1) are given in billion Mexican pesos (constant values). FDI/GDP ratios in columns (2) and (3) start only in 2003 since GDP data at the state-level is not available for earlier years. The last three columns refer to sectoral FDI inflows relative to total FDI inflows. These shares are given in percent and refer to agriculture (AGR), industry (IND), and services (SER), respectively. †The odd numbers of sectoral FDI shares for Querétaro de Arteaga are due to considerable negative net FDI flows in single years.
Data source: INEGI

in Mexico City. It is quite plausible that the country's capital is the number one FDI destination, since it is the economic center with many affiliates of foreign MNEs. Total FDI inflows in the capital amount to 1.2 trillion pesos over the full time period (column (2)) which makes up 22 percent of total inflows to Mexico. Columns (3) and (4) shed some light on two sub-periods and prove that FDI plays a role in all states throughout the considered time horizon. Each column shows the sum of annual inflows of the respective sub-period. In the end, the large differences between the states are of particular interest with respect to the following analysis explaining the variation of structural change within Mexican states.

The last three columns refer to the sectoral structure and highlight the differences between agriculture (AGR), industry (IND), and services (SER). The most striking observation is that FDI in agriculture is negligible in all states. Hence, the other two sectors are dominant in terms of FDI activities. The picture is very heterogeneous. In Durango, Hidalgo, and Yucatán there is an almost balanced distribution between industry and services while in many other states FDI inflows in one sector are dominant (e.g. Aguascalientes or Zacatecas). Across Mexico, FDI in the industry sector is prevalent with 65.8 percent on average.

FIGURE 4: **Major FDI source countries**



Data source: INEGI
Note: For a description of the state codes in part b) see Appendix A4

The information in the data also allows for a differentiation between FDI home countries. This appears to be important in the case of Mexico since there are a few major source countries. We illustrate this in Figure 4. Almost two thirds of the direct investments between 1999 and 2015 stem from the US, Canada, and Spain.

The US are the major economic partner in this context as the share is almost one half (47.4 percent). Due to various reasons such as the spatial proximity and the NAFTA, Mexico and the US have strong economic ties that result in significant financial and trade flows. Baldwin and Lopez-Gonzalez (2015) show that a high share of bilateral trade between the two economies is related to trade in intermediates, or in other words, to supply-chain trade. In this regard, Mexico imports a significant share of intermediates from the US to produce either final goods or processed intermediates for exporting (back to the US).[8] These trade patterns are some evidence for US MNEs' activity in Mexico since a considerable share appears to be "intrafirm trade" which is associated with FDI, especially with vertical structures. US FDI is extremely dominant in states that are located at the US-Mexico border. "Border states" are Baja California (BCN), Chihuahua (CHI), Coahuila de Zaragoza (COA), Nuevo León (NLN), Sonora (SON), and Tamaulipas (TAM). Except for Nuevo León, the share of US FDI is higher than 60 percent. To a large extent these investments are related to the "maquiladora" sector which is investigated in numerous studies on FDI and trade (e.g. Bergin et al., 2009; Castillo and de Vries, 2018).

Spain with its historical relations to Mexico as a former colonial power is also a major home country of FDI (12.6 percent) whereas Canada's investments are of minor importance in comparison (5.6 percent). However, FDI from Canada is prevalent in a few Mexican states, such as Guerrero (GRO) or Zacatecas (ZAC).

2.2.2 Sectoral employment

As shown in the long-run portray in Section 2.1, Mexico has turned into a relatively services-oriented economy in terms of employment since the 1980s. This is confirmed by the state-level perspective (Figure 5). The employment share in services (given for the

[8] The flows of supply-chain trade between the US and Mexico are even significant from the global perspective (Baldwin and Lopez-Gonzalez, 2015, pp.1694-1704).

FIGURE 5: **Sectoral employment shares by state, 2006 and 2016 (in %)**

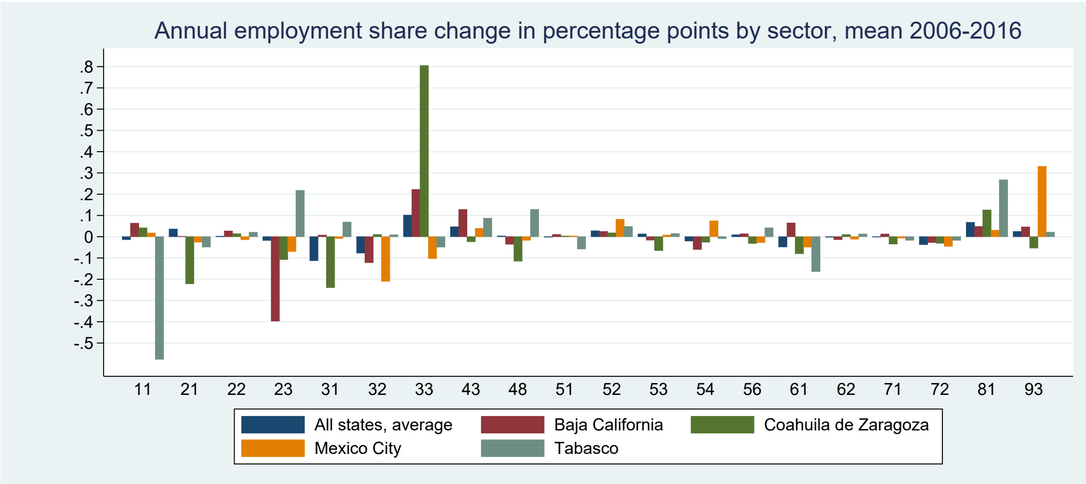
Data source: INEGI
Note: For a description of the state codes see Appendix A4

years 2006 and 2016) is dominant in all states, except for Chihuahua (CHI) in 2016. Yet, there is variation across the Mexican states in the sectoral composition. Extreme examples are Mexico City (CMX) and Chiapas (CHS). Mexico City is enormously dominated by the services sector (around 80 percent) and almost no employment in agriculture while in Chiapas roughly 45 percent of the work force is employed outside the services sector: about 25 percent in agriculture and about 20 percent in industry sectors.

A further interesting insight is that the "US border states" – Baja California (BCN), Chihuahua (CHI), Coahuila de Zaragoza (COA), Nuevo León (NLN), Sonora (SON), and Tamaulipas (TAM) – have relatively high shares in industry due to high activity in manufacturing (not explicitly shown in this figure) which goes partly back to the "maquiladora" sector.

More important for the following analysis of structural transformation are changes in the employment shares which indicate whether economic activity is shifted towards or away from a sector. We get a broad impression by a simple comparison of the years 2006 and 2016 – starting and ending year of our period of investigation – for each state (in Figure 5). For the majority of Mexican states we observe an increase in the services share which is again in line with economy-wide trend. However, our aim is to also take into account the changes in subsectors. Thus, we employ more disaggregated sectoral data in our following analysis. We consider the North American Industry Classification System (NAICS) and use annual data at the two-digit sector level for all Mexican states. Employing the NAICS two-digit level, we are able to differentiate between 20 sectors.

FIGURE 6: **Changes in sectoral employment**



Data source: INEGI
Note: For a description of the sector codes (11 to 93) see Appendix A3

In Figure 6, we show annual (sectoral) employment share changes for selected states and the average of all states. The numbers correspond to the mean of the period 2006-2016 in each sector given in percentage points. The values related to the average across all states appear moderate in the graphic. Yet, there are some notable characteristics in manufacturing (sectors 31-33). It seems that employment is shifted away from sectors 31 (food, beverages, tobacco, textiles) and 32 (wood, paper, chemicals, non-metallic products) while sector 33 (metallic and electronic products, machinery, furniture) is on average increasing by .1 percentage points per year. We find the largest annual change in sector 33 for Coahuila de Zaragoza with .8. This implies that within the ten year period this sector increases by 8 percentage points which is substantial. A further extreme change is visible for Tabasco. Sector 11 (agriculture) is largely shrinking while other sectors in this state are increasing, such as construction (23), transportation (48) or other services (81). The numbers for Mexico City indicate that economic activity is reallocated from industry sectors towards services and public administration (93). Finally, we note that the picture of sectoral employment changes is heterogeneous among the states, which points towards differences in structural change within Mexico.

2.2.3 Structural change

We calculate structural change from the reallocation of labor between sectors for an economic unit s at time t using Equation 1. In this regard, we follow McMillan and Rodrik (2011). The indicator is taken from a framework where economy-wide productivity change is decomposed into a *within* component and a *structural change* component.[9] Hence, we interpret the indicator in Equation 1 as growth-enhancing structural change.

$$ST_{s,t} = \sum_{j=1}^{n} y_{j,s,t}(\Theta_{j,s,t} - \Theta_{j,s,t-1}) \quad (1)$$

In our case, s refers to a Mexican state. $y_{j,s,t}$ represents the sectoral labor productivity level in sector j in state s in period t. It is measured by (gross) value added per employee. $\Theta_{j,s,t}$ is the respective sectoral employment share. The difference between the employment share of t and $t-1$ indicates a change over time and, thus, it points to a labor reallocation. A positive change signals a shift of economic activity towards the respective sector while a negative sign indicates a shift in the opposite direction. There are n sectors in the observed economic unit s. The number of n depends on the sectoral aggregation level. As mentioned before, we employ annual data at the NAICS two-digit level for all Mexican states. This level of (dis)aggregation is relatively detailed and ensures a solid calculation of structural change. We argue that this procedure is appropriate for our purpose since it is rather a labor reallocation between subsectors that is relevant in the given context than a labor reallocation between the broad sectors agriculture, industry, and services.

In Table 2, the values in columns (1), (3), and (5) indicate the average annual structural change for the respective period in Mexican pesos per employee. As a reference, the values in columns (2), (4), and (6) refer to the corresponding growth rates (in percent) of each

[9] Although this framework is typically used for decompositions at the country-level within the recent development literature (e.g. McMillan et al., 2014; Timmer et al., 2015), earlier applications are related to micro-level settings (e.g. Haltiwanger, 1997). For formal details on the decomposition framework, see Appendix A5.

