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Are routine jobs moving south?

Evidence from changes in the occupational structure of employment in the USA and Mexico

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Abstract: The decline of employment in middle-wage, routine task intensive jobs has been well documented for the USA. Increased offshoring towards lower-income countries such as Mexico has been proposed as a potential driver of this decline. Our analysis provides a unique and new approach to address the question of whether trade and offshoring have impacted the occupational structure of employment in the USA by comparing the evolution of employment across 175 detailed occupational categories in both countries. We find that, with few exceptions, the occupations that have declined in the USA have also declined in Mexico. Industries with larger growth in imports from Mexico do not experience a decline in their routine employment share in the USA, nor do US industries that increase their use of Mexican intermediate inputs. There is therefore little evidence that US middle-wage jobs are moving south. The evidence is consistent with common shocks being primarily responsible for the decline of middle-wage jobs in both countries.

Key words: employment structure, routine employment, trade, offshoring, Mexico

JEL classification: J21, F66, O33

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1 Introduction

Over recent decades, the share of employment in middle-wage jobs has declined in many developed countries (Acemoglu and Autor 2011; Autor et al. 2003; Goos et al. 2009). Two leading explanations have been proposed for the decline of these jobs in high-income countries. The first is that these disappearing jobs, many of which tend to be concentrated in the manufacturing sector, have declined due to globalization: as trade and offshoring costs have fallen, employment in certain occupations has been reallocated to lower-income countries where costs are lower. This type of job movement is featured in several theoretical contributions to the academic literature, such as those of Antràs et al. (2006), Egger et al. (2015), and Egger et al. (2016).[1] This argument has also gained a lot of political attention.[2] The second explanation links the decline of these middle-wage occupations to advancements in automation technologies. The literature pioneered by Autor et al. (2003) and Goos and Manning (2007) shows that occupations in the middle of the wage distribution in high-income countries tend to involve predominantly routine tasks—tasks that are easily codifiable and therefore particularly susceptible to automation.

Interestingly, these two explanations for the decline in middle-wage jobs in high-income countries have very different implications in terms of the changes in the occupational structure of employment that should be observed in developing countries. On the one hand, if the decline in high-income countries is associated with a movement of these jobs towards lower-income countries, then we would expect the occupations that decline in countries such as the USA to be growing in countries such as Mexico. On the other hand, if the main driver of the decline in these jobs is technology, then we would expect these occupations to also be declining in developing countries, either because these countries adopt the new technologies themselves (perhaps with a time lag), or because the adoption of the new technologies in developed countries allows firms in these countries to re-shore the production of certain tasks (Artuc et al. 2019; Faber 2019). So far, there is limited evidence on the evolution of the occupational structure of employment in developing countries.

In this paper, we contrast the changes in employment across occupations observed in the USA with the patterns observed for Mexico, a middle-income country with important commercial ties to the USA.[3] We use national labour force survey microdata for both countries, with a focus on the period 2003–18. We match occupational codes across the two countries and construct annual employment shares for a set of 175 consistently defined occupational categories that cover all non-agricultural civilian employment in both countries. We also analyse the extent to which changes in occupational employment structures in the two countries are correlated with observed trade flows.

We begin by showing that the wage ranking of our 175 detailed occupational categories is remarkably similar across the two countries. We also show that industries in the two countries tend to use a similar occupational mix, providing support for the hypothesis that, if the decline of middle-wage occupations in the USA were driven by relocation of production to Mexico, we should observe that occupations that decline in the USA would be growing in Mexico.

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[1] For example, from proposition 1 in Antràs et al. (2006: 53): 'globalization leads to the creation of routine (worker) jobs in the South and to their destruction in the North'.

[2] For example, in an op-ed in *USA Today* in 2016, Donald Trump wrote: 'The great American middle class is disappearing. One of the factors driving this economic devastation is America's disastrous trade policies.'

[3] Trade between the two countries has more than tripled since 1994, when the North American Free Trade Agreement (NAFTA) was implemented, and exceeded US$550 billion in 2015. At present, Mexico is the USA's third-largest trading partner (after Canada and China).

We then study the evolution of employment at the level of the four broad occupation groups commonly used in the job polarization literature (e.g. Acemoglu and Autor 2011): non-routine cognitive (NRC), routine cognitive (RC), routine manual (RM), and non-routine manual (NRM). In both countries, NRC occupations are the most skill-intensive and have the highest average wages; NRM occupations are the least skill-intensive and have the lowest average wages, while the routine groups are in the middle of the skill and wage distributions. We find that, in the first decade of the 2000s, the share of employment in RM occupations declines strongly in both countries. In recent years, RM employment has recovered slightly in the USA and more strongly in Mexico. The share of employment in low-skill NRM occupations has seen a strong increase in both countries, particularly over the earlier part of the century. The main difference across the two countries is that the USA features strong growth in high-paying NRC jobs, while employment in these occupations is stable in Mexico. Interestingly, we find that the patterns observed for Mexico as a whole are widespread throughout the country, and are observed also in border states, which feature a high concentration of export processing plants (*maquiladoras*). We also find similar patterns in terms of the evolution of RM employment when focusing only on formal-sector workers, where the impacts of trade and offshoring would be more likely to be observed.

Next, we turn to a detailed comparison of the employment share changes observed across our 175 occupational categories in the USA and Mexico. Our key finding is that the correlation in employment share changes across the two countries is consistently positive and statistically significant. In particular, the vast majority of middle-skill occupations that feature strong declines in the USA also experience declines in Mexico. We also explore whether there is any evidence of middle-wage jobs moving south in earlier years, by performing a similar analysis for the period 1990–2002. For this period, we find that the correlation in employment share changes for the 175 occupational categories across the two countries is much weaker and not statistically significant. However, even for this period there is no clear evidence that jobs that decline in the USA are systematically growing in Mexico.

We then perform a more detailed analysis of the employment share changes by exploiting variation across industries and relating these changes to data on final trade flows and intermediate input use. We first decompose the change in the employment share of each of the four broad occupational groups in each country into a component due to differential growth across industries, and a component due to changes in the occupational structure within industries. We find that there is a positive correlation across the two countries in the 'between-industry' contribution of each industry to the decline in RM employment. This implies that we do not see that industries that are declining in the USA are systematically growing in Mexico, even when we consider industries that are intensive in middle-skill RM workers. The 'within-industry' contribution of each industry is also positively correlated across the two countries, so it does not seem to be the case that middle-skill RM tasks within industries are being offshored to Mexico, or being replaced through the use of Mexican intermediate inputs.

When looking at trade flows by industry, we confirm the lack of a role for changes in trade volumes in accounting for the decline of middle-wage occupations. Industries with larger growth in imports from Mexico to the USA do not experience a decline in their routine employment shares in the USA, and neither do US industries that increase their use of Mexican intermediate inputs.

Overall, the fact that we consistently find evidence of a positive correlation in occupational employment share changes across the two countries suggests that workers in Mexico and the USA tend to complement, rather than substitute, each other in production. Hence, the concerns of US middle-wage jobs being lost due to trade with Mexico are misplaced. Given that the vast majority of middle-skill jobs are declining in both countries, it is more likely that common shocks are the primary drivers of these employment share changes. These common shocks could include the development of new technologies that can replace workers in these tasks, as suggested by Autor et al. (2003), though they could also be related to offshoring to third countries such as China.

Our paper contributes to the long-standing question about the role of trade and technology in driving changes in the job structure of the economy. A number of papers have focused on the relative demand for skilled and unskilled workers, and have generally found a more important role for technological change relative to trade in driving skill upgrading (see, e.g. Machin and Van Reenen 1998).[4] Starting with Autor et al. (2003), a more nuanced view of technology has emerged that focuses on the automation potential of tasks in different occupations. The focus on trade has also shifted towards the role of offshoring rather than overall trade in goods.[5] Goos et al. (2014) exploit measures of automation potential based on the routine task intensity index from Autor et al. (2003), as well as offshorability measures from Blinder and Krueger (2013), and find that, although both technology and offshoring play a role in driving changes in the occupational structure within industries, the role of the former is much more important than that of the latter.[6] Autor et al. (2015) use a spatial approach to disentangle the impacts of trade and technology on local labour markets. Their trade measure looks specifically at the rise of China, along the lines of Autor et al. (2013, 2014). They find that exposure to technology and to trade both disproportionately impact routine employment; however, exposure to Chinese imports also impacts other occupations, particularly in the manufacturing sector. Ebenstein et al. (2014) develop measures of occupational exposure to globalization and find that globalization has put downward pressure on worker wages.[7]

Our analysis provides a unique and new approach to address the question of whether trade and offshoring have impacted the occupational structure of employment in the USA. This is, to the best of our knowledge, the first paper to directly explore the evidence for the impacts of trade and offshoring by contrasting employment share changes at a detailed occupational level across countries. Rather than exploiting a specific shock, our paper investigates the evidence for the basic underlying idea that certain jobs are moving to developing countries over time as overall trade and offshoring costs are declining.

The paper most closely related to our analysis is that of Reijnders and de Vries (2018). They also analyse the extent to which tasks are reallocated across countries versus disappearing in all countries due to technological change. They implement a global value chains approach, which requires additional structure.[8] By focusing only on one pair of countries with a significant trading relationship, we are able to impose less structure and provide a more detailed and granular analysis of the observed patterns in the USA and Mexico.

Finally, our analysis adds to the large and growing literature on the disappearance of routine jobs by providing evidence on the decline in routine employment in Mexico. So far, the evidence for de-routinization outside of high-income countries is quite limited.[9] We also provide updates to the stylized facts observed for the USA. In particular, we show that the long-term decline in the employment share

[4] Other papers analysing how globalization impacts the skill premium include those by Goldberg and Pavcnik (2007), Grossman and Rossi-Hansberg (2008), Acemoglu et al. (2015), Burstein and Vogel (2017), and Hummels et al. (2018). Iacovone et al. (2013), Utar and Torres Ruiz (2013), and Mendez (2015) specifically focus on the impacts of trade on the Mexican labour market.

[5] Kovak et al. (2019), for example, use firm-level data on US multinationals to show how offshoring affects domestic employment within and across firms.

[6] See also Michaels et al. (2014) on the role of information communication technology (ICT) growth, trade, and offshoring in accounting for the polarization of skill demand.

[7] See also Traiberman (2019), who estimates a structural model of occupational choice to quantify the distributional consequences of trade shocks in Denmark.

[8] For example, differences in technology across countries are assumed to be Hicks-neutral.

[9] Recent notable contributions that consider these patterns include those of Ariza and Raymond Bara (2018) and the World Bank (2016). See also Hardy et al. (2016) for evidence on the patterns in Central and Eastern European countries. Dicarlo et al. (2016); Lewandowski et al. (2019) and Lo Bello et al. (2019) document differences in task content across countries with different levels of income per capita.

of middle-skill RM jobs has stopped in recent years, and that the strong growth in the employment share of NRM jobs observed in the early part of the twenty-first century has sharply slowed down in recent years.

2 Conceptualizing the potential impacts of trade and offshoring

In this section we briefly consider the different ways in which globalization and trade may impact the occupational structure at the aggregate and at the industry level in each country. Consider first the changes associated with trade in final goods. Increasing imports from Mexico to the USA in a particular industry could be associated with the reallocation of the production process of goods in that industry from US to Mexican plants (either because US plants offshore production, or because US plants shrink or shut down due to increased competition from Mexican imports). In this case, it is important to consider whether the production structure is similar for a given industry across the two countries. If not, then trade-induced declines in employment in a particular occupation in the USA could be met with occupational employment growth in a *different set* of occupations in Mexico.

To determine whether industries in the USA and Mexico use a similar occupational mix, Figure 1 compares the within-industry share of employment in each of four broad occupation groups across the two countries in 2005.[10] Each circle represents a particular industry, with the size of the circle being proportional to the average aggregate employment share across the two countries in 2005. Consider the top-left panel. Each circle indicates the share of workers within each industry that are in NRC occupations in each country. There is a clear pattern: industries that use higher shares of NRC occupations in the USA also use higher shares of this occupation in Mexico. The same is true in the remaining three panels for the other three occupation groups.

This result indicates that the occupational composition at the industry level is similar across the two countries. Therefore, if the entire production process of a good from a particular industry were relocated from the USA to Mexico, we would expect to see opposing changes in overall employment shares at the occupational level, something we investigate in Section 4. These opposing changes would be driven by opposing patterns in industrial employment shares across the two countries (i.e. industries that are shrinking in the USA would be growing in Mexico). For example, if the USA starts to import Mexican goods in routine-intensive industries, these industries should shrink in the USA, contributing to a decline of the overall routine employment share in the USA, while they should grow in Mexico, contributing to a rise in the overall routine employment share in Mexico. We investigate these industry-level patterns through a decomposition analysis in Section 5.

Increasing trade between Mexico and the USA, however, may not be associated with the relocation of production by firms with the average occupational employment structure in their industry. In particular, firms within industries may differ substantially in terms of their occupational structures.[11] One could hypothesize that when industrial output is relocated from the USA to Mexico, it is the most routine-intensive firms in the USA that relocate or shut down. Alternatively, it may be the case that US firms do not offshore their entire production process, but only certain parts of it. They may also replace certain parts of their production process by using imported intermediate inputs.[12] In this case, we once again would expect that, at the aggregate level, occupations that decline in the USA due to trade with

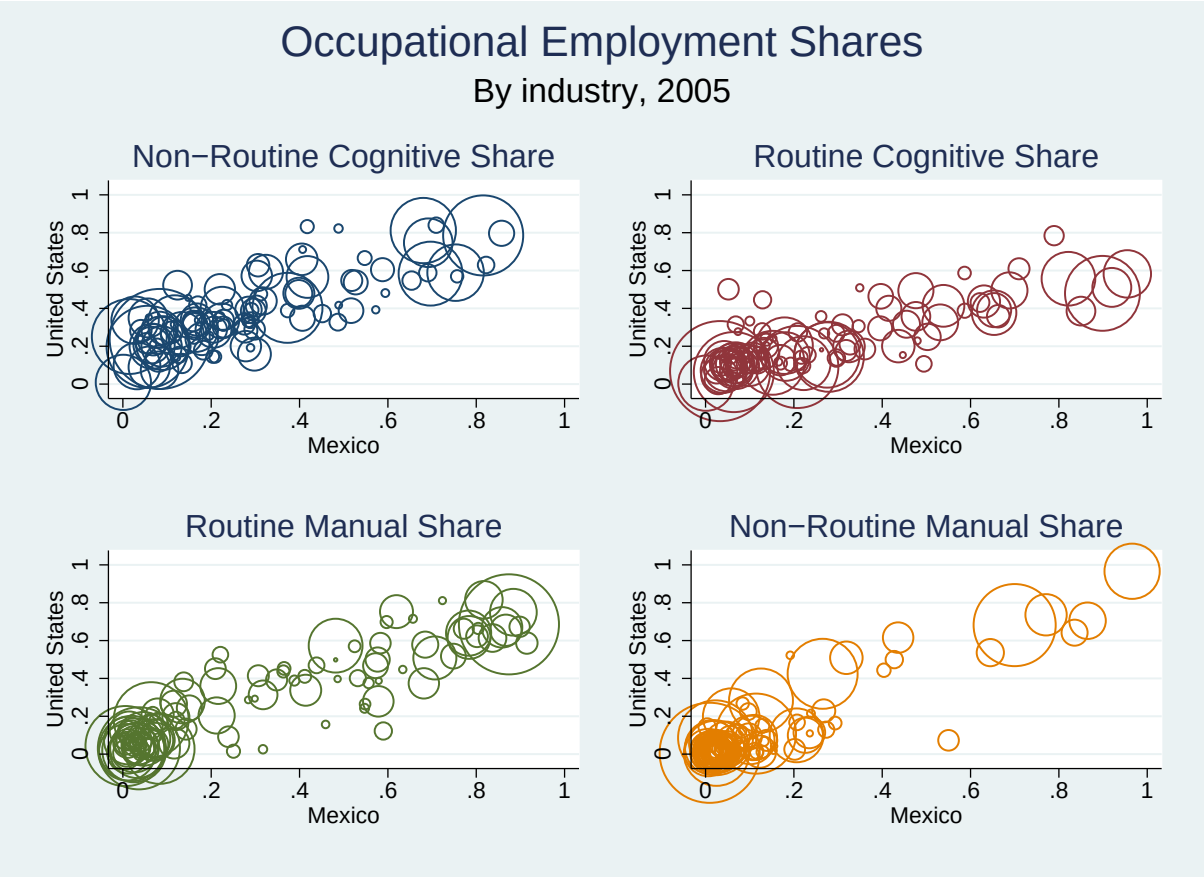
[10] The four groups are: NRC, RC, RM, and NRM. Full details on the way these groups are constructed and on their cross-country comparability are presented in Section 3.

[11] See, for example, the evidence in Gaggl and Wright (2017), Böckerman et al. (2019), and Cortes and Salvatori (2019).

[12] Baldwin and Robert-Nicoud (2014), for example, argue that instead of simply creating more trade in goods, global integration is increasingly marked by trade of intermediate goods and services, also known as 'fragmentation', 'offshoring', or 'task trade'.

Mexico would grow in Mexico. However, increased trade with Mexico could contribute to the decline in routine employment in the USA not just because of a change in the size of different industries (the 'between-industry' component), but also because of a 'within-industry' change, due to changes in the composition of employment within each industry. Section 5 analyses both of these components in the two countries.

Figure 1: Occupational employment shares by industry in the USA and Mexico



Note: each circle represents an ind_mxus industry, as detailed in Appendix Table A3, with the size of the circle corresponding to the average of the industry's share of aggregate employment in the USA and Mexico. Each panel plots the share of employment within each industry in the corresponding broad task cluster in the USA and Mexico. The aggregation to four broad task clusters is described in Section 3 and Appendix Table A2.
Source: authors' elaboration based on employment data from the US CPS (Current Population Survey) and Mexican ENOE (National Survey of Occupation and Employment).

3 Data and occupational matching

Our analysis is primarily based on national labour force survey data from Mexico and the USA. For the USA, we use data from the Current Population Survey (CPS), the primary source for the country's labour force statistics. The CPS is conducted at a monthly frequency and is sponsored jointly by the US Census Bureau and the US Bureau of Labor Statistics (BLS). We use the microdata made publicly available by IPUMS (Flood et al. 2018).