Table 2: **Structural change by state**

	(1)	(2)	(3)	(4)	(5)	(6)
	2006-2016		**2006-2011**		**2012-2016**	
	(MXN/emp)	(growth, %)	(MXN/emp)	(growth, %)	(MXN/emp)	(growth, %)
Aguascalientes	-3098	-.696	-1466	-.366	-4730	-1.03
Baja California	-7312	-1.71	-6016	-1.39	-8609	-2.02
Baja California Sur	-12341	-2.53	-16270	-3.28	-8413	-1.78
Campeche	-34069	-1.12	-257725	-9.96	189587	7.73
Chiapas	-18341	-8.04	-25295	-11.2	-11386	-4.88
Chihuahua	-15810	-4.14	-9298	-2.5	-22323	-5.78
Coahuila de Zaragoza	-6027	-1.16	-420	-.158	-11635	-2.16
Colima	-6152	-1.71	-4575	-1.28	-7730	-2.14
Distrito Federal (Mexico City)	-5426	-.667	-1854	-.263	-8998	-1.07
Durango	-8135	-2.26	-6279	-1.67	-9991	-2.86
Guanajuato	-3217	-.958	-1887	-.578	-4548	-1.34
Guerrero	-5934	-2.46	-8997	-3.85	-2872	-1.07
Hidalgo	-13831	-4.94	-11109	-4	-16552	-5.88
Jalisco	-4896	-1.18	-5617	-1.43	-4175	-.935
Michoacán de Ocampo	-6306	-2.23	-3530	-1.3	-9083	-3.17
Morelos	-6136	-2	-5508	-1.86	-6765	-2.14
México	-1153	-.503	-3630	-1.5	1323	.497
Nayarit	-359	-.119	427	.194	-1145	-.433
Nuevo León	-4312	-.751	-6388	-1.1	-2237	-.406
Oaxaca	-3649	-1.68	-3752	-1.74	-3546	-1.62
Puebla	-8009	-2.8	-5964	-2.24	-10053	-3.35
Querétaro de Arteaga	-4227	-.773	-1968	-.402	-6485	-1.14
Quintana Roo	-1158	-.329	-2548	-.633	231	-.0247
San Luis Potosí	-9278	-2.51	-13346	-3.71	-5210	-1.3
Sinaloa	-813	-.19	-59.1	.0346	-1568	-.415
Sonora	-6333	-1.22	-9849	-1.86	-2818	-.578
Tabasco	-14519	-1.82	7145	.879	-36183	-4.53
Tamaulipas	-11057	-2.81	-835	-.2	-21279	-5.42
Tlaxcala	-2960	-1.31	737	.192	-6657	-2.82
Veracruz de Ignacio de la Llave	-12920	-3.8	-9678	-3.01	-16163	-4.59
Yucatán	-912	-.337	-1128	-.397	-695	-.277
Zacatecas	-10488	-3.21	-9900	-3.37	-11077	-3.04
State average	-7787	-1.94	-13331	-2	-2243	-1.87

Notes: Values in columns (1), (3), and (5) are given as Mexican pesos per employee (MXN/emp) and calculated using Equation 1. As a reference, the values in columns (2), (4), and (6) refer to the corresponding growth rates (in percent) of each time period; where $ST_{s,t}$ is divided by the state labor productivity of the respective base year $t-1$. Data source: INEGI (authors' calculations)

time period; i.e. $ST_{s,t}$ of Equation 1 is divided by the state labor productivity of the respective base year $t-1$. Hence, the growth rates indicate how much structural change contributes to state-level productivity growth. Overall, we observe negative structural change. This is insofar not surprising since Mexico experienced negative productivity growth in the period 2006-2016. However, the result indicates that labor reallocation was on average inefficient, i.e. economic activity moved from more productive sectors to less productive sectors. Considering the state average in the last row, structural change reduces the productivity change by 7,787 pesos (per employee) per year which corresponds to a negative growth rate of 1.94 percent. The decrease is larger in the sub-period 2006-2011 (column 3: 13,331) than in the more recent sub-period 2012-2016 (column 5: 2,243).

A comparison of the states reveals considerable differences in the (negative) growth rates. While the reduction in some states like Nayarit and Sinaloa is only marginal, there is a large negative value for other states like Chiapas or Hidalgo. A final observation which we have to keep in mind for the following analysis is the result for Campeche. The structural change figures (in pesos per employee) for this state – especially for single years; not reported in the table – document clear outliers. These values are due to large labor productivity levels in the mining sector in Campeche. We consider this fact in the following by providing robustness checks with sub-sample regressions excluding this state.

3 Assessing the role of FDI for structural change

Our main objective is to investigate the relationship between FDI and structural transformation in Mexico. In particular, we are interested in the issue whether FDI has an impact on structural change. To analyze this we run a regression analysis where the unit of observation is a Mexican state.

3.1 Methodology

In terms of the econometric framework, we apply Equation (2):

$$ST_{s,t} = \alpha + \beta \; fdi_{s,t-k} + \gamma' X_{s,t-1} + \delta' Z_{s,t} + \mu_s + \lambda_t + \varepsilon_{s,t} \tag{2}$$

where $ST_{s,t}$ represents structural transformation in (a Mexican) state s and period t. It is calculated based upon the indicator introduced in Equation (1) and given in Mexican pesos per employee. It can be interpreted as a measure for effective structural transformation as it contributes to overall productivity growth via labor reallocation across sectors.

In Equation 2, the explanatory variable of interest is $fdi_{s,t-k}$. It captures the presence of MNEs' aggregated activity measured by FDI inflows relative to GDP in a state s at time $t-k$. We use different lag structures of this indicator since we expect that for a number of FDI projects it takes some time until the direct investments actually lead to structural change in terms of a labor reallocation. As an example, think of "greenfield" investments. It usually takes a considerable amount of time until labor is employed since potential places of work such as production facilities have to be build first. Moreover, supplementary investments in existing FDI projects that are associated with the provision of additional job opportunities may also attract labor to move. Again, it is plausible that there is a time gap between the point of time when the investment is done and the point of time when workers are actually employed. Especially, if labor moves across sectors such time gaps are likely as barriers and adjustment costs of a job change should be higher on average (compared to changes within a sector). Indeed, the literature illustrates that the time component plays a role for the effects of FDI on employment. There may occur transitory negative effects in the short-run and positive effects in the long-run (Jude and Silaghi, 2016). In particular for the long-run perspective, many studies suggest positive effects as, for example, unprofitable and least productive firms exit which allows for an efficient labor allocation (Helpman et al., 2004). Moreover, Hijzen et al. (2013) show that foreign presence leads to job creation.

Given that our dependent variable is calculated from changes between t and $t-1$, the FDI indicator is tested in lagged values starting with year $t-1$ up to $t-4$. Alternatively to aggregated FDI inflows, we also take into account indicators related to FDI in specific sectors. This is explained in detail in Section 3.2.

In principle, FDI stocks rather than FDI flows should be applied as a proxy for the activity of MNEs (Wacker, 2016). However, in the given context, there is a crucial argument to consider the latter. Since the dependent variable (structural transformation) describes a change over time, it is reasonable to assume that its variation is driven by *changes* in the activity of MNEs (which is more associated with FDI flows) rather than by the *level* (which is more associated with the FDI stock).

$X_{s,t-1}$ in Equation 2 refers to a vector of (time-variant and state-specific) control variables included as lagged values. We consider an indicator that addresses the development level of a state measured by GDP per capita. Additionally, we include the agricultural employment share which represents the *status* of structural change. States with a high share are supposed to be relatively backward in terms of structural transformation since a relatively high fraction of labor is bound in the "traditional" sector (McMillan et al., 2014).

$Z_{s,t}$ in Equation 2 refers to a vector of (time-variant and state-specific) control variables supposed to affect the dependent variable during its process in period t. We include net national migration (immigrants minus emigrants per 100.000 inhabitants from/to other Mexican states) in order to control for the potential movement of labor between Mexican states. Similarly, we control for international movement of workers by including net international migration (immigrants minus emigrants per 100.000 inhabitants from/to other countries). Moreover, we employ a variable addressing labor market frictions (measured by the number of labor market conflicts) which should account for resulting rigidities in labor reallocation.[10] Finally, we control for period-specific effects λ_t and state fixed-effects μ_s. α is the constant and ε_{st} is the error term.

In terms of the estimation method, we employ the fixed effects estimator. Thus, we exploit the panel structure of the data and the within variation in particular. We are able to consider ten (annual) periods of structural change starting with 2006-2007 and ending with 2015-2016. This time horizon appears to be relatively short when looking at the related literature investigating (long-run) structural transformation across countries (e.g. McMillan et al., 2014; Timmer et al., 2015; de Vries et al., 2015). Yet, our perspective is quite different compared to many other studies. One the one hand, considerable FDI inflows are a relatively young phenomenon in Mexico and, thus, potential effects are

[10] Definitions of all variables can be found in the Appendix A1. Moreover, descriptive statistics of all variables used in the regressions are displayed in the Appendix A2.

limited to the recent past. On the other hand, the labor reallocation in response to multinational activity is supposed to occur within a few years. Furthermore, we calculate structural change on the basis of quite disaggregated sectoral data. Hence, we take into account not only a shift of economic activity between agriculture, industry and services (or between nine sectors as, for example, in McMillan et al. (2014)) but also within these sectors. Such reallocations between subsectors are expected to play a role in the given context since FDI (or multinational activity, respectively) in a subsector in a Mexican state may be of great economic importance. Taking these aspects into account, the time dimension is appropriate from our point of view. The results of the regression analysis are presented in the following section.

3.2 Empirical results

3.2.1 Baseline estimations

In Table 3 we report our baseline results based on Equation (2). First, we solely include the control variables in column (1). The coefficient of GDP per capita (*gdppc*) is positive and significant at the one percent level suggesting that higher developed states are more likely to experience positive structural change. All other control variables seem to play no role in explaining structural change as the related estimates turn out to be insignificant.

In the subsequent specifications, we additionally include the variable of interest (aggregated FDI inflows relative to GDP in a Mexican state) with different lag structures. As argued before, we expect that on average FDI activities affect ST with a considerable time lag. In column (2), we use four lags of our FDI indicator. L1 refers to the lag in period $t-1$, L2 refers to the lag in period $t-2$, and so on. The estimates of the control variables do not change qualitatively. We find negative (insignificant) coefficients for the one-year and two-year lags. Yet, the estimate of L2 is lower in size. An insignificant estimate is also found for the three-year lag, but it is positive. Finally, the four-year lag of FDI turns out to be positive and statistically significant at the 5 percent level. We take this result as a first evidence that there are effects from FDI on structural change. Moreover, we note that the impact is positive and occurs with a considerable time lag. The latter fact reduces also the probability that this finding is subjected to potential reverse causality issues. Furthermore, to check whether the main finding is biased by potential correlations between the lagged FDI indicators, we conduct separate regressions including each indicator one at a time. The respective result for the four-year lag of FDI is shown in column (3). The estimate is highly significant at the one percent level and larger in size compared to column (2). The results related to the indicators with the lower lag structures are not shown in the table as all estimates are insignificant and qualitatively similar compared to column (2). Finally, we treat the estimates of column (2) as our baseline result which serves as a point of reference for the following estimations.

Next, we consider further lags of the FDI indicator as the time gap of potential effects may be even larger. This exercise involves some limitations since the number of periods decreases while using higher lags. This is due to a limitation in our state-level indicator of FDI relative GDP which we could not calculate for years before 2003. We simultaneously include lags up to six years in column (4). In this case, the full sample decreases by two periods which is associated with a reduction of 64 observations. All estimates for FDI are insignificant under these conditions. L4 and L6 are large in size and positive while L5 appears to be negative. Since it is likely that there is some correlation bias when including a set of lagged FDI indicators (as shown before), we only include L4, L5, and L6 in a separate regression. It turns out that the four-year lag is again significant at the five percent level. Although the five year lag is negative but insignificant, the six-year lag is positive and almost significant at the ten percent level. Overall, the findings in column (5) show that there are some notable changes compared to the baseline result. However, considering that the number of periods is reduced, they are not contradictory to our main finding. Instead the estimates are some supportive evidence that FDI has a positive effect on growth-enhancing structural change.

Finally, we investigate whether there are different effects from FDI in particular sectors. It is likely that the effect of aggregated FDI is driven by investments of MNEs that

TABLE 3: **Fixed effects regressions: Baseline results**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
L1.agr_emp_share	-2,158	-1,945	-1,742	-569.8	-496.6	-1,863	-1,656
	(-0.561)	(-0.459)	(-0.463)	(-0.180)	(-0.155)	(-0.488)	(-0.447)
L1.gdppc	0.111***	0.111***	0.114***	-2.219***	-2.204***	0.111***	0.118***
	(9.838)	(9.099)	(10.71)	(-16.36)	(-16.56)	(10.11)	(11.65)
national migration	-55.28	-53.36	-60.33	118.6	73.70	-51.90	-60.32
	(-1.448)	(-1.312)	(-1.557)	(1.384)	(1.366)	(-1.285)	(-1.424)
intern. migration	242.7	249.1	245.2	205.4*	195.0*	239.9	243.0
	(1.362)	(1.356)	(1.376)	(1.781)	(1.758)	(1.346)	(1.342)
labor conflicts	-1.011	-0.872	-0.935	0.479	0.0855	-0.988	-0.938
	(-0.531)	(-0.460)	(-0.494)	(0.179)	(0.0294)	(-0.513)	(-0.498)
L1.fdi		-1,093		-3,592			
		(-0.457)		(-1.146)			
L2.fdi		-178.7		-862.6			
		(-0.234)		(-0.899)			
L3.fdi		305.4		-135.1			
		(0.468)		(-0.135)			
L4.fdi		2,434**	2,911***	2,804	4,133**		
		(2.085)	(2.734)	(1.425)	(2.349)		
L5.fdi				-3,649	-2,606		
				(-1.280)	(-1.104)		
L6.fdi				3,828	1,748		
				(1.513)	(1.651)		
L4.fdi_agr						-123,020	
						(-0.868)	
L4.fdi_ind						2,804**	2,872***
						(2.542)	(2.837)
L4.fdi_ser						3,528	
						(1.058)	
Observations	320	320	320	256	256	320	320
R-squared	0.040	0.042	0.041	0.244	0.241	0.042	0.041
Number of state	32	32	32	32	32	32	32

Notes: ***, **, * indicate significance at the 1, 5, 10 percent level, respectively. t-statistics obtained from robust standard errors are displayed in parentheses. The dependent variable is always structural transformation calculated from Equation 1. All regressions include year dummies not reported. L1 refers to period $t-1$, L2 to $t-2$ and so on.

are active in industry or services sectors. To test this hypothesis, we employ alternative indicators of our FDI variable. We include individual indicators for FDI inflows in agriculture (fdi_agr), industry (fdi_ind), and services (fdi_ser), respectively. All three measures are included with their four-year lag structure. The corresponding coefficients are presented in column (6). The estimate for FDI in agriculture is negative, but insignificant. This is not surprising as we observe hardly any investments in the primary sector documented in Section 2. In contrast, FDI in industry is highly significant (at the five percent level) and positive. Moreover the size of the estimate is comparable with the coefficients of aggregated FDI in columns (2) and (3). FDI in services seems to play no role although the coefficient is also positive. As shown in a further regression where we solely include the controls and the variable of FDI in industry sectors, the estimate is even significant at the one percent level. We conclude that the positive effect from aggregated FDI on structural change is largely driven by investments in industry sectors.

3.2.2 FDI, structural change, and skill levels

So far, we have considered structural transformation based on the changes of sectoral employment shares – without distinguishing specific types of labor. In the next step, we address this issue and take into account different skill levels of the factor labor. This is relevant in the context of FDI and structural change because standard offshoring examples involve the differentiation of skill groups. That is, MNEs from advanced economies shift particular production steps intensive in relatively low-skilled labor to developing countries (where the costs of low-skilled labor are relatively low). This kind of offshoring behavior is associated with vertical FDI and can be observed in Mexico, in particular, for the US-Mexico relationship. Findings of Baldwin and Lopez-Gonzalez (2015) suggest that large amounts of FDI flows from the US to Mexico are associated with the following case: MNEs based in the US offshore production of intermediates or the assembly of goods to Mexican locations and import the (intermediate) output back to the US for further processing or final selling.[11] Mexico is labeled as "factory economy" in this relationship, providing relatively low-skilled labor for specific production steps. Given that a large amount of Mexican inward FDI comes from the US (as shown in Section 2) , it is worth to consider differences in structural transformation based on employment changes in specific skill groups.

The INEGI data contain information on sectoral employment classified into high-, medium-, and low-skilled labor. Thus, we are able to decompose our ST indicator according to these three skill categories and calculate $SThskill_{s,t}$, $STmskill_{s,t}$, and $STlskill_{s,t}$. Each indicator is used alternatively as the dependent variable in our econometric model given by Equation (2). The individual calculation of each indicator is similar to Equation (1). For each sector, we multiply the change of the sectoral employment share of the

[11] This typical form of offshoring is particularly relevant for the "maquiladora" sector which is investigated by Bergin et al. (2009), for example.

respective skill group with the average sectoral productivity. Afterwards, we take the sum over all sectors. We present the estimation results in Table 4.

Table 4: **Fixed-effects regressions: Skill levels and structural change**

Dep. variable:	(1) ST共hskill	(2) STmskill	(3) STlskill	(4) SThskill	(5) STmskill	(6) STlskill
L1.agr_emp_share	-531.6	-210.4	-1,193	-251.8	-185.6	-1,209
	(-0.427)	(-0.0963)	(-1.017)	(-0.238)	(-0.0949)	(-1.105)
L1.gdppc	0.145***	-0.00615	-0.0276***	0.150***	-0.00512	-0.0274***
	(18.33)	(-1.084)	(-7.857)	(23.20)	(-1.087)	(-7.101)
national migration	-18.44	-16.04	-19.12**	-27.55	-16.18	-16.86**
	(-0.724)	(-0.920)	(-2.254)	(-1.154)	(-0.954)	(-2.372)
intern. migration	116.5	102.5**	31.21*	112.6	103.8**	27.72*
	(0.864)	(2.298)	(1.856)	(0.853)	(2.276)	(1.750)
labor conflicts	-0.0765	-0.482	-0.303	-0.112	-0.469	-0.346
	(-0.122)	(-0.508)	(-0.520)	(-0.178)	(-0.500)	(-0.580)
L1.fdi	-1,862	759.3	8.016			
	(-1.270)	(0.852)	(0.0264)			
L2.fdi	538.6	-382.8	-331.0			
	(1.051)	(-0.887)	(-1.654)			
L3.fdi	345.2	-350.4	312.5			
	(0.599)	(-0.383)	(1.402)			
L4.fdi	-1,368	2,906**	890.6*			
	(-1.076)	(2.588)	(1.821)			
L4.fdi_agr				-46,744	-58,551	-17,266
				(-0.603)	(-0.947)	(-0.858)
L4.fdi_ind				-948.7	2,522**	1,220***
				(-0.768)	(2.639)	(2.802)
L4.fdi_ser				137.4	3,192	208.8
				(0.0732)	(1.494)	(0.330)
Observations	320	320	320	320	320	320
R-squared	0.041	0.038	0.064	0.039	0.037	0.064
Number of state	32	32	32	32	32	32

Notes: ***, **, * indicate significance at the 1, 5, 10 percent level, respectively. t-statistics obtained from robust standard errors are displayed in parentheses. All regressions include year dummies not reported. L1 refers to period $t-1$, L4 to $t-4$.

First, we include each of the different ST measures as the dependent variable of our baseline specification which includes up to four lags of aggregated FDI. The related results are shown in columns (1)-(3). A comparison of these estimation results reveals striking differences. The outcome suggests that there is no significant effect from FDI on structural change in terms of high-skilled labor reallocation ($SThskill$) whereas the measures of structural transformation based on medium- and low-skilled labor reallocation ($SThmkill$ and $STlskill$) are positively associated with the four-year lag of FDI. Hence, the significant effects come again with a considerable time lag. Compared to the baseline estimation result from Table 3 column (2), we note that in column (1) the role of our control variables does not change while in columns (2) and (3) there are differences. On the one hand, *gdppc* appears to be negative but only significant for low-skilled structural change. On the other hand, the indicators of migration seem to play a role in explaining the variation of structural change. Net international migration has a positive impact in both regressions while net national migration has a negative estimate (yet it is only significant for low-skilled structural change).

Second, we replicate the three estimations but alternatively include the sectoral (four-year lagged) FDI indicators. The results are presented in columns (4)-(6). The previous findings from Table 3 can also be observed here, i.e. the significant positive effect from aggregated FDI (in columns (2) and (3)) is based on investments in industry sectors as the significant estimates for fdi_ind in columns (5) and (6) suggest. These findings are linked to the discussion on typical offshoring activities described in the beginning of this section. MNEs (that are particularly active in industry sectors) fragment their production process and shift medium- or low-skilled intensive production steps to Mexico. That is, they conduct FDI and build up (or buy existing) factories where they employ medium- or low-skilled workers. Our results suggest that such activities of MNEs seem to change the economic structure within the locations (states) where they are active and contribute to growth-enhancing structural change in terms of a labor reallocation across sectors.