In the case of Mexico, we use the National Employment Survey (*Encuesta Nacional de Empleo*, ENE), and its successor from 2005 onwards, the National Survey of Occupations and Employment (*Encuesta Nacional de Ocupación y Empleo*, ENOE). The surveys have been conducted at a quarterly frequency since 2001. Microdata is available from Mexico's National Statistical Agency (INEGI). In order to

obtain information for earlier years, we supplement this with data from the 1990 and 2000 Mexican Census, as provided by IPUMS International (IPUMS 2019).

For reasons related to changes in occupational coding systems, which we discuss in further detail below, we focus primarily on the 2003–18 period. We restrict our sample to the civilian employed population aged 16–65. We exclude workers with missing information on their current occupation and, for consistency with the literature, we also exclude workers in agriculture and farming occupations.[13] Our Mexican sample contains around 586,000 observations per year, while the US sample contains around 717,000 observations per year. As in many other developing countries, Mexico has a large informal sector. However, occupational information is reported for all workers, including those in the informal sector, so we are able to include informal workers in our analysis.[14]

Summary statistics are presented in Table 1. In both countries, the workforce is ageing over time and the fraction of female workers is increasing, though both the average age and the fraction of female workers are higher in the USA. The share of employment in the manufacturing sector is higher in Mexico than in the USA, but it declines slightly in both countries between 2003 and 2018. Average real wages are around 10 times higher in the USA than in Mexico.[15] There are also substantial differences between the two countries in their workforce's educational composition. Educational attainment is much higher in the USA, but shows rapid improvement over time in Mexico. For example, in 2003 the proportion of college graduates is nearly twice as large in the USA as in Mexico, but this gap becomes substantially smaller by 2018. In spite of these important differences in workforce composition, we show below that the evolution of the occupational employment structure is remarkably similar in the two countries.

Table 1: Descriptive statistics for employed workers

	USA		Mexico	
	2003	2018	2003	2018
Average age	39.37	40.62	35.57	38.18
Fraction female	47.09	47.39	39.28	42.43
Average real wage (2009 US$)	19.91	21.42	2.33	2.04
Manufacturing share of emp.	12.55	10.25	20.93	19.15
Educational composition:				
Elementary education or less	1.94	1.46	38.81	18.88
Middle school	8.26	5.39	32.53	29.27
High school	60.15	55.39	13.58	26.82
College education or higher	29.65	37.77	15.08	25.04
Observations (unweighted)	774,379	652,000	707,823	592,622

Source: authors' elaboration, based on data from the US CPS and Mexican ENE and ENOE.

[13] Occupation is never missing for any of our observations in the USA. In Mexico, occupation is missing for no more than 0.05 per cent of observations per year. Less than 1.4 per cent of workers in our US sample are employed in agriculture or farming occupations between 2003 and 2018. In Mexico, the proportion ranges from 14.8 per cent in 2003 to 11.4 per cent in 2018.

[14] Slightly more than 50 per cent of employees in our sample are in the informal sector. Below we discuss the extent to which the main patterns observed in the data in terms of occupational employment share changes differ if we focus on formal-sector workers only.

[15] Wages in the USA are based on hourly wages, when available, or weekly earnings divided by usual (or actual) hours worked per week. As in Lemieux (2006), top-coded earnings are adjusted by a factor of 1.4. We convert nominal values to 2009 dollars based on the monthly Consumer Price Index (CPI, All Urban Consumers) from the BLS. Wages in Mexico are based on the earnings per hour variable available in the datasets. Nominal values are converted to 2009 pesos based on annual CPI data from the IMF World Economic Outlook April 2018 Database. Values in 2009 pesos are converted to 2009 US dollars based on the average daily exchange rate for 2009 reported by Banco de México. We do not adjust for purchasing power parity, so the difference in wage levels between the two countries partly reflects differences in living costs.

3.1 Matching occupation codes

The main challenge when trying to compare changes in employment at a detailed occupational level across countries is the fact that different countries use different occupational coding systems, and these coding systems also change for a given country over time. In the case of Mexico, occupations are coded using the *Clasificación Mexicana de Ocupaciones* (CMO) until mid-2012, and the *Sistema Nacional de Clasificación de Ocupaciones* (SINCO) from mid-2012 onwards.[16] In the USA the 1990 Census Occupation Coding (COC) system is used in the CPS until 2002; the 2000 COC system is used from 2003 to 2010; and the 2010 COC system is used from 2011 onwards.

In spite of the differences across countries and over time, it is possible to match occupations across different coding systems based on job titles. For example, there are specific occupation codes for 'accountants and auditors' in all coding systems. For the purposes of our analysis, our approach is to crosswalk the US and the Mexican codes to a new harmonized coding system. For the USA, we use the time-consistent 'occ1990dd' occupation codes from Autor and Dorn (2013). We match US occupation job titles to their closest match (or matches) in the CMO and SINCO systems, and group these into our new harmonized codes, which we denote as 'occ_mxus' in what follows. In some cases, we can make exact matches (as in the case of 'accountants and auditors'), while in other cases we need to generate categories that are somewhat more aggregated (e.g. 'other engineers'). Full details of the crosswalk are provided in Appendix Table A1. Our proposed system consists of 181 harmonized codes covering all occupations in both countries, with 175 of these corresponding to non-agricultural civilian occupations, which we focus on for the rest of the paper.

Although the occ1990dd codes aim at harmonizing the different coding systems used in the USA over time, some inconsistencies remain, which lead to discontinuities at the time when the underlying occupation coding system switches from 1990-COC to 2000-COC. Hence, we focus our analysis primarily on the period from 2003 onwards, where the occupational codes used in the USA remain fairly consistent. In a later section, we separately analyse the period before 2003, where occupations are consistently coded using the 1990-COC in the USA.

In addition to comparing the changes in the employment structure in the two countries using these 175 occupational categories, we also consider the patterns when aggregating these detailed occupations to the four broad occupation groups commonly used in the literature on job polarization (e.g. Acemoglu and Autor 2011). These four groups are:

1. Managers, directors, professionals, technicians: high-skill, high-wage occupations, intensive in NRC tasks.

2. Clerical, administrative, and sales: middle-skill, middle-wage occupations, intensive in RC tasks.

3. Production, crafts, repair, machine operators, and drivers: middle-skill, middle-wage occupations, intensive in RM tasks.

4. Janitors, security services, caring services, and other services: low-skill, low-wage occupations, intensive in NRM tasks.

[16] The 1990 Mexican Census uses a slightly modified version of the CMO system.

Appendix Table A2 shows how we map our harmonized occ_mxus codes to these four broad categories, and Appendix Figure A1 confirms that the wage and skill ranking of the four groups in Mexico is consistent with the ranking observed in the USA. [17]

The assignment of 'task labels' (i.e. NRC, RC, RM, NRM) to these four groups of occupations is commonly done in the literature, and is supported by characterizations of task content obtained from the US Dictionary of Occupational Titles, and its successor, O*Net (Acemoglu and Autor 2011). For simplicity, we use these same task labels as a shorthand way to refer to the four occupation groups in our context. We acknowledge that there is relatively little direct evidence on the task content of occupations in developing countries. The evidence that exists, however, suggests that although the task content of occupations may differ substantially between countries *in levels*, the *relative* within-country task ranking of occupations is similar across countries.[18] At the level of the four broad groups that we consider, we expect the relative task ranking to be similar in Mexico and in the USA. For example, even though clerical and production workers in Mexico may perform very different tasks than their US counterparts, we would expect that these workers would still be the ones that are performing routine tasks relatively more intensively in their respective countries, as compared to other workers such as managers or personal service workers. Hence, we believe the task content labels to be appropriate for the four groups in this context.[19]

In Figure 2 we compare the wage ranking of our 175 harmonized occupation groups at a given point in time across the two countries. Naturally, this ranking does not have to be the same across the two countries, as it will be influenced by local factors affecting demand and supply for different types of jobs. Figure 2 plots each occupation's median log wage in the USA against its median log wage in Mexico in 2003 in Panel A, and in 2018 in Panel B. Wages for both countries are in constant 2009 US dollars. Each circle represents one of our 175 occupations, with the size of the circle corresponding to the average of the occupation's share of aggregate employment in the USA and Mexico in the corresponding year. The colour of each circle indicates the broad occupational group that the occupation belongs to, with blue corresponding to NRC, red to RC, green to RM, and orange to NRM.

Remarkably, even though the wage *levels* are very different in the USA and Mexico (as indicated by the different range of the two axes), there is a strong correlation between the median occupational wages in the two countries; in other words, occupations that are relatively high paying in one country tend to also be towards the top of the distribution in the other country, both in 2003 and in 2018. The correlation coefficient is 0.79 in 2003 and 0.78 in 2018. In both countries, NRC occupations tend to be at the top of the distribution and NRM occupations tend to be at the bottom. RC and RM occupations tend to show quite a bit of overlap with each other in both countries.[20]

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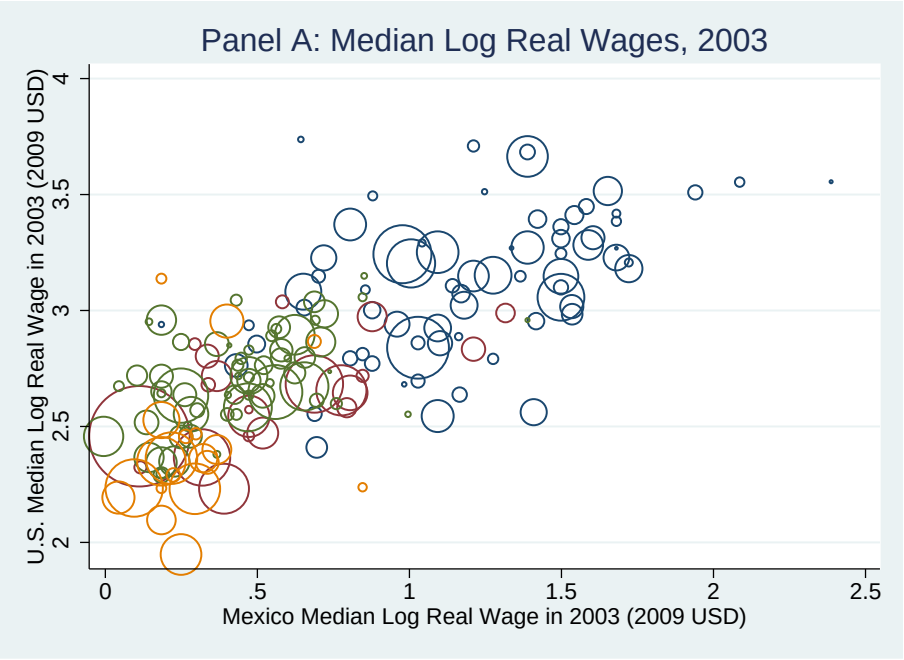
[17] A caveat of the results on the wage ranking is that the non-response rate to the earnings question in Mexico is relatively high, as pointed out by Campos-Vazquez and Lustig (2017). In 2003, 15.0 per cent of our sample has missing earnings data. The missing data problem is particularly severe for higher-paying occupations. In 2003, the proportion of missing earnings data is 18.9 per cent among NRC workers, 20.4 per cent among RC, 9.6 per cent among RM, and 11.6 per cent among NRM workers. Although this raises questions about our estimates of the wage *levels* in each occupation, we would not expect this to have an impact on the *relative ranking* of occupations within the country's wage distribution, which is what we are primarily interested in.

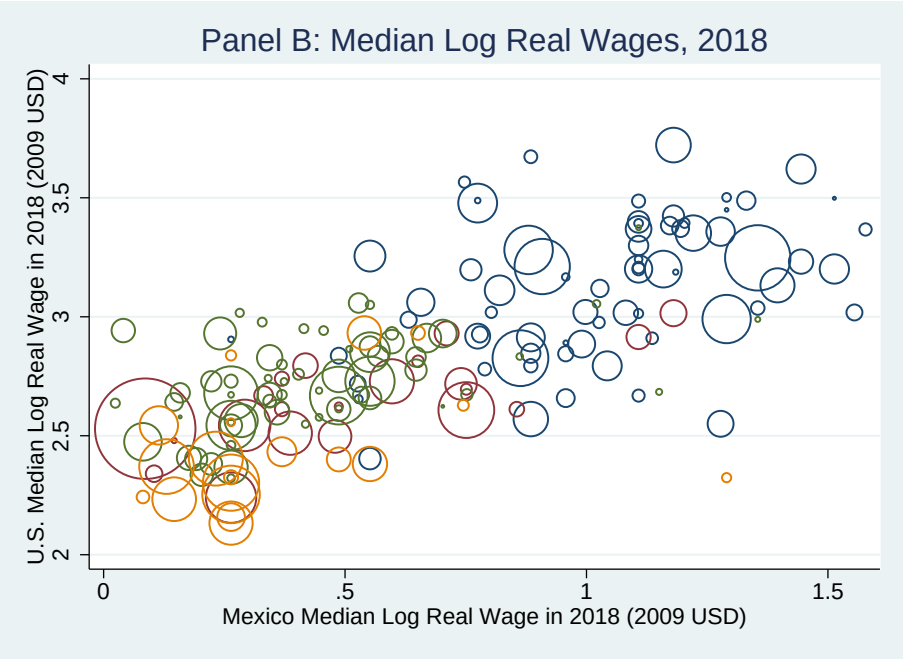
[18] See recent work by Dicarlo et al. (2016); Lewandowski et al. (2019) and Lo Bello et al. (2019) on differences in task content across countries with different levels of income per capita. See also Patt et al. (2017), who use data from CONOCER, a Mexican task dataset comparable to O*Net, to impute the skill scores of Mexican workers within the skill distribution of US workers.

[19] See also Bhalotra and Fernandez (2018), who perform a similar grouping of occupations using Mexican data.

[20] Appendix Table A6 identifies occupations that have substantially different (employment-weighted) percentile rankings in terms of their median wages across the two countries. A number of manual occupations stand out as ranking much higher in terms of their median wages in the USA compared to Mexico. In Mexico, several cognitive occupations receive relatively high wages compared to their ranking in the US distribution.

Figure 2: Occupational wages in the USA and Mexico





Note: each circle represents an occ_mxus occupation, as detailed in Appendix Table A1, with the size of the circle corresponding to the average of the occupation's share of aggregate employment in the USA and Mexico. The colour of each circle indicates the broad occupational group that the occupation belongs to: blue for NRC, red for RC, green for RM, and orange for NRM. For visual clarity, the figure excludes one small outlier occupation ('knitters, loopers, and textile operatives'; occ_mxus 162).
Source: authors' elaboration, based on wage data from the US CPS and Mexican ENE and ENOE.

3.2 Trade data

In Section 5 we merge the employment information from the labour force surveys with data on trade flows between the USA and Mexico. Data on international trade flows are from the United Nations Commodity Trade Statistics Database (UN Comtrade), which compiles import and export data from government agencies in close to 200 countries.[21] We focus on US imports of Mexican goods between 2005 and 2018 at the two-digit HS1996 level.

Data on trade flows of intermediate goods are from the Organisation for Economic Co-operation and Development (OECD) Inter-Country Input–Output (ICIO) Tables.[22] We use the December 2018 release of these tables and focus on the flows of intermediate goods and services from different Mexican industries to different US industries over the period 2005–15.

Nominal values in US dollars from Comtrade and from the ICIO Tables are converted to real values using the US GDP deflator from the St. Louis Fed's FRED database. The crosswalks used to match the industry codes in the Mexican ENOE, the US CPS, the Comtrade dataset, and the ICIO tables are detailed in Appendix Tables A3, A4, and A5.

4 Changes in occupational employment structures

4.1 Employment patterns across broad occupational groups

We begin by considering the evolution of the employment share of the four broad occupation groups in the two countries. Panel A of Figure 3 reproduces the well-known patterns regarding the evolution of the occupational employment structure in the USA from the mid-1980s until the early 2000s. This is a period that features very strong growth in high-skill NRC occupations, and strong declines in middle-wage routine employment, with the sharpest decline observed for RM occupations, and smaller declines for RC occupations. The share of employment in NRM occupations remains relatively stable.

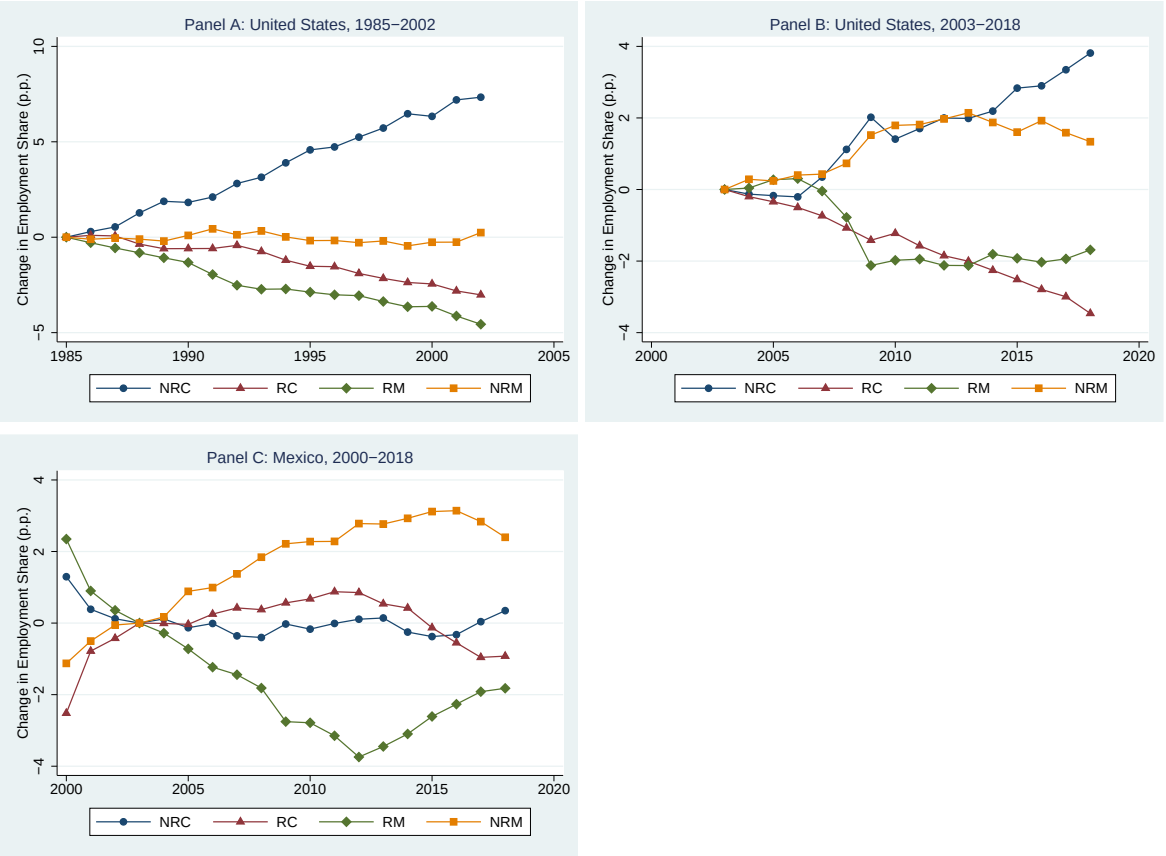
In Panel B we plot the changes over the period 2003–18. The first part of this period is similar to the earlier one, with continued declines in routine employment and increases in NRC employment. Another important feature of this early part of the century is the strong growth in low-skill NRM occupations (at least until 2013). Interestingly, the patterns are somewhat different in more recent years, with the share of RM employment remaining stable with a slight upwards trend in the post-Great Recession period, and with the growth in the share of NRM employment experiencing a marked slowdown.