3.2.3 Robustness checks

Excluding Campeche

As illustrated in Table 2, Campeche is characterized by extreme values in the structural change indicator compared to all other Mexican states due to large labor productivity levels in the mining sector. To minimize concerns on potential outlier biases in our estimates, we replicate our baseline estimations from Section 3.2.1 but exclude Campeche from the sample. The results are presented in Table 5. Overall, the findings confirm our previous findings. A positive effect of FDI on structural change can be observed for the four-year lag. Although the estimate is insignificant in column (2), it is highly significant when we include higher lags in columns (4) and (5). Again, there is evidence that the effect from aggregated FDI is based on investments in industry sectors regarding columns

(6) and (7).

Compared to the full-sample estimates, excluding Campeche has an effect on the coefficient of GDP per capita, which becomes non-significant throughout all regressions. This could be explained by the fact that Campeche is the state with the highest GDP per capita. Moreover, it belongs to a small group of states that experienced positive structural change during a sub-period. In addition, migration related variables, which were non-significant when using the full-sample, become a significant determinant of structural change. The estimates suggest that international immigration affects structural change positively, but net immigration from other Mexican states is negatively associated with structural change.

TABLE 5: **Fixed effects regressions: Excluding Campeche**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
L1.agr_emp_share	895.6	1,483	1,232	2,072	1,968	1,201	1,180
	(0.606)	(1.144)	(0.963)	(1.634)	(1.556)	(0.947)	(0.924)
L1.gdppc	-0.0580	-0.0670	-0.0755	0.510	0.470	-0.0857	-0.0866
	(-0.467)	(-0.550)	(-0.646)	(1.306)	(1.350)	(-0.707)	(-0.704)
national migration	-31.27**	-41.14*	-34.65**	-108.6**	-94.47***	-28.08*	-26.46*
	(-2.380)	(-1.874)	(-2.460)	(-2.292)	(-3.006)	(-1.912)	(-1.919)
intern. migration	75.27***	77.29***	77.85***	75.31	76.13	73.88***	72.81***
	(2.909)	(2.898)	(2.998)	(1.412)	(1.446)	(2.900)	(2.865)
labor conflicts	-0.457	-0.387	-0.375	-2.232**	-2.207**	-0.398	-0.407
	(-0.455)	(-0.380)	(-0.375)	(-2.108)	(-2.216)	(-0.379)	(-0.386)
L1.fdi		766.2		369.8			
		(0.828)		(0.354)			
L2.fdi		-244.6		262.5			
		(-0.435)		(0.427)			
L3.fdi		518.1		614.8			
		(0.992)		(0.789)			
L4.fdi		2,580	2,455*	4,194**	4,075**		
		(1.595)	(1.821)	(2.290)	(2.509)		
L5.fdi				-1,389	-1,702		
				(-0.688)	(-0.711)		
L6.fdi				1,235	1,234		
				(1.014)	(0.938)		
L4.fdi_agr						2,559	
						(0.0553)	
L4.fdi_ind						2,945**	2,939**
						(2.221)	(2.226)
L4.fdi_ser						536.5	
						(0.323)	
Observations	310	310	310	248	248	310	310
R-squared	0.044	0.068	0.064	0.107	0.105	0.067	0.066

Notes: ***, **, * indicate significance at the 1, 5, 10 percent level, respectively. t-statistics obtained from robust standard errors are displayed in parentheses. The dependent variable is always structural transformation calculated from Equation 1. All regressions include year dummies not reported. L1 refers to period $t-1$, L2 to $t-2$ and so on. All regressions include 31 states.

Results from averaged data

So far, all regressions are based on annual data. This approach may involve potential biases in the results as some variables – such as FDI inflows – may show extreme values in specific years. As a consequence, single observations may drive the overall results. We address this problem by using averaged data in the following estimations. We present results based on two-year averages in Table 6.

TABLE 6: **Fixed-effects regressions: Averaged data**

Dep. var.:	(1) ST	(2) ST	(3) SThskill	(4) STmskill	(5) STlskill	(6) SThskill	(7) STmskill	(8) STlskill
L1.agr_emp_share	5,262	5,416	5,549	-239.6	-25.87	5,198	115.2	124.3
	(1.599)	(1.690)	(1.130)	(-0.0860)	(-0.0446)	(1.116)	(0.0442)	(0.198)
L1.gdppc	0.0805***	0.0834***	0.0145***	0.117***	-0.0510***	0.0154***	0.119***	-0.0510***
	(5.380)	(4.684)	(2.851)	(15.92)	(-10.33)	(2.747)	(13.60)	(-9.628)
national migration	-54.83	-48.72	-18.41	-21.00	-15.42	-10.68	-24.02	-14.10*
	(-1.667)	(-1.418)	(-1.192)	(-1.402)	(-1.640)	(-0.829)	(-1.206)	(-1.723)
intern. migration	233.0	224.4	90.55	106.1*	38.00	95.94	98.71*	31.42
	(1.313)	(1.215)	(0.954)	(1.861)	(1.188)	(0.950)	(1.726)	(0.968)
labor conflicts	-1.304	-1.304	-0.218	-1.185	0.161	-0.129	-1.245	0.131
	(-0.560)	(-0.574)	(-0.337)	(-0.812)	(0.337)	(-0.192)	(-0.858)	(0.287)
L1.fdi	-105.1		1,586	-1,064	-627.1*			
	(-0.0908)		(1.236)	(-1.647)	(-1.870)			
L2.fdi	4,043*		-438.8	3,011**	1,448*			
	(2.006)		(-0.533)	(2.247)	(2.018)			
L2.fdi_agr		-143,984				-50,795	-70,543	-22,202
		(-1.375)				(-1.113)	(-1.259)	(-0.793)
L2.fdi_ind		4,367**				-1,195	3,521***	2,013***
		(2.653)				(-1.039)	(2.884)	(3.571)
L2.fdi_ser		2,485				586.4	2,081	-180.8
		(0.554)				(0.273)	(0.812)	(-0.182)
Observations	160	160	160	160	160	160	160	160
R-squared	0.058	0.060	0.053	0.059	0.104	0.051	0.059	0.107

Notes: ***, **, * indicate significance at the 1, 5, 10 percent level, respectively. t-statistics obtained from robust standard errors are displayed in parentheses. All regressions include period-specific dummies not reported. L1 refers to period $t-1$, L2 to $t-2$. All regressions include the full set of 32 states.

The results in columns (1) and (2) are qualitatively similar to those of our baseline estimations as the coefficients of all control variables and those of the FDI indicators are comparable. In this case, L1 refers to period $t-1$ which is an average of the two years directly before the structural transformation process, while L2 refers to period $t-2$ which is an average of the years three and four prior to structural change. Regarding the estimates related to FDI, the one for L1 is negative and insignificant while the one for L2 is significant and positive. This confirms our main finding. Moreover, there is evidence that the effect from aggregated FDI is driven by foreign investments in industry sectors (column (2)). Regarding the decomposition of structural change with respect to skill levels in columns (3)-(8), we have also supportive evidence for the previous results. Namely, the positive effect from FDI is associated with the reallocation of medium- and low-skilled labor.

4 FDI and sectoral employment changes

We extend our empirical analysis and run sector-state-level regressions. The aim of this exercise is to validate that the positive effect of FDI found in the previous section is associated with a labor reallocation at the sector-level as expected. Given that the structural change indicator in Equation 1 is calculated from two sectoral measures, namely, (i) labor productivity and (ii) employment share changes, we test whether FDI is positively correlated with measure (ii).

4.1 Methodology: Sector-state-level analysis

Considering Equation 1, any positive contribution to state-level structural change is based on an increase in the sectoral employment share. Thus, as a first step, our strategy is to analyze whether sectoral FDI is associated with a *positive* change of the employment share. In a second step, we take into account that an overall contribution to growth-enhancing structural change (aggregated over all sectors) rests upon a labor reallocation towards sectors with a relatively high productivity. In this context, we investigate whether sectoral FDI is linked to employment share increases in relative productive sectors. The econometric approach is given as a probit model in the following Equation 3:

$$PR(\Delta\theta_{j,s,t} > 0) = \beta \, fdi_{j,s,t-k} + u_{j,s,t} \tag{3}$$

We model the dependent variable as a binary indicator which is 1 if the sectoral employment share change ($\Delta\theta_{j,s,t}$) from $t-1$ to t is positive and 0 if it is negative. $fdi_{j,s,t-k}$ is the explanatory variable of interest. It captures the sectoral presence of MNEs' activity measured by FDI inflows in a sector j (relative to GDP) in state s at time $t-k$.

4.2 Empirical results: Sector-state-level regressions

We present the first set of probit regressions in Table 7. Starting with columns (1)-(4), we show results related to a pooled probit model. We include the full sample covering all sectors in column (1). It turns out that it is exclusively the four-year lag of the FDI indicator which is statistically significant (at the five percent level). This indicates that a higher activity of MNEs in a sector is associated with a higher probability that the employment share of this sector is growing.

Next, we split the sample up into the three main sectors and present the results for agriculture in column (2), for industry sectors in column (3), and for services sectors in column (4). Comparing these results, there are only two significant coefficients. On the one hand, it is the four-year lag FDI indicator estimated for the subsample of industry sectors. This finding is supportive evidence for a previous finding from the state-level analysis. That is, the positive link between FDI and positive employment share changes is evident for industry sectors. On the other hand, the one-year lag FDI indicator estimated for the sub-sample of services sectors is also positively significant. This points towards potential immediate effects from FDI in theses sectors occurring without a considerable time gap. We replicate all four regressions using the population-averaged probit model and obtain similar results in columns (5)-(8). Finally, we note that the test statistics (in terms of the Wald test p-values) of our regressions for the population-averaged probit model are slightly better for all four samples than those related to the pooled probit model. Hence, we use the former approach in the subsequent steps.