Panel C depicts the analogous patterns observed over the 2000–18 period in Mexico, where for comparability with Panel B, changes are also depicted relative to 2003 levels. There are two strong similarities with the USA: in both countries, the share of employment in middle-skill RM occupations declines strongly during the first decade of the 2000s, while in both countries the share of employment in low-skill NRM occupations features a strong increase during that time period. In terms of magnitudes, the employment share of RM jobs falls by 3.7 percentage points (p.p.) in Mexico between 2003 and 2012, while it falls by 2.1 p.p. in the USA over the same time period. The employment share of NRM jobs increases by 2.8 p.p. and 2.0 p.p. in Mexico and the USA, respectively, over that same time period. Interestingly, the employment share of RM jobs starts to recover in Mexico after 2012. This coincides with the period in which the employment share in these jobs in the USA is no longer declining.

[21] See: https://comtrade.un.org/data.

[22] See: www.oecd.org/sti/ind/inter-country-input-output-tables.htm.

Figure 3: Changes in employment shares by major occupation groups



Note: The aggregation to the four broad task clusters is described in Section 3 and Appendix Table A2.
Source: authors' elaboration, based on data from the US CPS and Mexican Census, ENE, and ENOE.

The two countries differ markedly, however, in terms of the evolution of high-skill NRC and middle-skill RC occupations. While the USA features strong growth in high-paying NRC jobs, employment in these occupations is stable in Mexico, at least until 2016. Mexico also features a slightly increasing share of employment in middle-paying RC occupations until 2011, in contrast with the declining trend observed in the USA throughout the 2000s.

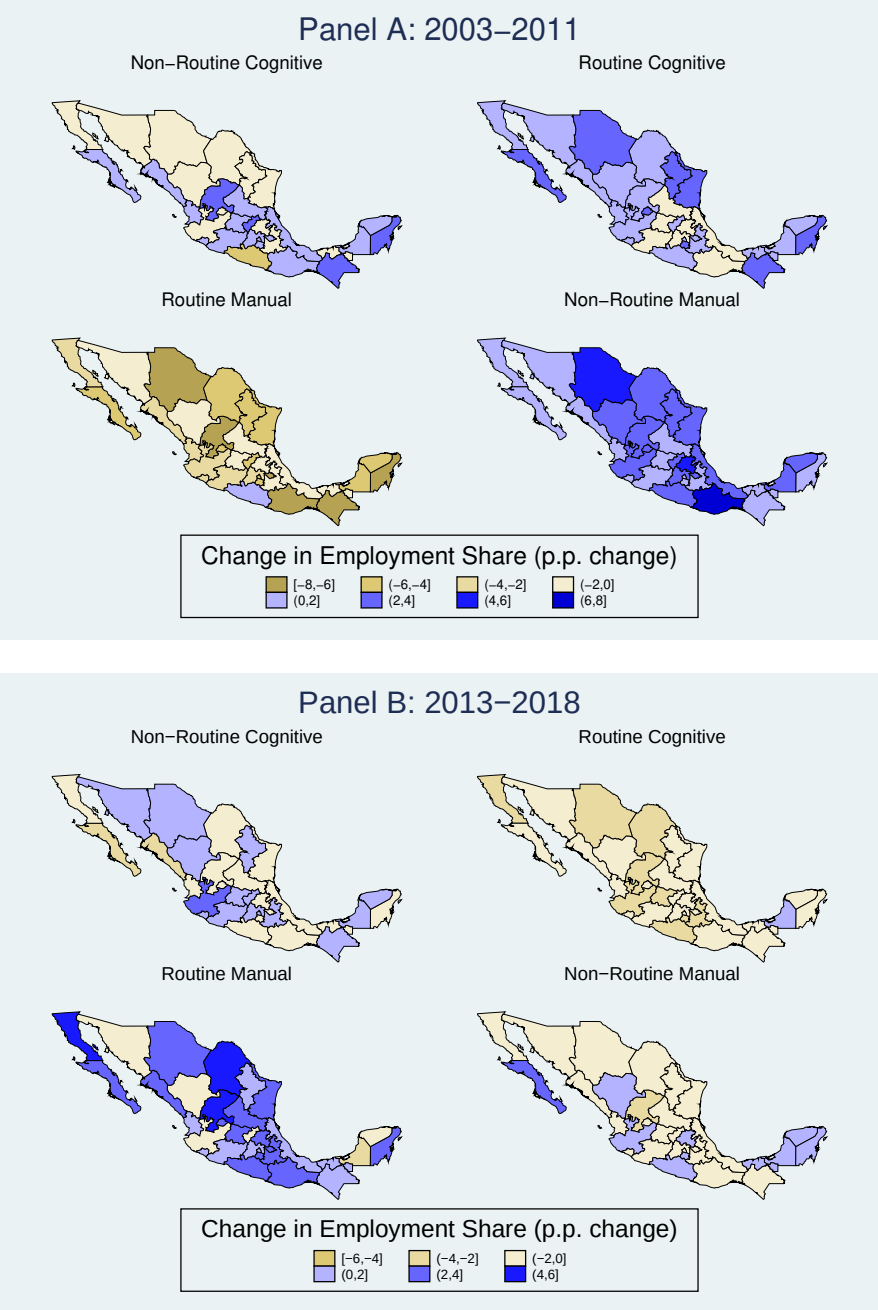
Appendix Figure A2 shows that much of the growth of NRM jobs in Mexico is driven by informal-sector workers; the share of formal-sector workers in NRM occupations remains fairly stable over time. However, in terms of the RM employment share among formal workers—where we would expect the impacts of trade and offshoring to be most likely to be observed—the pattern is very similar to the overall economy, with a strong initial decline followed by a recovery, particularly from 2012 onwards.

These broad-level results provide little support for the hypothesis that the decline of employment in middle-skill RM occupations in the USA has been associated with a movement of these jobs to Mexico. The aggregate patterns, however, might conceal important geographical variation. In Figure 4 we explore the evolution of these changes across Mexican states, with a particular interest in determining whether the patterns differ for states that border the USA. A high fraction of firms in these states are *maquiladoras*—firms that import inputs mostly from the USA, process them, and then ship them back to the origin country—and may be a more likely target for offshoring activity.[23] In fact, we find that the loss of RM employment in the earlier period, and the loss of RC employment in the more recent period,

[23] Utar and Torres Ruiz (2013) argue that since its introduction, the *maquiladora* industry moved from consisting only of low-skilled labour-intensive plants focusing on simple assembly jobs towards more advanced manufacturing processes, such as the production of machinery and automobiles. They point out that in 2006 the *maquiladora* industry in Mexico generated

is pervasive throughout Mexico, and observed at least as strongly in border states as in the rest of the country. This further raises questions about the plausibility of the claim that the decline in American RM jobs is due to a reallocation of these jobs to Mexico.

Figure 4: Changes in occupational composition by Mexican state, 2003–18



Note: change in employment shares by state, using the aggregation to four broad task clusters described in Section 3 and Appendix Table A2.
Source: authors' elaboration based on data from the Mexican ENE and ENOE.

more than US$25 billion in foreign exchange, and accounted for 44 per cent of total Mexican manufacturing exports; 94 per cent of the *maquiladora* exports in that year went to the USA.

4.2 Employment patterns across detailed occupations

The patterns documented in the previous section may hide important differences between the changes in the occupational structure of employment in the USA and Mexico. For example, it may be the case that even though RM occupations as a whole were shrinking in both countries in the early 2000s, certain types of RM jobs were shrinking in the USA but growing in Mexico. In this section we present our key results regarding the employment patterns in the two countries at the level of the 175 detailed harmonized occupations for the USA and Mexico that we have created ('occ_mxus').

We are interested in understanding whether occupations that are shrinking in the USA—middle-wage routine occupations in particular—are growing in Mexico. Panel A of Figure 5 plots the change in the employment share of each of the 175 occupations in the USA on the *y*-axis, and in Mexico on the *x*-axis, over the period 2003–11. The markers distinguish which broad occupational category each occupation corresponds to, with blue circles for NRC, red triangles for RC, green diamonds for RM, and orange squares for NRM.[24]

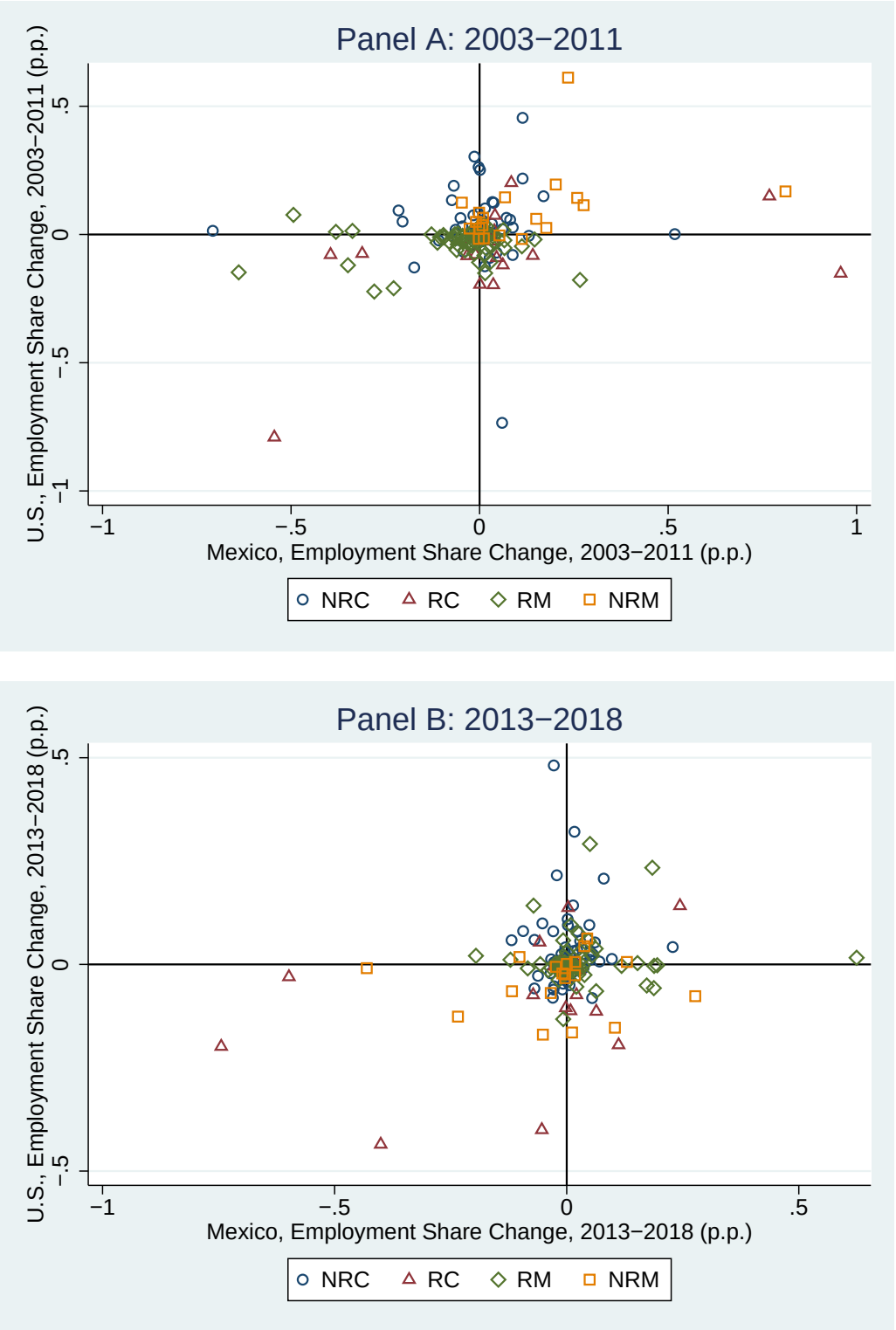
The figure shows a positive correlation in terms of changes in employment shares in the two countries between 2003 and 2011. The correlation coefficient is 0.26 and is significant at the 1 per cent level. The majority of the 175 occupations are either in the bottom-left quadrant (shrinking in both countries) or in the top-right quadrant (growing in both countries). Notably, many of the RM occupations that feature strong declines in the USA also experience declines in Mexico. The employment shares of 'assemblers of electrical equipment' and 'carpenters', for example, decline strongly in both countries. The main exception is 'truck, delivery and tractor drivers' (the notable green diamond in the lower-right quadrant of the graph), which grows fairly strongly in Mexico. As this is not an offshorable occupation, its decline in the USA and its growth in Mexico must be driven by other factors.

Appendix Table A7 presents detailed patterns for the occupations with the largest increases and decreases in employment shares in the USA. The occupation that shrinks the most in the USA is 'secretaries, typists and stenographers', which also shrinks strongly in Mexico. The next biggest fall in the USA is in supervisory-related occupations, which grow marginally in Mexico. Overall, the 10 occupations that experience the largest contractions in employment shares in the USA all decline or remain fairly constant (i.e. grow by less than 0.06 p.p.) in Mexico, with the exceptions being the truck driver occupation mentioned above, and 'administrative support jobs', which grow strongly in Mexico. Meanwhile, out of the 10 occupations that experience the largest growth in employment shares in the USA, all except 'primary school teachers' also grow or remain fairly constant (i.e. shrink by less than 0.02 p.p.) in Mexico.

Panel B of Figure 5 shows the corresponding pattern for 2013–18, the period that features a strong recovery in RM employment in Mexico. Once again, there is a positive correlation in the employment share changes across the two countries, with a correlation coefficient of 0.24, which is statistically significant at the 1 per cent level. Many of the RM occupations (indicated by green diamonds in the graph) which grow strongly in Mexico during this period also grow, or decline only slightly, in the USA. This period also features strong declines in RC occupations (indicated by red triangles in the graph) in both countries, notably 'cashiers, account collectors and clerks', 'secretaries, typists and stenographers', 'salespersons', and 'door-to-door sales, street sales, and news vendors'.

[24] Here and in most of the subsequent analysis we focus on long changes in each country, between 2003–11 (or 2005–11 in some cases) and 2013–18. It is important to note that neither country was experiencing a recession in any of these years. This alleviates the concern that the long changes may be affected by business cycle conditions in either country.

Figure 5: Change in occupational employment shares in the USA and Mexico for detailed occupational categories



Note: each symbol represents an occ_mxus occupation, as detailed in Appendix Table A1; blue circles correspond to NRC occupations, red triangles to RC ones, green diamonds to RM ones, and orange squares to NRM ones.
Source: authors' elaboration based on data from the US CPS and Mexican ENE and ENOE.

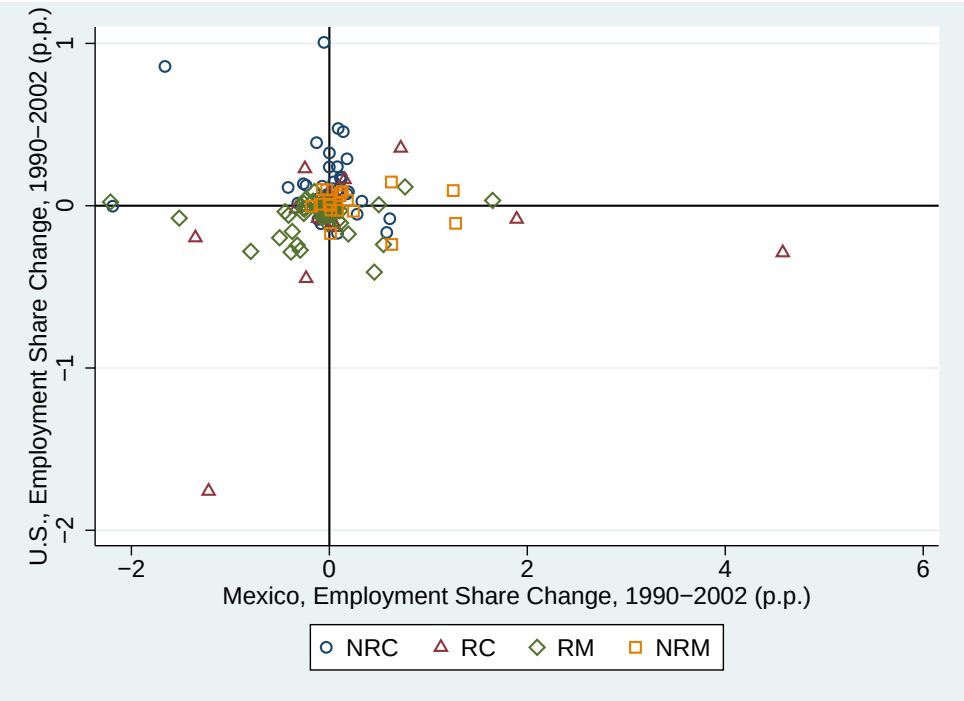
Overall, we find that during both the earlier and the more recent period there is a positive correlation in employment share changes across the two countries. The strongest divergence in employment share changes in the two countries occur in occupations that are unlikely to be susceptible to offshoring. Hence, we find little evidence that the decline of specific occupations in the USA is associated with a movement of these jobs to Mexico.

4.3 Were things different in the 1990s?

Our results show very little evidence of occupation-level relocation of jobs from the USA to Mexico in the period since 2003. We now consider whether these patterns were different during the 1990s, in the early years after the implementation of the NAFTA agreement. In Figure 6 we plot the changes in employment shares at the occupational level for the USA and Mexico over the 1990–2002 period. The evidence of a positive correlation in employment share changes across the two countries is much weaker for this time period. Overall, the correlation coefficient is 0.01 (p-value 0.87). Two notable outlier occupations stand out (the red triangles in the bottom-left and bottom-right quadrants, respectively). These occupations are 'secretaries, typists and stenographers', which shows a strong decline in both countries, and 'salespersons', which declines in the USA but grows very strongly in Mexico. Excluding these occupations, we obtain a correlation coefficient of –0.04, which remains statistically insignificant (p-value 0.57).

This weak correlation implies that even during this earlier time period, there is very little evidence that jobs that decline in the USA are systematically growing in Mexico. A few occupations decline in the USA but grow in Mexico between 1990 and 2002 (e.g. 'textile sewing machine operators' and 'assemblers of electrical equipment'); however, these occupations seem to be the exception rather than the norm.

Figure 6: Change in occupational employment shares in the USA and Mexico, 1990–2002



Note: each symbol represents an occ_mxus occupation, as detailed in Appendix Table A1; blue circles correspond to NRC occupations, red triangles to RC ones, green diamonds to RM ones, and orange squares to NRM ones.
Source: authors' elaboration based on data from the US CPS and Mexican Census and ENE.

5 Variation across industries and link with trade flows

So far we have shown that there is a positive correlation in the aggregate occupational employment share changes across the two countries over the last 15 years. In this section, we explore the extent to which this correlation varies across industries, and relate this to observed trade data.[25] This allows us to further probe the hypothesis that the decline in routine employment in the USA is at least partly due to a reallocation of these jobs to Mexico.

5.1 Patterns in tradable vs non-tradable industries

We begin by considering the correlation in occupational employment share changes separately in the tradable and the non-tradable sectors. To do this, we separate the sample according to the industry codes of each worker.[26] We compute the employment share of each of our 175 detailed occupations in each of the two broad sectors as a share of aggregate employment.

Figure 7 plots the employment share changes for each occupation in each sector, across the two sub-periods. Panels A and C show the patterns for the non-tradable sector. The changes in occupational employment shares are positively correlated in both periods, with correlation coefficients of 0.21 (p-value < 0.01) and 0.25 (p-value < 0.01) in the earlier and the later periods, respectively.

More interestingly, Panel B shows that the correlation in employment share changes in the early period is even stronger in the tradable sector compared to the non-tradable sector, with a correlation coefficient of 0.25 (p-value < 0.01).[27] The lack of a negative correlation in the tradable sector in this period provides further evidence against the hypothesis that the decline in US jobs is associated with a relocation of certain occupations to Mexico.

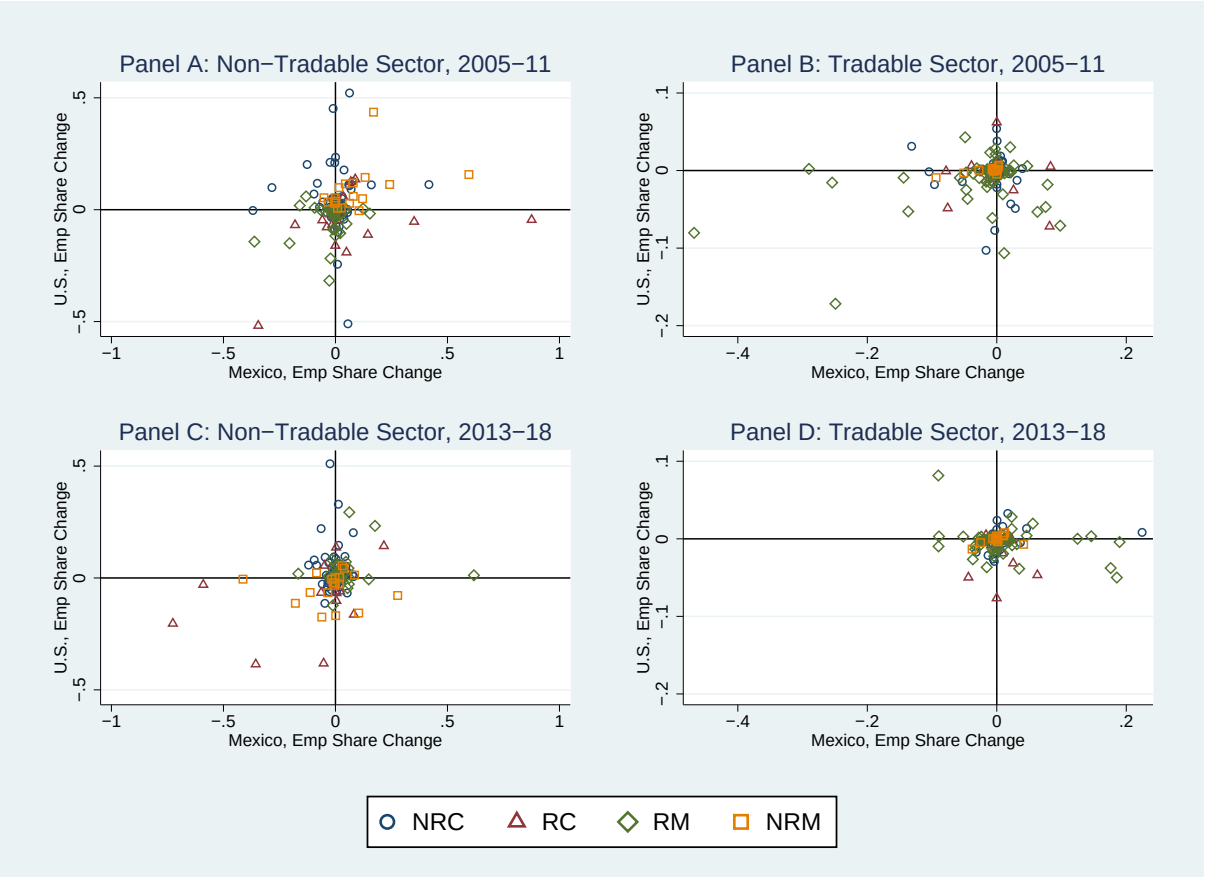
In the more recent period, though, we do observe a negative correlation, with a correlation coefficient of –0.16 (p-value < 0.05). Hence, between 2013 and 2018 there is some evidence that occupations in the tradable sector that experience a decline in their aggregate employment share in the USA experience an increase in their share in Mexico. Occupations such as 'machinists' and 'assemblers of electrical equipment', for example, shrink in terms of their overall employment share in the USA, but grow in Mexico, while the opposite is observed for occupations such as 'labourers'. We show below, however, that these patterns do not seem to be driven by changes in trade flows between the two countries.

[25] This section focuses on the period since 2005 (rather than the period since 2003) due to a change in the industry classification codes used in the Mexican datasets in that year.

[26] Workers with industry codes corresponding to agriculture, mining, or manufacturing are classified as working in the tradable sector; all others are classified as working in the non-tradable sector (i.e. utilities, construction, wholesale and retail trade, transportation, information and communications, finance, insurance and real estate, public administration, and other services).

[27] Note that the scale in Panels B and D is different from Panels A and C, as the changes in employment shares (out of total employment) are much smaller in the tradable sector.

Figure 7: Change in occupational employment shares in tradable and non-tradable industries in the USA and Mexico



Note: each symbol represents an occ_mxus occupation, as detailed in Appendix Table A1; blue circles correspond to NRC occupations, red triangles to RC ones, green diamonds to RM ones, and orange squares to NRM ones. Tradable industries are agriculture, mining, and manufacturing.
Source: authors' elaboration, based on data from the US CPS and Mexican ENOE.

5.2 Trade and changes within and between industries

We now explore the patterns of occupational change at a more granular industry level. As discussed in Section 2, if routine jobs are declining in the USA due to trade with Mexico, we should observe opposing patterns across the two countries both in the 'between-industry' and the 'within-industry' components of the decline in routine employment.

In order to explore these industry-level changes, we perform a decomposition of the change in the employment share of each of the four broad occupational groups in each country into a component due to differential growth across industries, and a component due to changes in the occupational structure within industries. In particular, the change in the employment share of each occupation can be decomposed as follows:

$$\begin{aligned} \Delta E_{jt} &= \sum_k \Delta E_{kt} \lambda_{jk} + \sum_k \Delta \lambda_{jkt} E_k \\ &\equiv \Delta E^B_{jt} + \Delta E^W_{jt} \end{aligned} \tag{1}$$

where ΔE_{jt} is the change in the overall share of employment in occupation j over time interval t in a particular country, ΔE^B_{jt} is the change in occupation j's share of employment attributable to changes in industrial composition (the 'between-industry' component), and ΔE^W_{jt} is the change attributable to changes in the occupational mix used within industries (the 'within-industry' component). The change in industry k's share of aggregate employment during time interval t is given by $\Delta E_{kt} = E_{k1} - E_{k0}$. The average annual employment share of industry k over the sample period is given by $E_k = (E_{k1} +$

$E_{k0})/2$. The change in occupation j's share of industry k employment during time interval t is given by $\Delta\lambda_{jkt} = \lambda_{jk1} - \lambda_{jk0}$. Occupation j's average share of industry k employment during that time is $\lambda_{jk} = (\lambda_{jk1} + \lambda_{jk0})/2$.

We start by focusing on the changes in RM employment. Figure 8 plots the contribution of each detailed industry to the overall change in employment in this occupation obtained from the decomposition analysis. Panel A focuses on the contributions to the between-industry component.[28] Negative values indicate that the industry is shrinking, while positive values indicate that the industry is growing. The magnitudes indicate the contribution of the industry to the aggregate change in the RM employment share, and are the result of the combination of the size of the industry's employment share change, and its RM intensity. For both the early and the later period, we observe positive correlations in these between-industry contributions. As discussed in Section 2, we should observe opposing patterns in the two countries if production of goods from routine-intensive industries were being relocated from the USA to Mexico. The fact that we do not see that industries that are declining in the USA are systematically growing in Mexico—even when weighted by their RM employment share—provides evidence against the hypothesis that the declines observed in the USA are due to relocation of production to Mexico due to trade or offshoring.

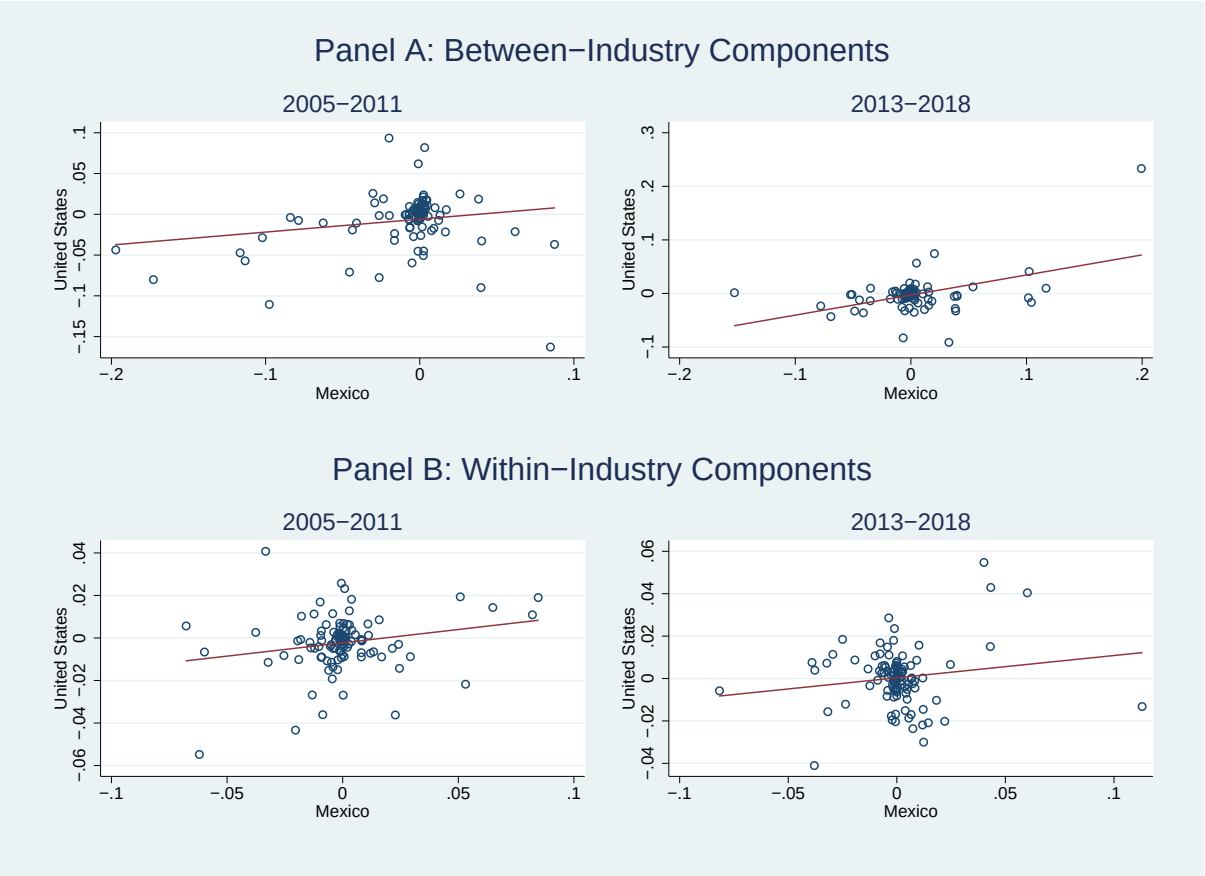
The results for the within-industry components are in Panel B of Figure 8. We find that the correlation across the two countries in the contribution of within-industry changes to the overall change in RM employment is also positive, in both the earlier and later periods. Here, the contributions are the result of the industry's size and the within-industry change in the RM employment share. The positive correlation indicates that the RM intensity of different industries is changing in the same direction in both countries. As discussed in Section 2, we should observe opposing patterns in the two countries if there is selection in terms of firm composition, or if firms offshore only certain tasks or replace these with intermediate inputs. Hence, these results provide evidence against the hypothesis that producers in the USA are offshoring their routine-intensive task processes to Mexico, or replacing them with imported Mexican intermediate inputs.

Appendix Figure A3 presents the analogous patterns for RC employment—the other broad occupational category that experienced a strong decline in the USA since 2005, as shown in Figure 3. Here we observe that the between-industry contributions to the decline in RC employment are slightly negatively correlated across the two countries in the earlier period, and positively correlated in the more recent period. The within-industry components are negatively correlated in both periods, though the correlations are fairly weak.

The overall contributions of the within-industry and the between-industry components to the change in each of the four occupations' employment shares in each country are presented in Appendix Table A8. For manual occupations (both routine and non-routine) in both periods, and for RC occupations in the more recent period, we find that between- and within-industry shifts consistently move occupational employment shares in the same direction in both countries. The changes have opposite signs across the two countries for RC occupations over the 2005–11 period, confirming the evidence in Appendix Figure A3: both within- and between-industry shifts contribute to a decline in the employment share of this occupation in the USA, whereas they both contribute to an increase in the employment share of this occupation in Mexico.

[28] We exclude the construction industry in all panels as it is an extreme outlier. For visual clarity, Panel A also excludes the clothing and apparel industry and the bus, taxi, and other urban transportation industry from the graph for the early period, and the manufacturing of transportation engines and equipment from the graph for the later period. Including these industries does not affect our results of interest.

Figure 8: Industry contributions to changes in routine manual employment share

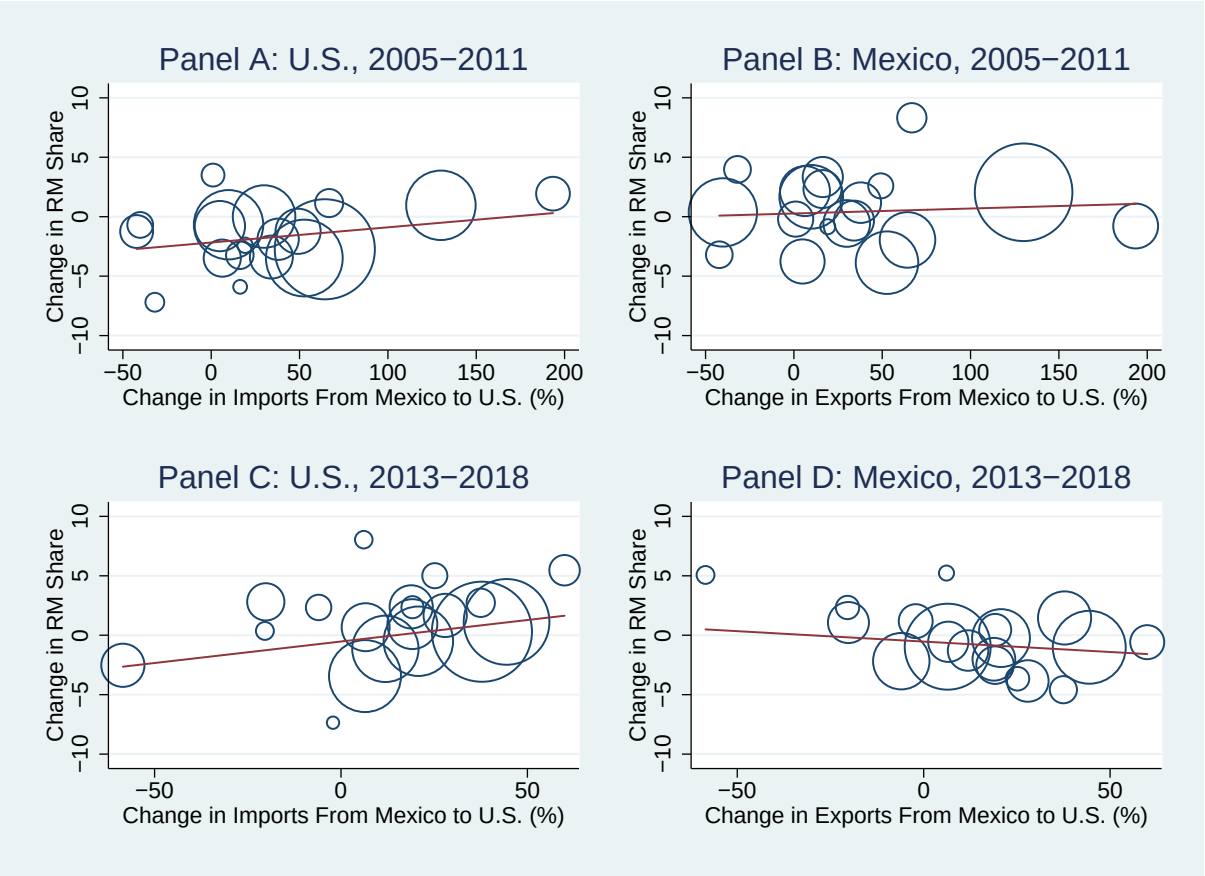


Note: each circle represents an ind_mxus industry, as detailed in Appendix Table A3. Panel A reports the contribution of each industry to the between-industry component of the change in the RM employment share, while Panel B reports the contribution of each industry to the within-industry component of the change in the RM employment share. These contributions are computed based on the decomposition in Equation (1). For visual clarity, we exclude the construction industry in all panels, as it is an extreme outlier. Panel A also excludes the clothing and apparel industry and the bus, taxi, and other urban transportation industry from the graph for the early period, and the manufacturing of transportation engines and equipment from the graph for the later period. Including these industries does not affect our results of interest.
Source: authors' elaboration based on data from the US CPS and Mexican ENOE.