TABLE 7: **Probit regressions**

Model:	**Pooled probit model**				**Population-averaged probit model**			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample:	Full	AGR	IND	SER	Full	AGR	IND	SER
L1.fdi	0.0349	-0.154	0.0145	0.285**	0.0328	-0.190	0.0116	0.308***
	(1.032)	(-0.0699)	(0.426)	(2.519)	(1.015)	(-0.106)	(0.341)	(3.132)
L2.fdi	-0.0390	1.857	-0.0338	-0.0741	-0.0396	1.951	-0.0326	-0.0829
	(-1.079)	(0.676)	(-0.892)	(-0.635)	(-0.896)	(0.581)	(-0.710)	(-0.652)
L3.fdi	-0.0581	-2.310	-0.0478	-0.175	-0.0634*	-2.061	-0.0526	-0.180
	(-1.600)	(-0.773)	(-1.254)	(-1.527)	(-1.896)	(-0.541)	(-1.594)	(-1.273)
L4.fdi	0.109**	2.315	0.140**	0.0545	0.126**	2.756	0.160***	0.0537
	(2.185)	(0.789)	(2.295)	(0.506)	(2.192)	(0.835)	(2.827)	(0.409)
Observations	6,080	320	1,920	3,840	6,080	320	1,920	3,840
Wald (p-value)	0.0816	0.782	0.147	0.101	0.0627	0.437	0.0851	0.0087

Notes: ***, **, * indicate significance at the 1, 5, 10 percent level, respectively. z-values are displayed in parentheses. The dep. var. is always the binary indicator that is 1 if the sectoral employment share change from $t-1$ to t is positive and 0 if it is negative. L1 refers to period $t-1$, L2 to $t-2$ and so on.

Next, we further investigate whether sectoral FDI is linked to employment share changes in relative productive sectors. In this respect, we differentiate between those sectors that have a labor productivity above the median (in a state in a year) indicated with "High" and those sectors with a productivity below the median labeled with "Low". The related results are shown in Table 8.

In column (1), we consider high-productive sectors within the full sample of ten years and 608 sector-state pairs. The estimates for the one-year and two-year lag of FDI are insignificant while there is negative coefficient for the three-year lag which is significant at the ten percent level. This single finding would suggest that FDI is associated with an employment share decrease in relative productive sectors. Yet, at the same time, we find a positive and significant estimate for the four-year lag of FDI which is two times larger in size and almost significant at the five percent level. Overall, this indicates that sectoral FDI is positively linked to an increase in the employment share of high-productive sectors.

Considering that we obtain a positive significant estimate for the four-year lag of FDI in column (1), the same indicator appears to be insignificant for low productive sectors in column (2). We find a similar result for industry sectors in columns (5) and (6). The positive estimate for the four-year lag of FDI in high-productive sectors is even significant at a higher level. Taken together, these findings are striking support for our results (and the related interpretation) in the previous section referring to the state-level analysis. It appears to be evident that multinational activity is associated with positive employment share changes in relative productive sectors and, thus, it contributes on average to growth-enhancing structural change within Mexican states. This effect is especially evident for industry sectors implying that multinational activity in industry leads to labor reallocation towards sectors with a higher average labor productivity. Again, this effect is strongly dependent on the lag structure. Thus, effective labor reallocation comes with a time gap in response to FDI.

In addition to these main findings, we have some evidence for a positive link between multinational activity and the probability of an employment share increase in relatively productive services sectors. However, this estimate is related to the one-year lag and indicates towards immediate effects. For the sake of completeness, estimation results referring to the agricultural sector are also shown in columns (3) and (4). However, these results have to be treated with caution. First, our type of disaggregation does not account for subsectors within agriculture. Thus, we do not account for potential labor reallocation within agriculture. Second, FDI in this sector is very low or almost absent in many Mexican states as shown in Table 1. Thus, we do not expect significant effects here. Third, the test statistics for both regressions point to uncertain results which may be also a consequence of the first argument that causes a low number of observations.

TABLE 8: **Probit regressions: High-productive vs. low-productive sectors**

Model:	Population-averaged probit model							
Sample:	**Full sample** divided into		**AGR** divided into		**IND** divided into		**SER** divided into	
Productivity of sectors:	High (1)	Low (2)	High (3)	Low (4)	High (5)	Low (6)	High (7)	Low (8)
L1.fdi	0.0596	-0.107	0.927	0.140	0.0330	-0.114	0.319***	0.494
	(1.463)	(-1.157)	(0.230)	(0.0669)	(0.846)	(-1.184)	(2.912)	(1.221)
L2.fdi	-0.0620	0.112	21.20	0.978	-0.0622	0.117	-0.0906	0.237
	(-1.098)	(0.917)	(1.261)	(0.269)	(-0.988)	(0.934)	(-0.678)	(0.505)
L3.fdi	-0.0706*	0.0336	6.083	-3.349	-0.0557	0.0283	-0.216	0.672
	(-1.832)	(0.317)	(0.729)	(-0.827)	(-1.593)	(0.256)	(-1.373)	(1.218)
L4.fdi	0.141*	0.0376	-45.06	5.464*	0.148**	0.0959	0.107	-0.423
	(1.946)	(0.351)	(-1.247)	(1.784)	(2.142)	(0.927)	(0.677)	(-0.932)
Observations	3,189	2,891	76	244	1,100	820	2,013	1,827
Wald (p-value)	0.0111	0.520	0.721	0.284	0.100	0.331	0.0147	0.105

Notes: ***, **, * indicate significance at the 1, 5, 10 percent level, respectively. z-values are displayed in parentheses. The dep. var. is always the binary indicator that is 1 if the sectoral employment share change from $t-1$ to t is positive and 0 if it is negative. L1 refers to period $t-1$, L2 to $t-2$ and so on.

In a final step, we conduct probit regressions with respect to the different skill levels of labor. That is, we use different dependent variables accounting for sectoral employment share changes in the respective skill group. This procedure extends the analysis of Section 3.2.2 and the results are shown in Table 9. Again, we take into account whether the employment share change occurs in a sector with a relatively high labor productivity level (above the median) or in a low productive sector. Overall, most of the coefficients are insignificant. Considering high-skilled labor in columns (1) and (2), we find significant negative estimates for the three-year lag of FDI in the sample of high productive sectors and for the one-year lag of FDI in the sample of low productive sectors. The former estimate suggests that FDI is associated with a decrease in the employment share of high-skilled workers in relative productive sectors while the latter points to the similar effect in less-productive sectors. Taken together, there is no clear finding for the impact of multinational activity on efficient labor reallocation for this skill group. The results for the group of medium-skilled labor in columns (3) and (4) suggest that there are no linkages between FDI and labor reallocation at all. For the group of low-skilled labor, we obtain a significant negative estimate for the two-year lag of FDI indicating that FDI is associated with a decrease in the employment share of this skill group in less-productive sectors. Thus, due to multinational activity low-skilled labor is reallocated to other sectors that may have a higher productivity (but not necessarily).

TABLE 9: **Probit regressions: Skill levels of labor**

Model:	**Population-averaged probit model**					
Dep. Var.:	Sectoral employment share change for different skill levels:					
	High skill		**Medium skill**		**Low skill**	
Productivity of sectors:	High (1)	Low (2)	High (3)	Low (4)	High (5)	Low (6)
L1.fdi	0.0288	-0.123*	0.0309	-0.0580	0.0215	0.0488
	(0.805)	(-1.692)	(0.971)	(-0.583)	(0.542)	(0.502)
L2.fdi	0.0239	-0.0245	-0.0230	0.108	-0.0158	-0.201**
	(0.482)	(-0.230)	(-0.714)	(0.890)	(-0.297)	(-2.147)
L3.fdi	-0.101**	0.185	-0.0114	0.0743	-0.0462	0.0517
	(-2.327)	(1.280)	(-0.339)	(0.771)	(-1.058)	(0.517)
L4.fdi	0.0735	0.0472	0.0140	0.00770	0.00644	-0.0744
	(1.228)	(0.396)	(0.245)	(0.0726)	(0.168)	(-0.707)
Observations	3,189	2,891	3,189	2,891	3,189	2,891
Wald (p-value)	0.0541	0.0945	0.848	0.113	0.248	0.0348

Notes: ***, **, * indicate significance at the 1, 5, 10 percent level, respectively. z-values are displayed in parentheses. The dep. var. is always a binary indicator that is 1 if the sectoral employment share change from $t-1$ to t for respective skill level is positive and 0 if it is negative. L1 refers to period $t-1$, L2 to $t-2$ and so on.

Finally, considering the results in Table 9, we do not find a clear support at the sector-level for our findings from Section 3.2.2 where we have evidence for significant effects from multinational activity contributing to state-level structural change going back the reallocation of medium- and low-skilled labor. At the same time, the two sets of findings are not contradicting.

5 Concluding remarks

We observe considerable FDI inflows in Mexico in the last two decades. Yet, the distribution of these flows is considerably disparate across Mexican states and economic activities. Moreover, there is variation within the states across time and sectors. At the same time, we observe notable structural change in the economy. On average, structural change was (productivity) growth-reducing in the considered time period. However, there is also variation within Mexican states. Taking into account these two phenomena, we analyze whether the activities of MNEs measured by FDI inflows have an impact on effective structural transformation running fixed effects regressions at the state-level.

The results suggest that if any there is a positive effect from FDI on growth-enhancing structural change. However, this effect depends critically on the lag structure of FDI. Since the positive (significant) finding is mainly related to the four-year lag indicator, increases in the effective labor reallocation due to multinational activity occur with a considerable time lag. Moreover, we find evidence that this positive impact stems from direct investments in industry sectors such as manufacturing. The results from the sector-state-level analysis verify that the mechanism through which FDI positively affects structural change is indeed a labor reallocation towards more productive sectors. In addition, there is some evidence that it is precisely the reallocation of medium- and low-skilled labor that is driven by FDI (in industry sectors).

Finally, we note that, indeed, FDI inflows appear to play a role in the structural transformation process of the Mexican economy. Regarding that structural change was on average growth-reducing during the considered time period, the positive estimate for FDI indicates that MNEs' activities attenuated this negative process. As a consequence, policy makers aiming at strategies to reverse structural change into a growth-enhancing process in Mexico should continue and encourage FDI promoting policies, especially in industry sectors.

References

Amendolagine, V., Coniglio, N. D., and Seric, A. (2017). Foreign Direct Investment and Structural Change in Africa: Does Origin of Investors Matter? In *Foreign Capital Flows and Economic Development in Africa*, pages 97–125. Palgrave Macmillan US, New York.

Baldwin, R. and Lopez-Gonzalez, J. (2015). Supply-chain Trade: A Portrait of Global Patterns and Several Testable Hypotheses. *The World Economy*, 38(11):1682–1721.

Bergin, P. R., Feenstra, R. C., and Hanson, G. H. (2009). Offshoring and Volatility: Evidence from Mexico's Maquiladora Industry. *American Economic Review*, 99(4):1664–1671.

Bernard, A. B., Jensen, J. B., Redding, S. J., and Schott, P. K. (2012). The Empirics of Firm Heterogeneity and International Trade. *Annual Review of Economics*, 4(1):283–313.