In order to directly exploit information on trade flows, Figure 9 plots the change in each industry's RM employment share against the change in trade volumes from Mexico to the USA in that industry, as measured in the Comtrade data. Here, each circle represents a tradable industry.[29] Panels A and C show the changes in RM employment shares in the USA. Both in the early and in the later periods, there is a positive correlation between the change in the trade flows in a particular industry, and the change in the industry's RM employment share. This implies that, if anything, industries that are importing more from Mexico are becoming *more* RM intensive in the USA. The correlations for Mexico, as shown in Panels B and D, are close to zero. Hence, Mexican industries that are exporting more to the USA do not seem to experience disproportionate changes in the share of RM workers that they employ.

[29] We exclude industries in the agricultural and forestry sectors (in line with our exclusion of workers in agriculture and farming occupations), as well as the metal ore mining industry, which is an outlier and corresponds to a very small fraction of overall employment in both countries.

Figure 9: Change in industrial routine manual employment share and trade between Mexico and the USA



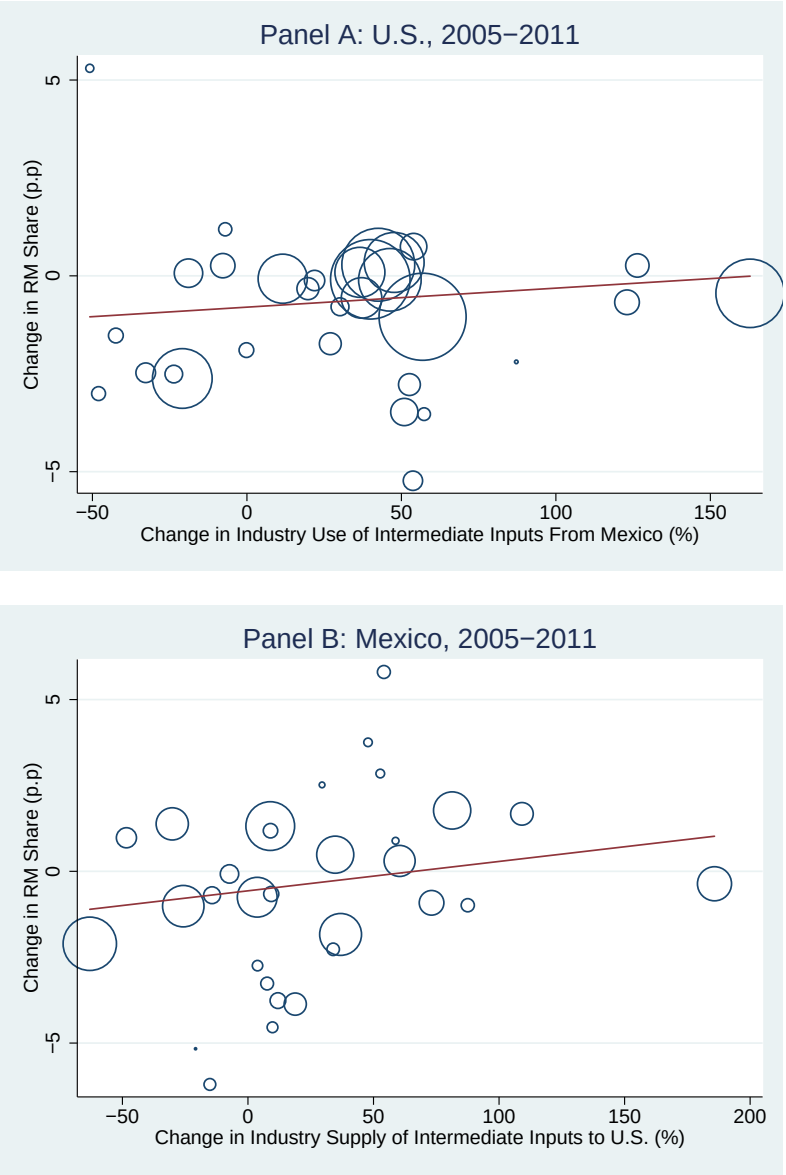
Note: each circle represents a tradable industry, as detailed in Appendix Table A4, with the size scaled according to the industry's share of aggregate employment in the corresponding country in 2011 (Panels A and B) or 2018 (Panels C and D). The figure plots the relationship between the change in imports from Mexico to the USA in each industry, and the change in the share of RM employment within the industry. We exclude industries in the agricultural and forestry sectors (in line with our exclusion of workers in agriculture and farming occupations), as well as the metal ore mining industry, which is an outlier and corresponds to a very small fraction of overall employment in both countries.
Source: authors' elaboration, based on trade data from Comtrade and employment data from US CPS and the Mexican ENOE.

In Figure 10 we explore the relationship with changes in the use or supply of intermediate inputs, as measured in the OECD ICIO Tables. If firms in certain industries in the USA offshore the production of RM tasks or intermediate inputs that are intensive in these tasks to Mexico, we would expect those industries to experience a decline in their RM employment share. Panel A plots the change in RM employment shares in the USA against the change in the value of Mexican intermediate inputs used by the industry between 2005 and 2011.[30] The correlation is weakly positive. This provides further evidence against the hypothesis that an increase in the intensity of usage of intermediate inputs from Mexico is associated with a decline in RM employment.

Panel B plots the analogous patterns for Mexico, where we now compute the change in the value of intermediate inputs *supplied* to the USA by each Mexican industry. In the case of Mexico, we also find a weakly positive correlation, implying that industries that are increasing their supply of intermediate inputs to the USA are becoming on average slightly more RM intensive.

[30] Panel A excludes mining and quarrying, and coke and refined petroleum, which are outliers and account for a very small proportion of employment in the USA; Panel B excludes publishing, which is an outlier and accounts for a very small proportion of employment in Mexico. The lines of best fit are computed including these outliers.

Figure 10: Change in industrial routine manual employment share and intermediate goods trade between Mexico and the USA



Note: each circle represents a tradable industry, as detailed in Appendix Table A5, with the size scaled according to the industry's share of aggregate employment in the corresponding country in 2011. Panel A plots the relationship between the change in each US industry's use of intermediate inputs from Mexico, and the change in its share of RM employment. Panel B plots the relationship between the change in each Mexican industry's supply of intermediate inputs to the USA, and the change in its share of RM employment. Panel A excludes mining and quarrying, and coke and refined petroleum, which are outliers and account for a very small proportion of employment in the USA; Panel B excludes publishing, which is an outlier and accounts for a very small proportion of employment in Mexico. The lines of best fit are computed including these outliers.
Source: authors' elaboration based on input–output data from the OECD ICIO Tables and employment data from the US CPS and the Mexican ENOE.

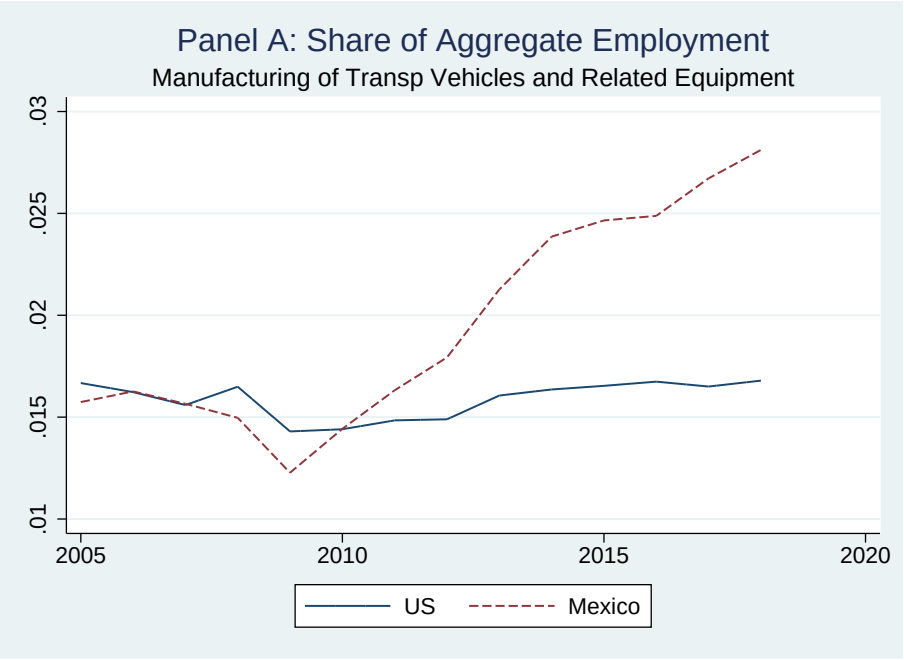
Appendix Figures A4 and A5 show the analogous patterns in terms of the relationship between trade flows and changes in RC employment shares. Even though we have documented somewhat opposing patterns in terms of between- and within-industry shifts in the two countries, the results in the figures suggest that these patterns are unlikely to be driven by trade between the two countries. Industries with larger growth in imports from Mexico to the USA do not experience a decline in their RC share in the USA, and neither do industries that increase their use of Mexican intermediate inputs. This is consistent with the idea that many RC occupations are not particularly offshorable.

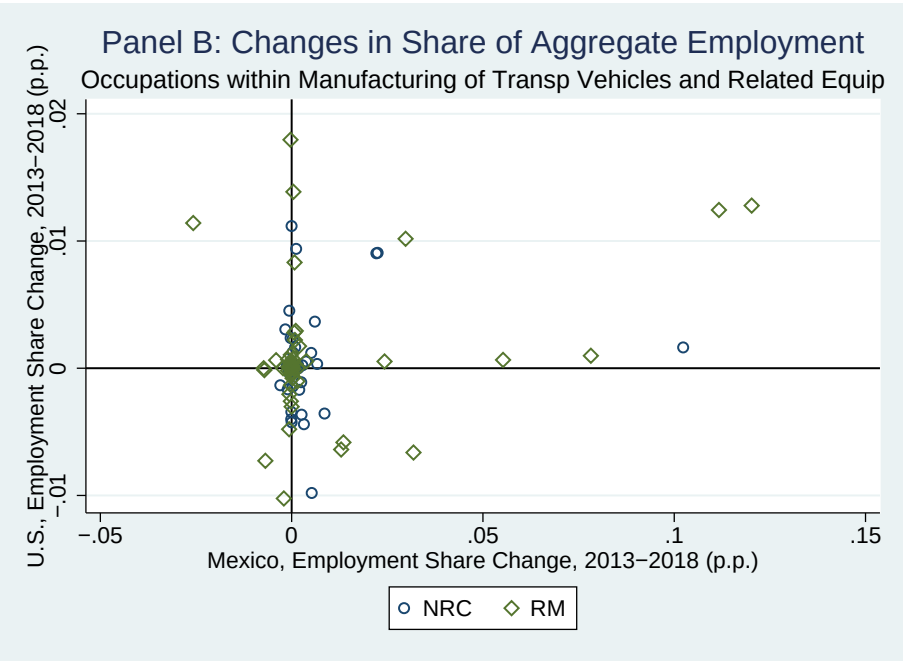
5.3 Focusing on the auto industry

As a final exercise, we focus on the patterns observed in the auto industry—a prominent industry that receives a lot of attention in the political discussion about offshoring. Panel A of Figure 11 shows the share of aggregate employment over time in manufacturing of transportation vehicles and related equipment, the industry that includes car manufacturing. We see a sharp increase in the share of employment in this sector in Mexico starting in 2009.

Panel B plots changes in the aggregate share of employment in different occupations within the manufacturing of transportation vehicles sector over the 2013–18 period. Since there are few workers within the vehicle manufacturing sector working in RC or NRM occupations, we focus only on those in NRC or RM jobs. The figure shows that the jobs that grow the most in Mexico during this time period also grow in the USA. Even within this sector, we see no clear evidence that declines in employment in the USA are being met with rising employment shares in Mexico. The overall correlation coefficient for the changes in the employment shares across the two countries, including all occupations with non-zero employment share changes in both countries, is 0.27, statistically significant at the 1 percent level. The correlation coefficient among NRC and RM occupations is 0.29 (or 0.27 if those with zero changes are excluded), also statistically significant at the 1 percent level.

Figure 11: Employment patterns: manufacturing of transportation vehicles and related equipment





Note: Panel A plots the share of aggregate employment in the manufacturing of transportation vehicles sector in each country. Panel B plots the change in the aggregate employment shares of occupations within the manufacturing of transportation vehicles sector for the 2013–18 period in each country. Each symbol represents an occ_mxus occupation, as detailed in Appendix Table A1; blue circles correspond to NRC occupations, and green diamonds to RM ones.
Source: authors' elaboration based on data from the US CPS and Mexican ENOE.

6 Conclusions

Employment in middle-wage routine task-intensive jobs has been declining in the USA over recent decades. One potential explanation for this decline is that these jobs have been moving to developing countries such as Mexico. In this paper we explore whether there is any evidence in favour of this type of argument. We do this by contrasting the observed changes in employment shares across detailed occupational categories in the USA and in Mexico, and by correlating the changes in the occupational employment structure of different industries to observed changes in trade flows between the two countries.

Overall, we find no evidence that the jobs that have been declining in the USA have been systematically growing in Mexico. In particular, the vast majority of the middle-skill RM occupations that feature strong declines in the USA also experience declines, or remain stable, in Mexico. The same is true for the vast majority of the middle-skill RC occupations that feature strong declines in the USA, such as secretaries and records clerks. There is also no evidence that US industries that have experienced stronger increases in imports from Mexico, either in terms of overall goods or in terms of intermediate inputs, have disproportionately decreased their employment of routine workers.

We conclude, therefore, that there is little to no evidence to support the argument that the decline of employment in middle-skill routine occupations in the USA has been primarily driven by a movement of these jobs to Mexico. Instead, our findings suggest that common shocks that affect employment at the occupational level in both countries are more likely to be the primary drivers of the observed employment patterns.

One natural explanation would be the development of new technologies that can replace labour in these tasks, as suggested by Autor et al. (2003) and the subsequent literature on job polarization. The observed patterns could be rationalized through the adoption of new technologies in both countries, or through the adoption of new technologies in the USA allowing firms in the country to re-shore the production of certain tasks (Artuc et al. 2019; Faber 2019). It is, however, also possible that the declines observed in both countries are indeed due to offshoring, but with jobs from both Mexico and the USA being offshored to other countries such as China. Regardless of the underlying driving force, the observed positive correlation in employment share changes across Mexico and the USA suggests that the labour inputs in the two countries should not be viewed as substitutes, but as complements, and that there is little empirical ground for the concern that the decline of middle-wage jobs in the USA is driven by a relocation of these jobs to Mexico.

References

Acemoglu, D. and D. Autor (2011). 'Skills, Tasks and Technologies: Implications for Employment and Earnings'. *Handbook of Labor Economics*, 4: 1043–171.

Acemoglu, D., G. Gancia, and F. Zilibotti (2015). 'Offshoring and Directed Technical Change'. *American Economic Journal: Macroeconomics*, 7(3): 84–122.

Antràs, P., L. Garicano, and E. Rossi-Hansberg (2006). 'Offshoring in a Knowledge Economy'. *Quarterly Journal of Economics*, 121(1): 31–77.

Ariza, J., and J.L. Raymond Bara (2018). 'Technical Change and Employment in Brazil, Colombia, and Mexico. Who are the Most Affected Workers?' *International Labour Review*. DOI: 10.1111/ilr.12104

Artuc, E., L. Christiaensen, and H. Winkler (2019). 'Does Automation in Rich Countries Hurt Developing Ones? Evidence from the US and Mexico'. Policy Research Working Paper 8741. Washington, DC: World Bank.

Autor, D.H., and D. Dorn (2013). 'The Growth of Low Skill Service Jobs and the Polarization of the U.S. Labor Market'. *American Economic Review*, 103(5): 1553–97.

Autor, D.H., F. Levy, and R.J. Murnane (2003). 'The Skill Content of Recent Technological Change: An Empirical Exploration'. *Quarterly Journal of Economics*, 118(4): 1279–333.

Autor, D.H., D. Dorn, and G.H. Hanson (2013). 'The China Syndrome: Local Labor Market Effects of Import Competition in the United States'. *American Economic Review*, 103(6): 2121–68.

Autor, D.H., D. Dorn, G.H. Hanson, and J. Song (2014). 'Trade Adjustment: Worker-Level Evidence'. *Quarterly Journal of Economics*, 129(4): 1799–860.

Autor, D.H., D. Dorn, and G.H. Hanson (2015). 'Untangling Trade and Technology: Evidence from Local Labour Markets'. *Economic Journal*, 125(584): 621–46.

Baldwin, R., and F. Robert-Nicoud (2014). Trade-in-Goods and Trade-in-Tasks: An Integrating Framework. *Journal of International Economics*, 92(1): 51–62.

Bhalotra, S.R., and M. Fernandez (2018). 'Women's Labor Force Participation and the Distribution of the Gender Wage Gap'. Working Paper 2010-10. Colchester: University of Essex.

Blinder, A.S., and A.B. Krueger (2013). 'Alternative Measures of Offshorability: A Survey Approach'. *Journal of Labor Economics*, 31(S1): S97–S128.

Böckerman, P., S. Laaksonen, and J. Vainiomäki (2019). 'Does ICT Usage Erode Routine Occupations at the Firm Level?' *Labour*, 33(1): 26–47.

Burstein, A., and J. Vogel (2017). 'International Trade, Technology, and the Skill Premium'. *Journal of Political Economy*, 125(5): 1356–412.

Campos-Vazquez, R.M., and N. Lustig (2017). 'Labour Income Inequality in Mexico: Puzzles Solved and Unsolved'. WIDER Working Paper 2017/186. Helsinki: UNU-WIDER.

Cortes, G.M., and D.M. Morris (2019). 'Are Routine Jobs Moving South? Evidence from Changes in the Occupational Structure of Employment in the U.S. and Mexico'. Working Paper 19-15. Waterloo, Canada: Rimini Centre for Economic Analysis.

Cortes, G.M., and A. Salvatori (2019). 'Delving into the Demand Side: Changes in Workplace Specialization and Job Polarization'. *Labour Economics*, 57: 164–76.

Dicarlo, E., S. Lo Bello, S. Monroy-Taborda, A.M. Oviedo, M.L. Sanchez-Puerta, and I. Santos (2016). 'The Skill Content of Occupations across Low and Middle Income Countries: Evidence from Harmonized Data'. Discussion Paper 10224. Bonn: IZA.

Ebenstein, A., A. Harrison, M. McMillan, and S. Phillips (2014). 'Estimating the Impact of Trade and Offshoring on American Workers Using the Current Population Surveys'. *Review of Economics and Statistics*, 96(4): 581–95.

Egger, H., U. Kreickemeier, and J. Wrona (2015). 'Offshoring Domestic Jobs'. *Journal of International Economics*, 97(1): 112–25.

Egger, H., U. Kreickemeier, C. Moser, and J. Wrona (2016). 'Offshoring and Job Polarisation between Firms'. Working Paper 08/16. Dresden: Center of Public and International Economics.

Faber, M. (2019). 'Robots and Reshoring: Evidence from Mexican Labor Markets'. *Working Paper 2018/27*. Basel: Faculty of Business and Economics, University of Basel.

Flood, S., M. King, R. Rodgers, S. Ruggles, and J.R. Warren (2018). 'Integrated Public Use Microdata Series (IPUMS), Current Population Survey': Version 6.0 [dataset].

Gaggl, P., and G.C. Wright (2017). 'A Short-Run View of What Computers Do: Evidence from a UK Tax Incentive'. *American Economic Journal: Applied Economics*, 9(3): 262–94.

Goldberg, P.K., and N. Pavcnik (2007). 'Distributional Effects of Globalization in Developing Countries'. *Journal of Economic Literature*, 45(1): 39–82.

Goos, M., and A. Manning (2007). 'Lousy and Lovely Jobs: The Rising Polarization of Work in Britain'. *Review of Economics and Statistics*, 89(1): 118–33.

Goos, M., A. Manning, and A. Salomons (2009). 'Job Polarization in Europe'. *American Economic Review*, 99(2): 58–63.

Goos, M., A. Manning, and A. Salomons (2014). 'Explaining Job Polarization: Routine-Biased Technological Change and Offshoring'. *American Economic Review*, 104(8): 2509–26.

Grossman, G.M., and E. Rossi-Hansberg (2008). 'Trading Tasks: A Simple Theory of Offshoring'. *American Economic Review*, 98(5): 1978–97.

Hardy, W., R. Keister, and P. Lewandowski (2016). 'Technology or Upskilling? Trends in the Task Composition of Jobs in Central and Eastern Europe'. Working Paper 2016-40. Hong Kong: HKUST Institute for Emerging Market Studies.

Hummels, D., J.R. Munch, and C. Xiang (2018). 'Offshoring and Labor Markets'. *Journal of Economic Literature*, 56(3): 981–1028.

Iacovone, L., F. Rauch, and L.A. Winters (2013). 'Trade as an Engine of Creative Destruction: Mexican Experience with Chinese Competition'. *Journal of International Economics*, 89(2): 379–92.

IPUMS (2019). 'Integrated Public Use Microdata Series (IPUMS), International'. Version 7.2 [dataset].

Kovak, B.K., L. Oldenski, and N. Sly (2019). 'The Labor Market Effects of Offshoring by U.S. Multinational Firms'. *Review of Economics and Statistics*. DOI: 10.1162/rest_a_00878.

Lemieux, T. (2006). 'Increasing Residual Wage Inequality: Composition Effects, Noisy Data, or Rising Demand for Skill?' *American Economic Review*, 96(3): 461–98.

Lewandowski, P., A. Park, W. Hardy, and Y. Du (2019). 'Technology, Skills, and Globalization: Explaining International Differences in Routine and Nonroutine Work Using Survey Data'. Discussion Paper 12339. Bonn: IZA.

Lo Bello, S., M.L. Sanchez Puerta, and H. Winkler (2019). 'From Ghana to America: The Skill Content of Jobs and Economic Development'. Policy Research Working Paper 8758. Washington, DC: World Bank.

Machin, S., and J. Van Reenen (1998). 'Technology and Changes in Skill Structure: Evidence from Seven OECD Countries'. *Quarterly Journal of Economics*, 113(4): 1215–44.

Mendez, O. (2015). 'The Effect of Chinese Import Competition on Mexican Local Labor Markets'. *North American Journal of Economics and Finance*, 34:364–80.

Michaels, G., A. Natraj, and J. Van Reenen (2014). 'Has ICT Polarized Skill Demand? Evidence from Eleven Countries Over Twenty-Five Years'. *Review of Economics and Statistics*, 96(1): 60–77.

Patt, A., J. Ruhose, S. Wiederhold, and M. Flores (2017). 'International Emigrant Selection on Occupational Skills'. Discussion Paper 10837. Bonn: IZA.

Reijnders, L.S., and G.J. de Vries (2018). 'Technology, Offshoring and the Rise of Non-Routine Jobs'. *Journal of Development Economics*, 135: 412–32.

Traiberman, S. (2019). 'Occupations and Import Competition: Evidence from Denmark'. *American Economic Review*, 109(12): 4260–301.

Utar, H., and L.B. Torres Ruiz (2013). 'International Competition and Industrial Evolution: Evidence from the Impact of Chinese Competition on Mexican Maquiladoras'. *Journal of Development Economics*, 105: 267–87.

World Bank (2016). *World Development Report 2016: Digital Dividends*. Washington, DC: World Bank.

Appendix

Table A1: Crosswalk of occupation codes

occ_mxus	Occupation description	occ1990dd codes	CMO codes	SINCO codes	MX 1990 census codes
1	Chief executive, proprietors, public administrators, and legislators	4	2100, 2101, 2110, 2111, 2119, 2123, 2124, 2126, 2127, 5120, 5140, 5150, 5170, 5180, 2129, 5129, 5139, 5159, 5179, 5189, 6102	1111, 1113, 1121, 1122, 1129, 1112, 1314, 1315, 1412, 1322, 1323, 1224, 1222, 1999, 1312, 1524	2100, 2101, 2110, 2111, 2119, 2123, 2124, 2125, 2127, 2129, 5120, 5140, 5150, 5170, 5180, 6100, 6102
2	Financial managers	7	2121, 6110	1211, 1212, 1512, 4201	2121
3	Human resources and labour relations managers	8, 27	6111	1511	6101
4	Managers and specialists in marketing, advert., PR	13	1173, 1167	2112	1167, 1174, 1425, 6120
5	Managers in education and related fields	14	2125, 6101	1223, 1523, 1324, 2311	2126
6	Managers of medicine and social welfare occupations	15	2120, 6100, 6109, 6132	1221, 1521, 1522, 2524	2120, 6109
7	Managers of properties and real estate	18	2122	1411	2122
8	Funeral directors	19	8160	1723, 5253, 1423	8170
9	Managers and administrators, n.e.c.	22	2130, 2131, 2132, 2133, 2190, 2139	1131, 1132, 1133, 1134, 1135, 1321	2130, 2131, 2132, 2133, 2139, 2190
10	Accountants and auditors	23	1172	2121	1173
11	Other financial specialists	25, 375	7132, 7134, 7135	2122, 2514	7132, 7134, 7135, 6121
12	Management analysts	26	1171, 1179	2111	1171, 1179
13	Buyers, wholesale and retail trade	29, 33, 34	7130	4221	7130
14	Construction inspectors	35	5160, 5169	1615	5160
15	Inspectors and compliance officers	36	5121, 5131, 5141, 5171, 5181, 5149	2630, 2640, 8201, 7401, 7301, 8101	5121, 5131, 5141, 5171, 5181, 6103, 5122, 5142, 5172, 5182
16	Supervisors of building service and construction work	448, 450, 588	6140, 5161, 5111	1613, 1313, 2523, 7101	5111, 5161
17	Supervisors of motor vehicle transportation	803	6121	1623, 8301, 2661, 2662	6104
18	Supervisors of food preparation and service	433	5100, 5101, 5109	1712, 5101, 7501	5100, 5101, 5102
19	Supervisors, n.e.c.	628, 303, 243	6133, 6190, 5190, 6130, 6120, 6131, 6150, 6180, 6139, 6160	1614, 7201, 1624, 1629, 1621, 1622, 1721, 1722, 1711	5190, 5191, 5192
20	Management support occupations	37	6290	3999, 3201, 3101	6190
21	Architects and urbanists	43, 173	1100	2263	1100
22	Metallurgical, petroleum, mining, geological, and materials engineers	45, 47, 75	1102, 1103	2254, 2262	1102, 1103
23	Chemical, industrial, and mechanical engineers	48, 56, 57	1104	2251, 2252, 2253	1104

occ_mxus	Occupation description	occ1990dd codes	CMO codes	SINCO codes	MX 1990 census codes
24	Civil engineers	53	1101	2261	1101
25	Electrical engineers, computer analysts, and scientists	55, 64, 65, 308, 228, 233	1105, 1205	2241, 2242, 2281, 2641, 2271, 2272, 2651, 2652, 2643	1105, 1205
26	Other engineers	59, 44	1106, 1109	2421	1109, 1135
27	Mathematicians, statisticians, and actuaries	66, 68	1111, 1211, 1119, 1219, 1210	2212, 2611	1111, 1119, 1210, 1211, 1219
28	Physicists and astronomers	69	1110	2211	1110
29	Chemists	73	1120	2222	1120
30	Atmospheric and space scientists	74	1141	2223	1141
31	Agricultural and food scientists	77	1150, 1240	2231, 2613	1150, 1240
32	Biological scientists	78	1140, 1142, 1149	2221	1140, 1142, 1149
33	Foresters and conservation scientists	79	1152, 4139	2233, 9121	1152, 4139
34	Physicians	84	1130	2411, 2412, 2427	1130
35	Dentists	85	1132	2413	1132
36	Veterinarians	86	1151, 1241, 1242, 1249, 1243	2232, 2614	1151, 1241, 1242, 1243, 1249
37	Optometrists	87	1133, 1222	2422	1133, 1222
38	Nurses, therapists and other health occupations	89, 88, 83, 95, 98, 99, 103, 104, 105, 106, 207	1131, 1220	2425, 2817, 2823, 2824, 2825, 2826, 2426, 2811, 2821	1131, 1220
39	Pharmacists	96	1121, 1231	2428, 2814	1121, 1231
40	Dieticians and nutritionists	97	1134, 1223	2423, 2816	1134, 1223
41	Subject instructors (college)	154	1300	2321	1300
42	Kindergarten and earlier school teachers	155	1340	2335	1340
43	Primary school teachers	156	1330	2332	1330
44	Secondary school teachers	157	1320, 1310	2331, 2322	1310, 1320
45	Special education teachers	158	1350, 1351, 1352, 1353, 1354, 1359	2341, 2342, 2343	1350, 1351, 1352, 1353, 1359
46	Teachers, n.e.c.	159, 387	1331, 1166, 1332, 1360, 1361, 1362, 1363, 1390, 1369	2712, 2714, 2312, 2333, 2334, 2339, 2391, 2711, 2713, 2715	1166, 1331, 1339, 1361, 1362, 1369, 1390
47	Librarians and archivists	164, 165, 329	1174	2144	1172, 6140
48	Economists, market and survey researchers	166, 386, 316	1170, 6232	2123, 3231, 3232	1170
49	Psychologists	167, 163	1164	2142	1164
50	Social workers	377, 174, 177	1250	2143, 2531, 2532	1250
51	Social scientists and sociologists, n.e.c.	169	1161, 1169	2132	1161, 1169
52	Clergy and religious workers	176	1180, 1260	2533, 2145	1180, 1260
53	Lawyers and judges	178, 234	1160	2135	1160
54	Writers and authors	183, 184, 195, 384	1400, 1401	2151, 2152, 2153	1400, 1401
55	Designers	185, 789	1423	2541, 2542, 2543, 2544	1424
56	Musicians and singers	186	1410, 1411, 1412	2171, 2172, 2173	1410, 1411, 1412
57	Actors, directors, and producers	187	1413, 1430, 1431, 1439	2175, 1421, 1422	1413, 1430, 1431, 1439

occ_mxus	Occupation description	occ1990dd codes	CMO codes	SINCO codes	MX 1990 census codes
58	Painters, sculptors, craft-artists, and print-makers	188	1420, 5232, 5130	2161, 2162, 7321	1420, 5130, 5232, 5132
59	Photographers and motion picture projectionists	189, 467	1206	2655, 2653, 2654	1206, 1422, 5372
60	Dancers	193	1414, 1422	2174, 2164	1414, 1423
61	Art/entertainment performers and related occs	194, 198	1460, 1461, 1432, 1429, 1469, 1490, 1419, 7213	2551, 2552, 2553	1419, 1429, 1432, 1490, 7213, 8150, 8151, 8152, 8159
62	Athletes, sports instructors, and officials	199	1364, 1440, 1450, 1451	2561, 2562, 2563, 2716	1360, 1440, 1450, 1451
63	Other professionals, n.e.c.	76	1153, 1162, 1163, 1165, 1168, 1129, 1159, 1190	2131, 2134, 2133, 2141, 2234	1129, 1153, 1159, 1162, 1163, 1165, 1168, 1190, 6122
64	Clinical laboratory technologies and technicians	203, 223, 224	1230, 1239, 1232	2612, 2813	1230, 1239
65	Dental assistants and specialists	204, 445	1221	2815, 2822	1221
66	Health technicians and record technologists	205, 208, 206, 678	1229, 1139	2812, 2424	1229
67	Other technicians	225, 214, 229	1201, 1202, 1203, 1204	2621, 2622, 2623, 2624, 2633, 2637	1201, 1202, 1203, 1204
68	Surveyors, cartographers, mapping scientists, drafters	218, 217	1200	2625	1200
69	Airplane pilots and traffic controllers	226, 227	5530, 8102	8311, 5231	5530, 8104
70	Technicians, n.e.c.	235	1252, 1290, 1209	2511, 2991, 2992	1209, 1290
71	Salespersons	275, 256, 379, 258	7100, 7110, 7120, 7111	4111, 4231, 4211, 4213, 4212, 4214	7100, 7111, 7120, 7121
72	Real estate sales occupations	254, 866	7131	4223, 4311	7131
73	Financial service sales occupations	255, 344	7110	4201	7110
74	Insurance sales occupations	24, 253	7133	4222	7133
75	Accounting and auditing sales occupations	337	1251	2512	1251
76	Cashiers, account collectors, and clerks	276, 328, 338, 378, 383	6210, 6211, 6219	3121, 3122, 9732	6123, 6124, 6129
77	Door-to-door sales, street sales, and news vendors	277	7200, 7201, 7210, 7211, 7209, 7219, 7290	9511, 9512, 9521, 9624, 4224, 9332, 9899	7200, 7201, 7202, 7209, 7210, 7211, 7219, 7290
78	Salespersons, n.e.c.	274, 677	7139, 7190	4999	7139, 7190
79	Secretaries, typists and stenographers	313, 315	6200, 6201	3111, 3112	6110, 6111, 6112
80	Hotel clerks	317	1175, 8123	9623, 2113, 9622	1175, 8102
81	Transportation ticket and reservation agents	318	6231	3221	6151
82	Receptionists and other information clerks	319	6230	3211, 3212, 4232	6150
83	Correspondence and order clerks	326, 335, 346	6220	3131	6141
84	Office machine operators	347	6203	3114	6130, 6131
85	Telecom operators	348, 349	6240, 6241, 6249	3213	6160, 6161, 6169
86	Messengers, postal and mail clerks	354, 356, 357	6251, 6259, 7121	9722, 9723	6171, 6179, 7122
87	Mail carriers for postal service	355	6250	9721	6170

occ_mxus	Occupation description	occ1990dd codes	CMO codes	SINCO codes	MX 1990 census codes
88	Dispatchers	359	6260	3141, 3142	6180, 6181, 6182, 6183, 6189
89	Warehouse workers	364, 365, 368, 373	6221	3132	6142
90	Meter readers	366	5470	9731, 9232	5470, 5471
91	Administrative support jobs, n.e.c.	376, 389, 336, 385	6270, 6209, 6229, 6239, 6202	3115, 3113	6139, 6149, 6152, 6159
92	Housekeepers, maids, butlers, and cleaners	405	8200, 8209	9611, 9643, 9601, 5113	8200, 8201, 8209
93	Laundry and dry cleaning workers	408	8110, 8111, 8119	9641, 9642	8110, 8111, 8112, 8119
94	Guards and police	415, 426	8303, 8204	5313, 5301, 5314	8303
95	Fire fighting, fire prevention, and fire inspection occs	417	8300	5311	8300
96	Guards and police, public service	418, 423, 425	8301, 8302, 8304	5312, 2521, 2522, 2513, 1526	8301, 8302, 8304
97	Armed forces		8310, 8311, 8312	5401, 5411, 5412, 5413, 1225, 1525	8310, 8311, 8312
98	Protective service, n.e.c.	427	8390, 8309, 8319	1226, 5999	8309, 8319, 8390
99	Bartenders and waiters/waitresses	434, 435	8101	5115, 5116	8101
100	Cooks	436	5208, 8100	5111, 5112, 5114	5208, 8100
101	Food preparation workers	439, 688	5400, 5201, 5203, 5304, 5206, 5207, 5205	7512, 7514, 7515, 7516, 7517, 9236, 9411	5201, 5203, 5204, 5205, 5206, 5207, 5400
102	Miscellaneous food preparation and service workers	444	5306, 5209	8163	5209, 5306
103	Gardeners and groundskeepers	451	8125, 8203	5241, 5242, 9651	8124
104	Cleaning workers in establishments	453, 875, 455, 887	8124, 7212	9661, 9662, 9663, 2827, 9621, 9631, 9632, 9633, 9634	7212, 8123
105	Barbers, hairdressers and cosmetologists	457, 458	8130, 8131, 8139	5211, 5212	8130, 8131
106	Recreation and hospitality assistants	283, 459, 461, 462, 466	8150, 8159	3222, 4233, 9713, 5251	8160, 8169
107	Baggage porters, bellhops and concierges	464	8120, 8122	9711	8103, 8120, 8122
108	Personal service occupations	468, 469, 447	8151, 8201	5221, 5222, 5201	8161, 8202
109	Misc. personal service occupations	470	8132, 8109, 8129, 8190	5213	8109, 8129, 8132, 8190
110	Public transportation attendants and inspectors	471	5522	9311	5523
111	Animal caretakers, except farm	472	4115, 4116	6125, 6127, 5254	4116
112	Farm managers	473, 475, 28	2128, 4170, 6170	6101, 6201, 1311, 1611	2128, 4170, 4171, 4172, 4173, 4179