Borensztein, E., De Gregorio, J., and Lee, J.-W. (1998). How Does Foreign Direct Investment Affect Economic Growth? *Journal of International Economics*, 45(1):115–135.

Carstens, A. G. and Werner, A. M. (2000). *Mexico's Monetary Policy Framework Under a Floating Exchange Rate Regime*, pages 80–86. Inflation Targeting in Practice: Strategic and Operational Issues and Application to Emerging Market Economies. International Monetary Fund, Washington.

Castillo, J. C. and de Vries, G. (2018). The Domestic Content of Mexico's Maquiladora Exports: A Long-run Perspective. *The Journal of International Trade & Economic Development*, 27(2):200–219.

de Vries, G., Timmer, M., and de Vries, K. (2015). Structural Transformation in Africa: Static Gains, Dynamic Losses. *Journal of Development Studies*, 51(6):674–688.

Duarte, M. and Restuccia, D. (2010). The Role of the Structural Transformation in Aggregate Productivity. *Quarterly Journal of Economics*, 125(1):129–173.

Escobar Gamboa, O. R. (2013). Foreign Direct Investment (FDI) Determinants and Spatial Spillovers Across Mexico's States. *Journal of International Trade & Economic Development*, 22(7):993–1012.

Fons-Rosen, C., Kalemli-Ozcan, S., Sorensen, B., Villegas-Sanchez, C., and Volosovych, V. (2017). Foreign Investment and Domestic Productivity: Identifying Knowledge

Spillovers and Competition Effects. Technical report, National Bureau of Economic Research, Cambridge.

Görg, H. and Strobl, E. (2005). Spillovers from Foreign Firms through Worker Mobility: An Empirical Investigation. *Scandinavian Journal of Economics*, 107(4):693–709.

Gurría, J. A. (2000). Mexico: Recent Developments, Structural Reforms, and Future Challenges. *Finance and Development*, 37(1):23.

Haltiwanger, J. (1997). Measuring and Analyzing Aggregate Fluctuations: The Importance of Building from Microeconomic Evidence. *Review*, (May):55–78.

Helpman, E., Melitz, M. J., and Yeaple, S. R. (2004). Export Versus FDI with Heterogeneous Firms. *American Economic Review*, 94(1):300–316.

Herrendorf, B., Rogerson, R., and Valentinyi, Á. (2014). Growth and Structural Transformation. In Aghion, P. and Durlauf, S. N., editors, *Handbook of Economic Growth*, volume 2 of *Handbook of Economic Growth*, chapter 6, pages 855–941. Elsevier.

Hijzen, A., Martins, P. S., Schank, T., and Upward, R. (2013). Foreign-Owned Firms Around the World: A Comparative Analysis of Wages and Employment at the Micro-Level. *European Economic Review*, 60:170–188.

Javorcik, B. S. (2004). Does Foreign Direct Investment Increase the Productivity of Domestic Firms? In Search of Spillovers Through Backward Linkages. *American Economic Review*, 94(3):605–627.

Jude, C. and Silaghi, M. I. P. (2016). Employment Effects of Foreign Direct Investment: New Evidence from Central and Eastern European Countries. *International Economics*, 145:32–49.

Lewis, W. A. (1954). Economic Development with Unlimited Supplies of Labour. *The Manchester School*, 22(2):139–191.

Mayer, T. and Ottaviano, G. (2007). *The Happy Few: The Internationalisation of European Firms*. Bruegel Blueprint Series. Bruegel, Brussels.

McMillan, M. and Rodrik, D. (2011). Globalization, Structural Change, and Productivity Growth. In Bacchetta, M. and Jansen, M., editors, *Making Globalization Socially Sustainable*, pages 49–84. International Labour Organization and World Trade Organization, Geneva.

McMillan, M., Rodrik, D., and Verduzco-Gallo, Í. (2014). Globalization, Structural Change, and Productivity Growth, with an Update on Africa. *World Development*, 63:11–32.

OECD (2015). *OECD Economic Surveys: Mexico*. OECD Publishing, Paris.

Padilla-Pérez, R. and Villarreal, F. G. (2017). Structural Change and Productivity Growth in Mexico, 1990–2014. *Structural Change and Economic Dynamics*, 41:53–63.

SCJN (2010). *Political Constitution of the United Mexican States*. Mexican Supreme Court SCJN, Mexico City, 4 edition.

Temple, J. and Wößmann, L. (2006). Dualism and cross-country growth regressions. *Journal of Economic Growth*, 11(3):187–228.

Timmer, M., de Vries, G., and de Vries, K. (2015). *Patterns of Structural Change in Developing Countries*, pages 65–83. Routledge Handbook of Industry and Development. Routledge, Oxford.

Timmer, M. P., de Vries, G., and de Vries, K. (2014). Patterns of Structural Change in Developing Countries.

UNCTAD (2018). UNCTAD Stat: Foreign direct investment inward flows. Assessed March 01, 2018, http://unctadstat.unctad.org.

Wacker, K. M. (2016). (When) Should We Use Foreign Direct Investment Data to Measure the Activities of Multinational Corporations? Theory and Evidence. *Review of International Economics*, 24(5):980–999.

Appendix

A1 Definition of variables

Variable	Definition
ST	Structural change in pesos per employee
SThskill	Structural change based on the reallocation of high-skilled labor
STmskill	Structural change based on the reallocation of medium-skilled labor
STlskill	Structural change based on the reallocation of low-skilled labor
agr_emp_share	Employment in agriculture as a share of total employment in percent
gdppc	Gross domestic product in pesos per capita
national migration	Net national migration (immigrants minus emigrants) per 100,000 inhabitants
intern. migration	Net international migration (immigrants minus emigrants) per 100,000 inhabitants
labor conflicts	Number of labor conflicts
fdi_gdp	FDI inflows relative to GDP in percent

For the calculation of *ST* we use gross value added and employment data at the sector-state-level. The data preparation of these data is described as follows.

Gross value added at the sector-state-level is taken from the National Accounts of Mexico. These data were retrieved from INEGI's Banco de Información Económica. (http://www.inegi.org.mx/sistemas/bie/)

INEGI reports from the National Accounts of Mexico the number of workers per economic activity aggregated at the country-level. The number of workers correspond to the number of paid employees. Owners and family workers are not considered by INEGI. The advantage of these data is that it allows for a decomposition into three skill level groups according to educational levels: i) low-skilled (upon to basic education, primary school), ii) medium-skilled (from secondary to high school), and high-skilled (with a degree higher than high school). These data were retrieved from INEGI's Total Factor Productivity database. (http://www.inegi.org.mx/est/contenidos/proyectos/cn/ptf/tabulados.aspx)

To estimate the distribution of the labor units of each sector across Mexican States, we use individual-level data from INEGI's National Survey on Employment (ENOE; http://www.beta.inegi.org.mx/proyectos/enchogares/regulares/enoe/). More precisely, for each year, each 2-digit sector, and each skill-level, we estimate the share of workers for each State. Finally, we combine these shares with the number of workers from National Accounts of Mexico to obtain the number of workers per sector-state pair.

A2 Descriptive statistics

Variable	Obs	Mean	Std. dev.	Minimum	Maximum
ST	320	-7787	91535	-1032946	703789
SThskill	320	-157.4	63446	-475125	547146
STmskill	320	-996.4	42959	-632009	172579
STlskill	320	-6627	16962	-191640	63876
agr_emp_share	320	8.76	5.97	0.15	27.55
gdppc	320	148774	28657	53077	1191245
national migration	320	0.15	0.05	-1.01	2.16
intern. migration	320	-0.19	0.05	-0.84	0.28
labor conflicts	320	6462	1159	581	31696

Notes: All descriptive statistics are calculated on the basis of the sample included in the estimations presented in Table 3. Std. dev. refers to the within standard deviation.

A3 Sectoral structure (NAICS)

Sector code	Description
AGR	**Agriculture**
11	Agriculture
IND	**Industry**
21	Mining & quarrying
22	Utilities: Electric, water, and gas supply
23	Construction
31	Manufacturing: Food, beverages, tobacco, textiles
32	Manufacturing: Wood, paper, chemicals, non-metallic products
33	Manufacturing: Metallic and electronic products, machinery, furniture
SER	**Services**
43	Wholesale and retail trade
48	Transportation
51	Information services
52	Finance and insurance services
53	Real estate, rental, and leasing services
54	Professional, scientific, and technical services
56	Business support services, waste management and remediation services
61	Educational services
62	Health care and social assistance
71	Arts, entertainment, and recreation
72	Accommodation and food services
81	Other services
93	Public administration

Notes: Sectors are classified according to the NAICS 2013 2-digit level. For details see `http://www.inegi.org.mx/est/contenidos/Proyectos/SCIAN/naics_scian/default_i.aspx`.

A4 List of Mexican States

State name	State code
Aguascalientes	AGS
Baja California	BCN
Baja California Sur	BCS
Campeche	CAM
Chiapas	CHS
Chihuahua	CHI
Coahuila de Zaragoza	COA
Colima	COL
Distrito Federal (Mexico City)	CMX
Durango	DGO
Guanajuato	GTO
Guerrero	GRO
Hidalgo	HGO
Jalisco	JAL
Michoacán de Ocampo	MIC
Morelos	MOR
México	MEX
Nayarit	NAY
Nuevo León	NLN
Oaxaca	OAX
Puebla	PUE
Querétaro de Arteaga	QRO
Quintana Roo	QTR
San Luis Potosí	SLP
Sinaloa	SIN
Sonora	SON
Tabasco	TAB
Tamaulipas	TAM
Tlaxcala	TLA
Veracruz de Ignacio de la Llave	VER
Yucatán	YUC
Zacatecas	ZAC

A5 Decomposition of productivity change

The general framework of economy-wide productivity change applied by McMillan and Rodrik (2011) reads as follows.

$$\Delta Y_t = \underbrace{\sum_{j=1}^{n} \Theta_{j,t-k} \Delta y_{j,t}}_{within\ component} + \underbrace{\sum_{j=1}^{n} y_{j,t} \Delta \Theta_{j,t}}_{structural\ transformation}$$

where Y_t and $y_{j,t}$ refer to economy-wide and sectoral labor productivity levels in period t, respectively; $\Theta_{j,t}$ is the employment share of sector j in period t; Δ denotes changes in productivity or employment shares between the initial period $t-k$ and t. There are n sectors in the economy. The first term on the right-hand side refers to a within sector component of productivity change, weighted by the employment share of each sector at the beginning of the time period. The second term refers to productivity change due to the structural transformation component which is calculated as the change in sectoral employment shares weighted by the respective sectors productivity level at the end of the time period.