occ_mxus	Occupation description	occ1990dd codes	CMO codes	SINCO codes	MX 1990 census codes
113	Farm workers	479	4100, 4101, 4102, 4103, 4104, 4105, 4106, 4107, 4108, 4110, 4111, 4112, 4113, 4114, 4120, 4132, 4136, 4109, 4119, 4169, 4190	6111, 6112, 6113, 6114, 6115, 6116, 6121, 6122, 6123, 6124, 6126, 6131, 6223, 6226, 9111, 9112, 9113, 6119, 6129, 6999	4100, 4101, 4102, 4103, 4104, 4105, 4106, 4107, 4108, 4109, 4110, 4111, 4112, 4113, 4114, 4119, 4120, 4132, 4136, 4169, 4190, 4115, 4180
114	Graders, sorters and inspectors of agricultural products	488, 489	4160	6117, 6128	4160, 4121
115	Timber, logging, and forestry workers	496	4130, 4131, 4133, 4134, 4135	6221, 6222, 6224, 6225, 6227, 9124	4130, 4131, 4133, 4134, 4135
116	Fishers, marine life cultivators, hunters, and kindred	498	4140, 4150, 4151, 4161, 4159	6231, 6211, 6212, 6213, 9122, 9123	4140, 4150, 4151, 4159, 4161
117	Automobile mechanics and repairers	503, 505, 507, 508, 514	5245	2631, 2632	5245
118	Industrial machinery installers and repairers	516, 518, 519, 534	5246, 5265	2634, 2638	5246, 5265
119	Repairers and installers of electrical equipment	523, 543, 509	5272	2645, 2646	5275
120	Telecom and household appliances installers and repairers	526, 527, 577	5271	2644	5271, 5272, 5273, 5274
121	Precision makers, repairers, and smiths	535, 713	5248	7221	5248
122	Locksmiths and safe repairers	536	5244	7222	5244
123	Mechanics and repairers, n.e.c.	525, 533, 539, 549	5247, 5249, 5279	2635, 2636, 2639, 2649	5247, 5249, 5279
124	Masons, tilers, and construction material installers	563, 583, 593	5260, 5264, 5266	7121, 7132, 7133	5260, 5264, 5266
125	Carpenters	567, 657, 658	5230	7311, 7312, 7123	5230, 5231
126	Drywall installers and plasterers	573, 584	5262	7131	5262
127	Electricians	575	5270	2642	5270
128	Painters, construction and maintenance	579	5261	7135	5261
129	Plumbers, pipe fitters, and steamfitters	585	5267	7134, 9222	5267
130	Concrete and cement workers	588	5251, 5352	8171, 7612	5252, 5251, 5352
131	Glaziers	589	5252, 5151	7613, 7601	5151, 5253, 5152
132	Operators of construction equipment	594, 598, 756, 844, 848, 853	5360, 5501	8114, 8351	5360, 5501
133	Roofers and slaters	595	5263	7122	5263
134	Structural metal workers	597, 709	5342	8122	5345
135	Misc. construction and related occupations	599	5461	1619	5162
136	Drillers of oil wells	614	5311	8112	5311
137	Explosives workers	615	5310	8111	5310
138	Miners	616	5210, 5211	7111, 7112	5210, 5211, 5212
139	Other mining occupations	617	5110, 5410, 5411, 5119, 5319	1612, 9212, 9211	5110, 5112, 5213, 5219, 5319, 5410, 5411
140	Machinists	637, 644	5383, 5381, 5334, 5331, 5382	8132, 8135, 8143, 8145, 8133	5331, 5334, 5382, 5383, 5385, 5386

occ_mxus	Occupation description	occ1990dd codes	CMO codes	SINCO codes	MX 1990 census codes
141	Boilermakers	643	5240	7211	5240
142	Engravers	649	1421	2163	1421
143	Other metal and plastic workers	653	5280, 5480, 5440	7411, 9233, 9231	5280, 5440, 5441, 5480
144	Dressmakers, seamstresses, and tailors	666	5222	7341	5223
145	Upholsterers	668	5225	7351	5226
146	Shoemakers, other prec. apparel and fabric workers	669, 745	5227, 5223, 5226, 5224, 5220, 5229, 5323	7353, 7331, 7342, 7343, 7352, 8154	5220, 5221, 5224, 5225, 5227, 5228, 5229, 5323
147	Hand molders and shapers, except jewellers	675	5250	7611	5250
148	Bookbinders	679, 765	5333	8144	5333
149	Other precision and craft workers	684	5344	8211, 7214	5347
150	Butchers and meat cutters	686	5200	7511	5200
151	Bakers	687	5202	7513	5202
152	Water and sewage treatment plant operators	694	5312, 5380	8113, 8134	5312, 5381
153	Power plant operators	649	5312, 5380	8113, 8134	5370
154	Other plant and system operators	696, 699	5371, 5305, 5351, 5350	8162, 8172	5305, 5350, 5351, 5373, 5371
155	Lathe, milling, and turning machine operatives	703, 706, 707, 708, 724, 769, 634	5343, 5349	8123	5341, 5343, 5344, 5346, 5349
156	Moulders and casting machine operators	719, 544, 645	5340, 5341, 5228	8121, 7344	5340, 5342
157	Metal platers	723	5243, 5242	7223, 7213	5242, 5243
158	Sawing machine operators and sawyers	727	5330	8141	5330
159	Other woodworking machine operators	733	5332	8142	5332
160	Printing and wood treatment machine operators, n.e.c.	729, 734	5430, 5339	9234	5339, 5430, 5431, 5432
161	Typesetters and compositors	736	5233	7322	5233, 5234
162	Knitters, loopers, and toppers textile operatives	739	5221	7332	5222
163	Textile cutting, pressing, and dyeing machine operators	743, 747	5324	8155	5324
164	Textile sewing machine operators	744, 738	5322	8153	5322
165	Miscellaneous textile machine operators	749	5320, 5321, 5329	8151, 8152	5320, 5321, 5329
166	Packers, fillers, and wrappers	754, 888	5401, 5421, 5431, 5441, 5451, 5481	9712	5401, 5402, 5403, 5421, 5422, 5423, 5433, 5442, 5443, 5453, 5483, 5493, 5472
167	Extruding and forming machine operators	755	5353	8173	5353
168	Food roasting and baking machine operators	763	5300, 5302, 5301, 5303, 5304, 5307	8161	5300, 5301, 5302, 5303, 5304, 5307
169	Photographic process workers	774	5335, 5234	7323	5235, 5335
170	Machine operators, n.e.c.	779, 753, 757, 764, 766	5390, 5509, 5309, 5359, 5379, 5389	8131, 8199, 8999	5309, 5354, 5359, 5379, 5380, 5384, 5389, 5390, 5509

occ_mxus	Occupation description	occ1990dd codes	CMO codes	SINCO codes	MX 1990 census codes
171	Welders, solderers, and metal cutters	783	5241	7212	5241
172	Assemblers of electrical equipment	785	5345	8212	5348
173	Production checkers, graders, and sorters n.e.c.	799, 873, 878	5491, 5490	9239	5490, 5491, 5492, 5481, 5482
174	Truck, delivery, and tractor drivers	804	5502, 5521	8341, 8352	5502, 5521
175	Bus and taxi cab drivers, and chauffeurs	808, 809	5520, 8202	8342, 8343	5520, 5522
176	Railroad conductors and yardmasters	823, 824, 825	5510, 5511	8331, 9312	5510, 5511
177	Ship crews and marine engineers	829	5540, 5541, 5542, 5543, 5549	8321, 8322, 8323, 8324	5540, 5541, 5542, 5543, 5549
178	Miscellaneous transportation occupations	834, 813, 885	5550, 5551, 5500, 5590, 5529	6311, 9321, 9322, 8344, 8349	5500, 5529, 5550, 5551, 5590
179	Stevedores and misc. material moving occupations	859	8126	9331	8125
180	Helpers in construction work	865, 869	5460, 5269	7113, 9221	5269, 5460, 5461
181	Labourers, n.e.c.	889	5450, 5420, 5231, 5253, 5281, 8121, 8140, 8152, 5239, 5259, 5290, 9999	9733, 7614, 7313, 5252, 7412, 9237, 9235, 9999, 7999, 4312	5239, 5254, 5259, 5281, 5290, 5420, 5450, 5451, 5452, 8121, 8140, 8162, 9900, 9910, 9996, 9999, 0000

Source: authors' own construction.

Table A2: Grouping of occupations

Occupation group	Occupation codes (occ_mxus)
Non-routine cognitive (NRC)	
Executive, administrative, and managerial occs	1 – 9
Management-related occupations	10 – 20
Professional specialty occupations	21 – 63
Technicians and related support occupations	64 – 70
Routine cognitive (RC)	
Sales occupations	71 – 78
Administrative support occupations	79 – 91
Routine manual (RM)	
Mechanics and repairers	117 – 123
Construction trades	124 – 135
Extractive occupations	136 – 139
Precision production occupations	140 – 154
Machine operators, assemblers, and inspectors	155 – 173
Transportation and material moving occupations	174 – 181
Non-routine manual (NRM)	
Housekeeping and cleaning occupations	92, 93
Protective service occupations	94 – 96, 98
Other service occupations	99 – 111

Source: authors' own construction.

Table A3: Crosswalk of industry codes

Mexico	USA	ind_mxus	Industry description
1110	0170	1100	Crop production
1121, 1122	0180	1111	Animal production and aquaculture
1130	0190, 0270	1112	Forestry and logging
1141, 1142	0280	1113	Fishing, hunting, and trapping
1150, 1199	0290	1114	Unspecified support activities and services for agriculture
2110, 2132	0370	2111	Oil and gas extraction
2121	0380	2123	Coal mining
2122	0390	2134	Metal ore mining
2123, 2129	0470, 0480	2145	Non-metallic mineral mining and quarrying and mining n.e.c.
2131, 2199	0490	2167	Support mining activities and related services
2210	0570	2211	Electric power generation, transmission, and distribution
2221	0680, 0670	2212	Water, steam, and air conditioning distribution
2222, 2361, 2362, 2363, 2370, 2381, 2382, 2399	0580, 0590, 0690	2213	Electric, gas, and other combinations of energy distribution
2361, 2362, 2363, 2370, 2381, 2382, 2399	0770	2333	Construction
3110	1070, 1080, 1090, 1170, 1180, 1190, 1270, 1280, 1290	3111	Food industry
3120	1370, 1390	3112	Alcoholic beverage and tobacco industry
3130	1470, 1670, 1590	3113	Textile manufacturing industry and intermediary textile goods
3140	1480, 1490, 1570	3114	Textile manufacturing industry of final goods (except clothes)
3150	1680, 1690	3115	Clothing and apparel industry
3160	1790, 1770	3116	Leather manufacturing industry, leather goods, and leather footwear
3220	1870, 1880, 1890	3117	Paper industry and related products
3210	3770, 3780, 3790, 3870, 3875	3118	Wood industry
3230	1990	3119	Printing and related support services
3240	2090	3120	Miscellaneous petroleum and coal products
3250	2070, 2180, 2190, 2270, 2280, 2380, 2290	3121	Chemical industry
3260	2170, 2370, 2390	3122	Plastic and rubber industry
3270	2470, 2480, 2490, 2570, 2590	3123	Non-metallic mineral industry and related manufactured products
3310, 3320	2680, 2690, 2770, 2780, 2670, 2990, 2790, 2870, 2880, 2890, 2970, 2980	3125	Metallurgy and alloys industry, and related manufactured products
3330	3190, 3070, 3080, 3090, 3095, 3170, 3180, 3290	3126	Machinery industry and parts manufacturing
3340	3360, 3365, 3370, 3380	3127	Manufacturing of computers, communication technologies, etc.
3350	3390, 3470, 3490	3128	Manufacturing of electronic goods, equipment, and household electronics

Mexico	USA	ind_mxus	Industry description
3360	3570, 3580, 3590, 3670, 3680, 3690	3129	Manufacturing of transportation engines and related equipment
3370	3890, 3895	3130	Furniture manufacturing and related products industry
3380, 3399	3960, 3970, 3980, 3990	3131	Other miscellaneous manufacturing industries
4310	4470, 4480, 4560, 4580	4311	Food, beverages, and miscellaneous wholesale trade
4320	4390, 4080	4312	Apparel, footwear, and household furniture wholesale trade
4330	4380, 4190, 4195, 4260, 4265	4313	Pharmaceuticals and similar wholesale trade
4340	4090, 4180, 4280, 4370, 4570, 4290	4314	Raw material supplies and similar wholesale trade
4350	4270, 4170, 4490	4315	Machinery, equipment for agriculture, wholesale trade
4360	4070	4316	Truck, car equipment, and related parts wholesale trade
4370, 4399	4585, 4590	4317	Wholesale electronic markets, agents and brokers wholesale trade
4611, 4612	4970, 4980, 4990	4611	Food, beverages, and miscellaneous consumables goods retail trade
4620	4770, 4780	4612	Household appliance and furniture retail trade
4631, 4632	5170, 5180, 5190, 5270, 5275, 5280	4613	Retail sale of textiles, jewellery, clothing accessories, and footwear
4641, 4642	5070, 5080	4614	Retail trade of health care items
4651, 4652	5480, 5290, 5295, 5370, 5670	4615	Retail trade of stationery products, and other articles for personal use
4661, 4662	4790, 4795, 5590, 5380, 5390, 5470, 5490, 5570, 5580, 5690	4616	Retail trade of household electronics gift shops and similar
4671, 4672	4870, 4880, 4890	4617	Retail trade of hardware supplies, hardware tools, and glass products
4681, 4682	5090, 5680, 4670, 4680, 4690	4618	Retail sale of engine vehicles, spare parts, fuels, and lubricants
4690, 4699	5591, 5592, 5790	4620	Retail trade through the internet, print, television, and similar retail trade n.e.c.
4810	6070	4811	Air transportation
4820	6080	4812	Rail transportation
4830	6090	4813	Water transportation
4840	6170	4814	Truck transportation
4850	6180, 6190	4815	Bus service, taxi service, and other urban transit services (except train)
4860	6270	4816	Pipeline transportation
4870	6280	4817	Scenic and sightseeing transportation
4881, 4882, 4899	6290	4818	Services incidental to transportation
4910	6370	4901	Postal service
4920	6380	4902	Couriers and messengers
4930	6390	4903	Warehousing and storage
5110	6470, 6480, 6490	5111	Newspaper, magazine, books, software, and other publishing integrated material
5120	6570, 6590	5112	Film industry, video games, and sound and music industry
5150	6670	5113	Broadcasting media (except internet)
5170	6672, 6675, 6680, 6690, 6692	5114	Other mediums of telecommunication
5180	6790, 6695, 6770	5115	Data processing, services, and storage centres
5190, 5199	6780	5116	Not specified mediums and services of telecommunications

Mexico	USA	ind_mxus	Industry description
5210, 5221, 5222, 5223, 5229	6870, 6880, 6890	5211	Banking and related activities
5230	6970	5212	Securities, commodities, funds, trusts, and other financial investments
5240, 5299	6990	5213	Insurance carriers and related activities
5310	7070	5311	Real estate
5321	7080	5312	Car and truck rental, and other transportation equipment rental
5322	7170, 7180	5313	Miscellaneous personal rental services
5330, 5399	7190	5314	Commercial, industrial, and other intangible assets rental and leasing
5411	7270, 7280, 7290, 7370, 7380, 7390, 7490	5401	Scientific, technical, and other professional services
5412	7460	5402	Research and development services
5413	7480	5403	Veterinary services
5414	7470	5404	Advertising, public relations, and related services (2013 onward)
5510, 5611	7570	5501	Management of companies and enterprises
5612, 5613	7580, 7770, 7690	5602	Landscaping, cleaning and maintenance of building services
5614	7680	5603	Travel arrangements and reservation services
5615	7670	5604	Other administrative and support business services
5616	7780, 7590	5605	Waste management and remediation services
5620	7790	5606	Elementary and secondary schools
6111, 6112, 6119, 6121, 6122, 6129	7860	6101	Educational and training schools
6131, 6132, 6139, 6141, 6142, 6149, 6150, 6199	7870, 7880, 7890	6102	External private health care centres and similar (except hospitals)
6211, 6212, 6219	7970, 7980, 7990, 8070, 8080, 8090, 8170, 8180	6201	Hospitals and professional nursing care facilities
6222, 6229	8190, 8270	6202	Residential care facilities, and similar (except skilled nursing)
6231, 6232, 6239	8290, 8380	6203	Child daycare services
6251, 6252, 6259	8470	6204	Other unspecified social government welfare services
6241, 6242, 6249, 6299	8370, 8390	6205	Entertainment centres, sport centres, and other entertainment services
7111, 7112, 7113, 7114, 7115	8560	7101	Museums, art galleries, historical sites, and similar entertainment centres
7120	8570	7102	Gambling centres and casinos and other unspecified amusement centres
7131, 7132, 7133	8580, 8590, 8670	7103	Temporary housing services, hotels, and travel accommodation
7210	8660	7201	Restaurants, bars, nightclubs, and similar entertainment centres
7221, 7222, 7223	8680, 8690	7202	Repair, maintenance services of automobiles and similar
8111, 8123, 8122	8770, 8780	8101	Repair, maintenance services of equipment and similar
8112, 8119	8790, 8870, 8880, 8890	8102	Barber shops, hair salons, and related personal services
8121, 8124	8970, 8980, 8990, 9070, 9090	8103	Funeral homes, cemeteries, and crematories
8125	9080	8104	Private associations, private clubs, NGOs, unions, and related entities
8130	9160, 9170, 9180, 9190	8105	Private household services

Mexico	USA	ind_mxus	Industry description
8140	9290	8106	Executive, judicial, and legislative bodies
9311	9370, 9380, 9390	9301	Public government administration
9312, 9313, 9314, 9319, 9320	9470, 9480, 9490, 9570, 9590, 9890, 9891, 9892, 9893, 9894, 9895, 9896	9302, 9303	National security and international affairs bodies

Source: authors' own construction.