Hohenheim Discussion Papers in Business, Economics and Social Sciences

The Faculty of Business, Economics and Social Sciences continues since 2015 the established "FZID Discussion Paper Series" of the "Centre for Research on Innovation and Services (FZID)" under the name "Hohenheim Discussion Papers in Business, Economics and Social Sciences".

Institutes

510 Institute of Financial Management
520 Institute of Economics
530 Institute of Health Care & Public Management
540 Institute of Communication Science
550 Institute of Law and Social Sciences
560 Institute of Economic and Business Education
570 Institute of Marketing & Management
580 Institute of Interorganizational Management & Performance

Research Areas (since 2017)

INEPA "Inequality and Economic Policy Analysis"
TKID "Transformation der Kommunikation – Integration und Desintegration"
NegoTrans "Negotiation Research – Transformation, Technology, Media and Costs"
INEF "Innovation, Entrepreneurship and Finance"

Download Hohenheim Discussion Papers in Business, Economics and Social Sciences from our homepage: https://wiso.uni-hohenheim.de/papers

No.	Author	Title	Inst
01-2015	Thomas Beissinger, Philipp Baudy	THE IMPACT OF TEMPORARY AGENCY WORK ON TRADE UNION WAGE SETTING: A Theoretical Analysis	520
02-2015	Fabian Wahl	PARTICIPATIVE POLITICAL INSTITUTIONS AND CITY DEVELOPMENT 800-1800	520
03-2015	Tommaso Proietti, Martyna Marczak, Gianluigi Mazzi	EUROMIND-D: A DENSITY ESTIMATE OF MONTHLY GROSS DOMESTIC PRODUCT FOR THE EURO AREA	520
04-2015	Thomas Beissinger, Nathalie Chusseau, Joël Hellier	OFFSHORING AND LABOUR MARKET REFORMS: MODELLING THE GERMAN EXPERIENCE	520
05-2015	Matthias Mueller, Kristina Bogner, Tobias Buchmann, Muhamed Kudic	SIMULATING KNOWLEDGE DIFFUSION IN FOUR STRUCTURALLY DISTINCT NETWORKS – AN AGENT-BASED SIMULATION MODEL	520
06-2015	Martyna Marczak, Thomas Beissinger	BIDIRECTIONAL RELATIONSHIP BETWEEN INVESTOR SENTIMENT AND EXCESS RETURNS: NEW EVIDENCE FROM THE WAVELET PERSPECTIVE	520
07-2015	Peng Nie, Galit Nimrod, Alfonso Sousa-Poza	INTERNET USE AND SUBJECTIVE WELL-BEING IN CHINA	530

No.	Author	Title	Inst
08-2015	Fabian Wahl	THE LONG SHADOW OF HISTORY ROMAN LEGACY AND ECONOMIC DEVELOPMENT – EVIDENCE FROM THE GERMAN LIMES	520
09-2015	Peng Nie, Alfonso Sousa-Poza	COMMUTE TIME AND SUBJECTIVE WELL-BEING IN URBAN CHINA	530
10-2015	Kristina Bogner	THE EFFECT OF PROJECT FUNDING ON INNOVATIVE PERFORMANCE AN AGENT-BASED SIMULATION MODEL	520
11-2015	Bogang Jun, Tai-Yoo Kim	A NEO-SCHUMPETERIAN PERSPECTIVE ON THE ANALYTICAL MACROECONOMIC FRAMEWORK: THE EXPANDED REPRODUCTION SYSTEM	520
12-2015	Volker Grossmann Aderonke Osikominu Marius Osterfeld	ARE SOCIOCULTURAL FACTORS IMPORTANT FOR STUDYING A SCIENCE UNIVERSITY MAJOR?	520
13-2015	Martyna Marczak Tommaso Proietti Stefano Grassi	A DATA–CLEANING AUGMENTED KALMAN FILTER FOR ROBUST ESTIMATION OF STATE SPACE MODELS	520
14-2015	Carolina Castagnetti Luisa Rosti Marina Töpfer	THE REVERSAL OF THE GENDER PAY GAP AMONG PUBLIC-CONTEST SELECTED YOUNG EMPLOYEES	520
15-2015	Alexander Opitz	DEMOCRATIC PROSPECTS IN IMPERIAL RUSSIA: THE REVOLUTION OF 1905 AND THE POLITICAL STOCK MARKET	520
01-2016	Michael Ahlheim, Jan Neidhardt	NON-TRADING BEHAVIOUR IN CHOICE EXPERIMENTS	520
02-2016	Bogang Jun, Alexander Gerybadze, Tai-Yoo Kim	THE LEGACY OF FRIEDRICH LIST: THE EXPANSIVE REPRODUCTION SYSTEM AND THE KOREAN HISTORY OF INDUSTRIALIZATION	520
03-2016	Peng Nie, Alfonso Sousa-Poza	FOOD INSECURITY AMONG OLDER EUROPEANS: EVIDENCE FROM THE SURVEY OF HEALTH, AGEING, AND RETIREMENT IN EUROPE	530
04-2016	Peter Spahn	POPULATION GROWTH, SAVING, INTEREST RATES AND STAGNATION. DISCUSSING THE EGGERTSSON-MEHROTRA-MODEL	520
05-2016	Vincent Dekker, Kristina Strohmaier, Nicole Bosch	A DATA-DRIVEN PROCEDURE TO DETERMINE THE BUNCHING WINDOW – AN APPLICATION TO THE NETHERLANDS	520
06-2016	Philipp Baudy, Dario Cords	DEREGULATION OF TEMPORARY AGENCY EMPLOYMENT IN A UNIONIZED ECONOMY: DOES THIS REALLY LEAD TO A SUBSTITUTION OF REGULAR EMPLOYMENT?	520

No.	Author	Title	Inst
07-2016	Robin Jessen, Davud Rostam-Afschar, Sebastian Schmitz	HOW IMPORTANT IS PRECAUTIONARY LABOR SUPPLY?	520
08-2016	Peng Nie, Alfonso Sousa-Poza, Jianhong Xue	FUEL FOR LIFE: DOMESTIC COOKING FUELS AND WOMEN'S HEALTH IN RURAL CHINA	530
09-2016	Bogang Jun, Seung Kyu-Yi, Tobias Buchmann, Matthias Müller	THE CO-EVOLUTION OF INNOVATION NETWORKS: COLLABORATION BETWEEN WEST AND EAST GERMANY FROM 1972 TO 2014	520
10-2016	Vladan Ivanovic, Vadim Kufenko, Boris Begovic Nenad Stanisic, Vincent Geloso	CONTINUITY UNDER A DIFFERENT NAME. THE OUTCOME OF PRIVATISATION IN SERBIA	520
11-2016	David E. Bloom Michael Kuhn Klaus Prettner	THE CONTRIBUTION OF FEMALE HEALTH TO ECONOMIC DEVELOPMENT	520
12-2016	Franz X. Hof Klaus Prettner	THE QUEST FOR STATUS AND R&D-BASED GROWTH	520
13-2016	Jung-In Yeon Andreas Pyka Tai-Yoo Kim	STRUCTURAL SHIFT AND INCREASING VARIETY IN KOREA, 1960–2010: EMPIRICAL EVIDENCE OF THE ECONOMIC DEVELOPMENT MODEL BY THE CREATION OF NEW SECTORS	520
14-2016	Benjamin Fuchs	THE EFFECT OF TEENAGE EMPLOYMENT ON CHARACTER SKILLS, EXPECTATIONS AND OCCUPATIONAL CHOICE STRATEGIES	520
15-2016	Seung-Kyu Yi Bogang Jun	HAS THE GERMAN REUNIFICATION STRENGTHENED GERMANY'S NATIONAL INNOVATION SYSTEM? TRIPLE HELIX DYNAMICS OF GERMANY'S INNOVATION SYSTEM	520
16-2016	Gregor Pfeifer Fabian Wahl Martyna Marczak	ILLUMINATING THE WORLD CUP EFFECT: NIGHT LIGHTS EVIDENCE FROM SOUTH AFRICA	520
17-2016	Malte Klein Andreas Sauer	CELEBRATING 30 YEARS OF INNOVATION SYSTEM RESEARCH: WHAT YOU NEED TO KNOW ABOUT INNOVATION SYSTEMS	570
18-2016	Klaus Prettner	THE IMPLICATIONS OF AUTOMATION FOR ECONOMIC GROWTH AND THE LABOR SHARE	520
19-2016	Klaus Prettner Andreas Schaefer	HIGHER EDUCATION AND THE FALL AND RISE OF INEQUALITY	520
20-2016	Vadim Kufenko Klaus Prettner	YOU CAN'T ALWAYS GET WHAT YOU WANT? ESTIMATOR CHOICE AND THE SPEED OF CONVERGENCE	520

No.	Author	Title	Inst
01-2017	Annarita Baldanzi Alberto Bucci Klaus Prettner	CHILDRENS HEALTH, HUMAN CAPITAL ACCUMULATION, AND R&D-BASED ECONOMIC GROWTH	INEPA
02-2017	Julius Tennert Marie Lambert Hans-Peter Burghof	MORAL HAZARD IN VC-FINANCE: MORE EXPENSIVE THAN YOU THOUGHT	INEF
03-2017	Michael Ahlheim Oliver Frör Nguyen Minh Duc Antonia Rehl Ute Siepmann Pham Van Dinh	LABOUR AS A UTILITY MEASURE RECONSIDERED	520
04-2017	Bohdan Kukharskyy Sebastian Seiffert	GUN VIOLENCE IN THE U.S.: CORRELATES AND CAUSES	520
05-2017	Ana Abeliansky Klaus Prettner	AUTOMATION AND DEMOGRAPHIC CHANGE	520
06-2017	Vincent Geloso Vadim Kufenko	INEQUALITY AND GUARD LABOR, OR PROHIBITION AND GUARD LABOR?	INEPA
07-2017	Emanuel Gasteiger Klaus Prettner	ON THE POSSIBILITY OF AUTOMATION-INDUCED STAGNATION	520
08-2017	Klaus Prettner Holger Strulik	THE LOST RACE AGAINST THE MACHINE: AUTOMATION, EDUCATION, AND INEQUALITY IN AN R&D-BASED GROWTH MODEL	INEPA
09-2017	David E. Bloom Simiao Chen Michael Kuhn Mark E. McGovern Les Oxley Klaus Prettner	THE ECONOMIC BURDEN OF CHRONIC DISEASES: ESTIMATES AND PROJECTIONS FOR CHINA, JAPAN, AND SOUTH KOREA	520
10-2017	Sebastian Till Braun Nadja Dwenger	THE LOCAL ENVIRONMENT SHAPES REFUGEE INTEGRATION: EVIDENCE FROM POST-WAR GERMANY	INEPA
11-2017	Vadim Kufenko Klaus Prettner Vincent Geloso	DIVERGENCE, CONVERGENCE, AND THE HISTORY-AUGMENTED SOLOW MODEL	INEPA
12-2017	Frank M. Fossen Ray Rees Davud Rostam-Afschar Viktor Steiner	HOW DO ENTREPRENEURIAL PORTFOLIOS RESPOND TO INCOME TAXATION?	520
13-2017	Steffen Otterbach Michael Rogan	SPATIAL DIFFERENCES IN STUNTING AND HOUSEHOLD AGRICULTURAL PRODUCTION IN SOUTH AFRICA: (RE-) EXAMINING THE LINKS USING NATIONAL PANEL SURVEY DATA	INEPA
14-2017	Carolina Castagnetti Luisa Rosti Marina Töpfer	THE CONVERGENCE OF THE GENDER PAY GAP – AN ALTERNATIVE ESTIMATION APPROACH	INEPA

No.	Author	Title	Inst
15-2017	Andreas Hecht	ON THE DETERMINANTS OF SPECULATION – A CASE FOR EXTENDED DISCLOSURES IN CORPORATE RISK MANAGEMENT	510
16-2017	Mareike Schoop D. Marc Kilgour (Editors)	PROCEEDINGS OF THE 17TH INTERNATIONAL CONFERENCE ON GROUP DECISION AND NEGOTIATION	NegoTrans
17-2017	Mareike Schoop D. Marc Kilgour (Editors)	DOCTORAL CONSORTIUM OF THE 17TH INTERNATIONAL CONFERENCE ON GROUP DECISION AND NEGOTIATION	NegoTrans
18-2017	Sibylle Lehmann-Hasemeyer Fabian Wahl	SAVING BANKS AND THE INDUSTRIAL REVOLUTION IN PRUSSIA SUPPORTING REGIONAL DEVELOPMENT WITH PUBLIC FINANCIAL INSTITUTIONS	520
19-2017	Stephanie Glaser	A REVIEW OF SPATIAL ECONOMETRIC MODELS FOR COUNT DATA	520
20-2017	Dario Cords	ENDOGENOUS TECHNOLOGY, MATCHING, AND LABOUR UNIONS: DOES LOW-SKILLED IMMIGRATION AFFECT THE TECHNOLOGICAL ALIGNMENT OF THE HOST COUNTRY?	INEPA
21-2017	Micha Kaiser Jan M. Bauer	PRESCHOOL CHILD CARE AND CHILD WELL-BEING IN GERMANY: DOES THE MIGRANT EXPERIENCE DIFFER?	INEPA
22-2017	Thilo R. Huning Fabian Wahl	LORD OF THE LEMONS: ORIGIN AND DYNAMICS OF STATE CAPACITY	520
23-2017	Matthias Busse Ceren Erdogan Henning Mühlen	STRUCTURAL TRANSFORMATION AND ITS RELEVANCE FOR ECONOMIC GROWTH IN SUB-SHARAN AFRICA	INEPA
24-2017	Sibylle Lehmann-Hasemeyer Alexander Opitz	THE VALUE OF POLITICAL CONNECTIONS IN THE FIRST GERMAN DEMOCRACY – EVIDENCE FROM THE BERLIN STOCK EXCHANGE	520
25-2017	Samuel Mburu Micha Kaiser Alfonso Sousa-Poza	LIFESTOCK ASSET DYNAMICS AMONG PASTORALISTS IN NORTHERN KENYA	INEPA
26-2017	Marina Töpfer	DETAILED RIF DECOMPOSITION WITH SELECTION – THE GENDER PAY GAP IN ITALY	INEPA
27-2017	Robin Jessen Maria Metzing Davud Rostam-Afschar	OPTIMAL TAXATION UNDER DIFFERENT CONCEPTS OF JUSTNESS	INEPA
28-2017	Alexander Kressner Katja Schimmelpfeng	CLUSTERING SURGICAL PROCEDURES FOR MASTER SURGICAL SCHEDULING	580
29-2017	Clemens Lankisch Klaus Prettner Alexia Prskawetz	ROBOTS AND THE SKILL PREMIUM: AN AUTOMATION-BASED EXPLANATION OF WAGE INEQUALITY	INEPA

No.	Author	Title	Inst
30-2017	Ann-Sophie Adelhelm Melanie Bathelt Mirjam Bathelt Bettina Bürkin Sascha Klein Sabrina Straub Lea Wagner Fabienne Walz	ARBEITSWELT: DIGITAL – BELASTUNG: REAL? DER ERLEBTE WANDEL DER ARBEITSWELT INNERHALB DER IT-BRANCHE AUS SICHT DER ARBEITNEHMER	550
31-2017	Annarita Baldanzi Klaus Prettner Paul Tscheuschner	LONGEVITY-INDUCED VERICAL INNOVATION AND THE TRADEOFF BETWEEN LIFE AND GROWTH	520
32-2017	Vincent Dekker Kristina Strohmaier	THE EFFECT OF TRANSFER PRICING REGULATIONS ON INTRA-INDUSTRY TRADE	520
01-2018	Michael D. Howard Johannes Kolb	FOUNDER CEOS AND NEW VENTURE MEDIA COVERAGE	INEF
02-2018	Peter Spahn	UNCONVENTIONAL VIEWS ON INFLATION CONTRAOL: FORWARD GUIDANCE, THE NEO-FISHERIAN APPROACH, AND THE FISCAL THEORY OF THE PRICE LEVEL	520
03-2018	Aderonke Osikominu Gregor Pfeifer	PERCEIVED WAGES AND THE GENDER GAP IN STEM FIELDS	INEPA
04-2018	Theresa Grafeneder-Weissteiner Klaus Prettner Jens Südekum	THREE PILLARS OF URBANIZATION: MIGRATION, AGING, AND GROWTH	INEPA
05-2018	Vadim Kufenko Vincent Geloso Klaus Prettner	DOES SIZE MATTER? IMPLICATIONS OF HOUSEHOLD SIZE FOR ECONOMIC GROWTH AND CONVERGENCE	INEPA
06-2018	Michael Trost	THE WHOLE IS GREATER THAN THE SUM OF ITS PARTS – PRICING PRESSURE INDICES FOR MERGERS OF VERTICALLY INTEGRATED FIRMS	520
07-2018	Karsten Schweikert	TESTING FOR COINTEGRATION WITH TRESHOLD ADJUSTMENT IN THE PRESENCE OF STRUCTURAL BREAKS	520
08-2018	Evanthia Fasoula Karsten Schweikert	PRICE REGULATIONS AND PRICE ADJUSTMENT DYNAMICS: EVIDENCE FROM THE AUSTRIAN RETAIL FUEL MARKET	520
09-2018	Michael Ahlheim Jan Neidhardt Ute Siepmann Xiaomin Yu	WECHAT – USING SOCIAL MEDIA FOR THE ASSESSMENT OF TOURIST PREFERENCES FOR ENVIRONMENTAL IMPROVEMENTS IN CHINA	520

No.	Author	Title	Inst
10-2018	Alexander Gerybadze Simone Wiesenauer	THE INTERNATIONAL SALES ACCELERATOR: A PROJECT MANAGEMENT TOOL FOR IMPROVING SALES PERFORMANCE IN FOREIGN TARGET MARKETS	570
11-2018	Klaus Prettner Niels Geiger Johannes Schwarzer	DIE WIRTSCHAFTLICHEN FOLGEN DER AUTOMATISIERUNG	INEPA
12-2018	Martyna Marczak Thomas Beissinger	COMPETITIVENESS AT THE COUNTRY-SECTOR LEVEL: NEW MEASURES BASED ON GLOBAL VALUE CHAINS	520
13-2018	Niels Geiger Klaus Prettner Johannes Schwarzer	AUTOMATISIERUNG, WACHSTUM UND UNGLEICHHEIT	INEPA
14-2018	Klaus Prettner Sebastian Seiffert	THE SIZE OF THE MIDDLE CLASS AND EDUCATIONAL OUTCOMES: THEORY AND EVIDENCE FROM THE INDIAN SUBCONTINENT	INEPA
15-2018	Marina Töpfer	THE EFFECT OF WOMEN DIRECTORS ON INNOVATION ACTIVITY AND PERFORMANCE OF CORPORATE FIRMS - EVIDENCE FROM CHINA –	INEF
16-2018	Timo Walter	TRADE AND WELFARE EFFECTS OF A POTENTIAL FREE TRADE AGREEMENT BETWEEN JAPAN AND THE UNITED STATES	INEPA
17-2018	Jonas Frank	THE EFFECTS OF ECONOMIC SANCTIONS ON TRADE: NEW EVIDENCE FROM A PANEL PPML GRAVITY APPROACH	INEPA
18-2018	Jonas Frank	THE EFFECT OF CULTURE ON TRADE OVER TIME – NEW EVIDENCE FROM THE GLOBE DATA SET	520
19-2018	Dario Cords Klaus Prettner	TECHNOLOGICAL UNEMPLOYMENT REVISITED: AUTOMATION IN A SEARCH AND MATCHING FRAMEWORK	INEPA
20-2018	Sibylle Lehmann-Hasemeyer Andreas Neumayer	THE PERSISTENCE OF OWNERSHIP INEQUALITY – INVESTORS ON THE GERMAN STOCK EXCHANGES, 1869-1945	INEPA
21-2018	Nadja Dwenger Lukas Treber	SHAMING FOR TAX ENFORCEMENT: EVIDENCE FROM A NEW POLICY	520
22-2018	Octavio Escobar Henning Mühlen	THE ROLE OF FDI IN STRUCTURAL CHANGE: EVIDENCE FROM MEXICO	520

IMPRINT

University of Hohenheim
Dean’s Office of the Faculty of Business, Economics and Social Sciences
Palace Hohenheim 1 B
70593 Stuttgart | Germany
Fon +49 (0)711 459 22488
Fax +49 (0)711 459 22785
wiso@uni-hohenheim.de
wiso.uni-hohenheim.de