Table A4: Crosswalk between ind_mxus codes and Comtrade two-digit HS1996 codes

ind_mxus	Comtrade two-digit HS1996
1100, 1114	7, 8, 9, 10, 11, 12, 13, 14, 15
1111	1, 2, 4, 5
1112	6
1113	3
2111, 2123, 2167	27
2134	26
2145	25
3111	16, 17, 18, 19, 20, 21, 23
3112	22, 24
3113	53, 54, 55, 56
3114	57, 58, 59, 60, 66, 67
3115	50, 51, 52, 61, 62, 63, 65
3116	41, 42, 43, 64
3117, 3119	48, 49
3118	44, 45, 46, 47
3121, 3120	28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38
3122	39, 40
3123	68, 69, 70, 71
3125	72, 73, 74, 75, 76, 78, 79, 80, 81, 82, 83
3126, 3127, 3128	84
3129	86, 87, 88, 89
3130	94
3131	85, 90, 91, 92, 93, 95, 96, 97, 99

Source: authors' own construction.

Table A5: Crosswalk between ind_mxus codes and ICIO industry codes

ind_mxus	ICIO code	Industry description
1100–1114	d01t03	Agriculture, forestry, and fishing
2111, 2123	d05t06	Mining and extraction of energy-producing products
2134	d07t08	Mining and quarrying of non-energy-producing products
2167	d09	Mining support service activities
3111–3112	d10t12	Food products, beverages, and tobacco
3113–3116	d13t15	Textiles, wearing apparel, leather, and related products
3118, 3130	d16	Wood and products of wood and cork
3117–3119	d17t18	Paper products and printing
3120	d19	Coke and refined petroleum products
3121	d20t21	Chemicals and pharmaceutical products
3122	d22	Rubber and plastic products
2145, 3123	d23	Other non-metallic mineral products
3125	d24	Basic metals
3127	d25, d26	Fabricated metal, computer, electronic, and optical products
3128	d27	Electrical equipment
3126	d28	Machinery and equipment, n.e.c.
3129	d29	Motor vehicles, trailers, and semi-trailers
3131, 8102	d30	Other transport equipment
2212, 2213, 5606	d31t33	Other manufacturing; repair and installation of machinery and equipment
2211, 2333	d35t39	Electricity, gas, water supply, sewerage, waste and remediation services
4311–4317, 4611-4618, 4620, 8101	d41t43	Construction
4811–4818, 4903	d45t47	Wholesale and retail trade; repair of motor vehicles
7201, 7202	d49t53	Transportation and storage
5111–5113	d55t56	Accommodation and food services
5116	d58t60	Publishing, audiovisual, and broadcasting activities
5114–5115	d61	Telecommunications
5211–5213	d62t63	IT and other information services
5311	d64t66	Financial and insurance activities
5401, 5402, 5501, 5601, 5605	d68	Real estate activities
9301–9303, 9901	d69t82	Other business sector services
6101, 6102	d84	Public admin. and defence; compulsory social security
6201–6203, 6205	d85	Education
4901, 4902, 5312-5314, 5403, 5404, 6204, 7101-7103, 8103-8105	d86t88	Human health and social work
8106	d90t96	Arts, entertainment, recreation, and other service activities
n/a	d97t98	Private households with employed persons

Source: authors' own construction.

Table A6: Occupations with major differences in wage rankings in the USA and Mexico, 2003

Panel A: occupations ranked at least 25 percentile points higher in the USA

	Group	USA percentile	Mexico percentile	US employment share	MX employment share
Hand molders and shapers, except jewellers	RM	43	3	0.02	0.14
Printing and wood treatment machine operators, n.e.c.	RM	47	8	0.24	0.43
Concrete and cement workers	RM	61	33	0.09	0.34
Funeral directors	NRC	66	23	0.04	0.01
Miners	RM	66	22	0.03	0.05
Other metal and plastic workers	RM	68	23	0.12	1.30
Public transportation attendants and inspectors	NRM	77	23	0.12	0.04
Optometrists	NRC	100	68	0.03	0.03

Panel B: occupations ranked at least 45 percentile points higher in Mexico

	Group	USA percentile	Mexico percentile	US employment share	MX employment share
Cashiers, account collectors, and clerks	RC	5	53	2.79	1.29
Supervisors of food preparation and service	NRC	18	77	0.50	0.21
Photographers and motion picture projectionists	NRC	31	77	0.12	0.22
Drywall installers and plasterers	RM	32	77	0.19	0.12
Roofers and slaters	RM	32	80	0.18	0.03
Correspondence and order clerks	RC	31	81	0.46	0.15
Accounting and auditing sales occupations	RC	36	81	1.10	0.87
Protective service, n.e.c.	NRM	9	83	0.11	0.00
Other mining occupations	RM	30	84	0.02	0.03
Teachers, n.e.c.	NRC	28	86	1.22	0.46
Athletes, sports instructors, and officials	NRC	35	88	0.16	0.18
Kindergarten and earlier school teachers	NRC	31	93	0.50	0.63

Note: occupations are ranked based on their median wages in 2003 and assigned to percentiles based on their share of national employment.The assignment of occupations to broad task clusters is described in Appendix Table A2.

Source: authors, based on data from the US CPS and Mexican ENE data.

Table A7: Occupations with the largest changes in employment shares in the USA, 2003–11

Panel A: occupations with the largest declines in employment shares in the USA

		Change in employment share (p.p.)	
	Group	USA	Mexico
Secretaries, typists, and stenographers	RC	-0.791	-0.544
Supervisors, n.e.c.	NRC	-0.734	0.060
Assemblers of electrical equipment	RM	-0.222	-0.279
Carpenters	RM	-0.210	-0.228
Accounting and auditing sales occupations	RC	-0.196	0.036
Salespersons, n.e.c.	RC	-0.195	0.001
Truck, delivery, and tractor drivers	RM	-0.177	0.266
Administrative support jobs, n.e.c.	RC	-0.152	0.958
Machine operators, n.e.c.	RM	-0.151	0.015
Textile sewing machine operators	RM	-0.148	-0.639

Panel B: occupations with the largest increases in employment shares in the USA

		Change in employment share (p.p.)	
	Group	USA	Mexico
Cooks	NRM	0.168	0.811
Primary school teachers	NRC	0.190	-0.068
Bartenders and waiters/waitresses	NRM	0.195	0.202
Cashiers, account collectors, and clerks	RC	0.202	0.084
Other technicians	NRC	0.218	0.114
Health technicians and record technologists	NRC	0.252	0.001
Management support occupations	NRC	0.263	-0.003
Managers and administrators, n.e.c.	NRC	0.304	-0.014
Nurses, therapists and other health occupations	NRC	0.455	0.114
Personal service occupations	NRM	0.612	0.235

Notes: The assignment of occupations to broad task clusters is described in Appendix Table A2.

Source: authors, based on data from the US CPS and Mexican ENE and ENOE.

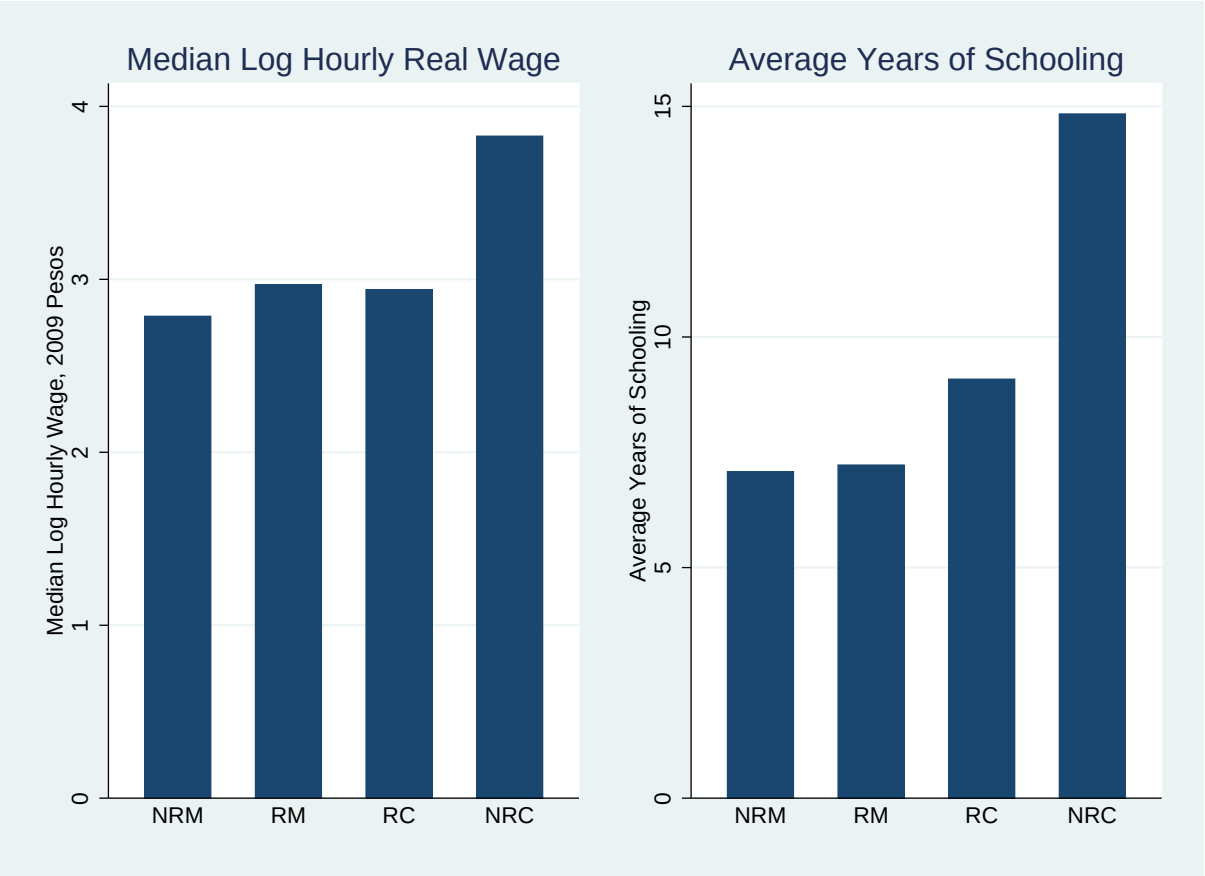
Table A8: Decomposition of changes in occupational employment shares into within-industry and between-industry components

	USA		Mexico	
	2005–11	2013–18	2005–11	2013–18
Non-routine cognitive				
Total change	1.88	1.83	0.10	0.18
Between industry	0.96	0.16	0.25	–0.09
Within industry	0.91	1.66	–0.15	0.27
Routine cognitive				
Total change	–1.23	–1.46	0.88	–1.46
Between industry	–0.39	–0.34	0.49	–1.33
Within industry	–0.84	–1.12	0.39	–0.13
Routine manual				
Total change	–2.22	0.44	–2.38	1.62
Between industry	–1.82	0.34	–2.13	1.54
Within industry	–0.40	0.10	–0.25	0.07
Non-routine manual				
Total change	1.58	–0.81	1.40	–0.34
Between industry	1.25	–0.16	1.39	–0.13
Within industry	0.33	–0.64	0.01	–0.21

Notes: the table shows the results of the decomposition in Equation (1) based on the ind_mxus industry aggregation, as detailed in Appendix Table A3.

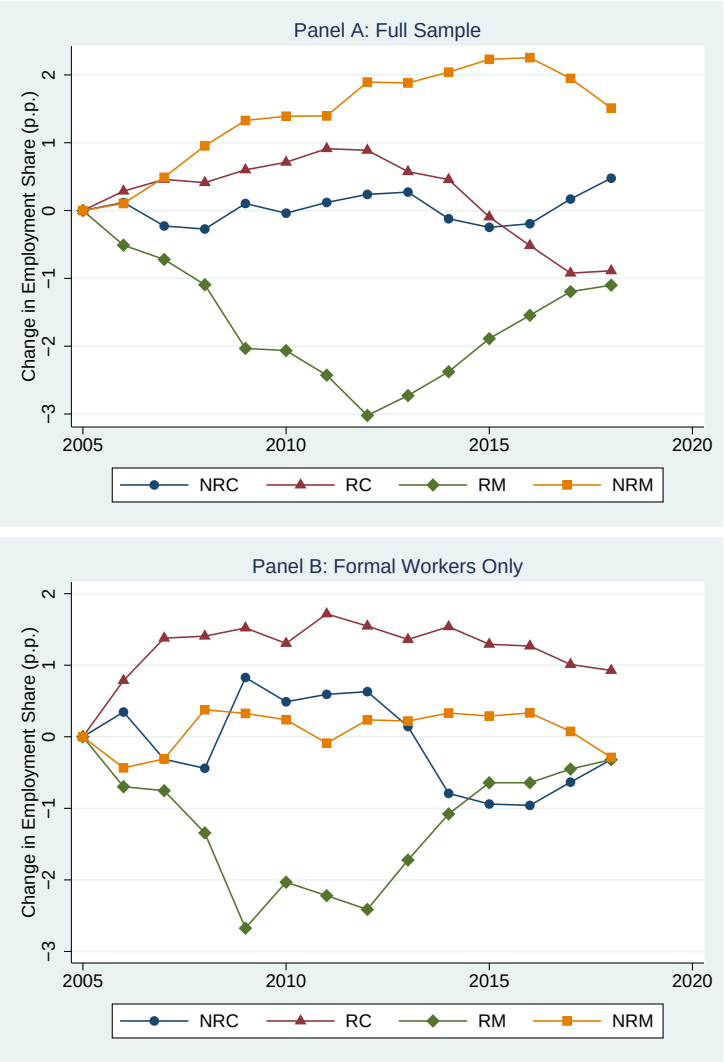
Source: authors, based on data from the US CPS and Mexican ENOE

Figure A1: Wage and education levels across major occupation groups in 2003, Mexico



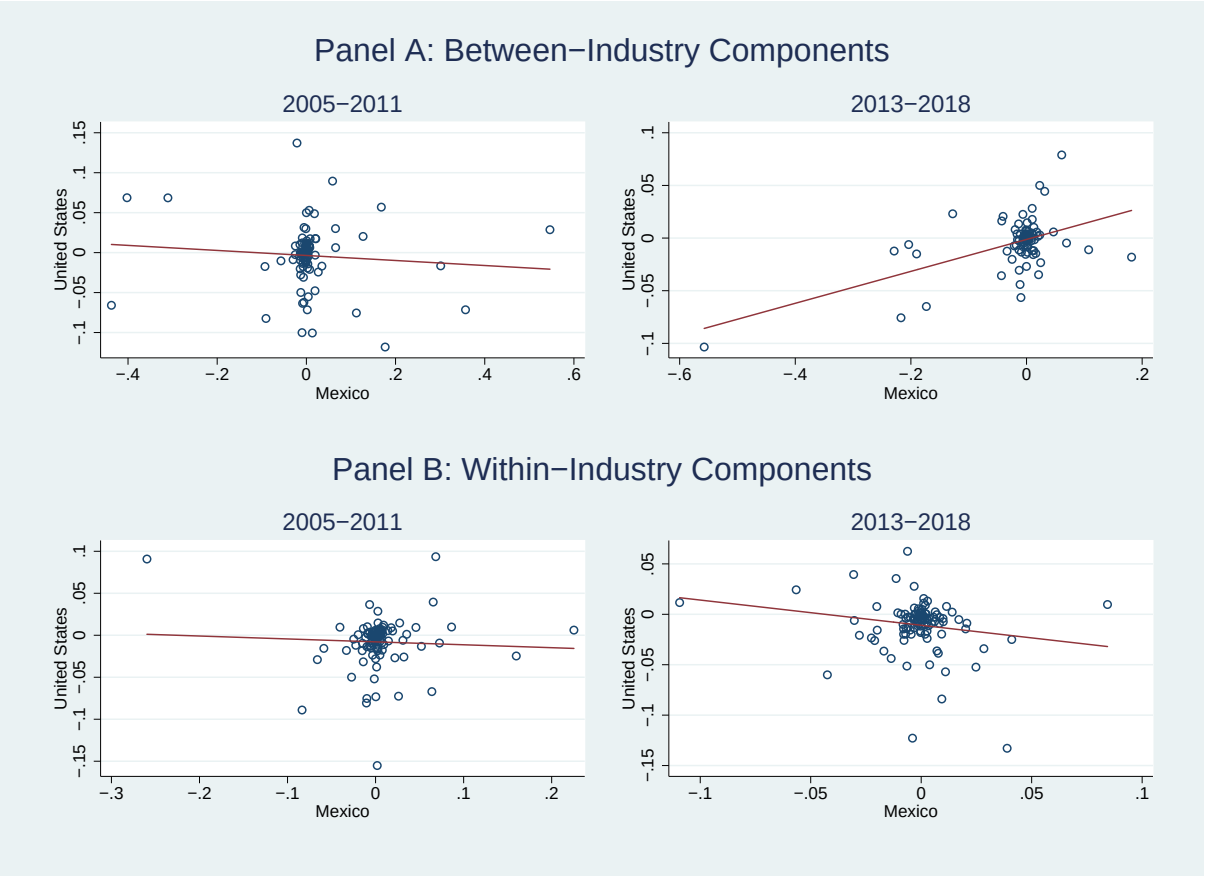
Source: authors, based on Mexican ENE data, using the aggregation to four broad task clusters described in Appendix Table A2.

Figure A2: Employment share changes, overall and formal-sector workers only, Mexico



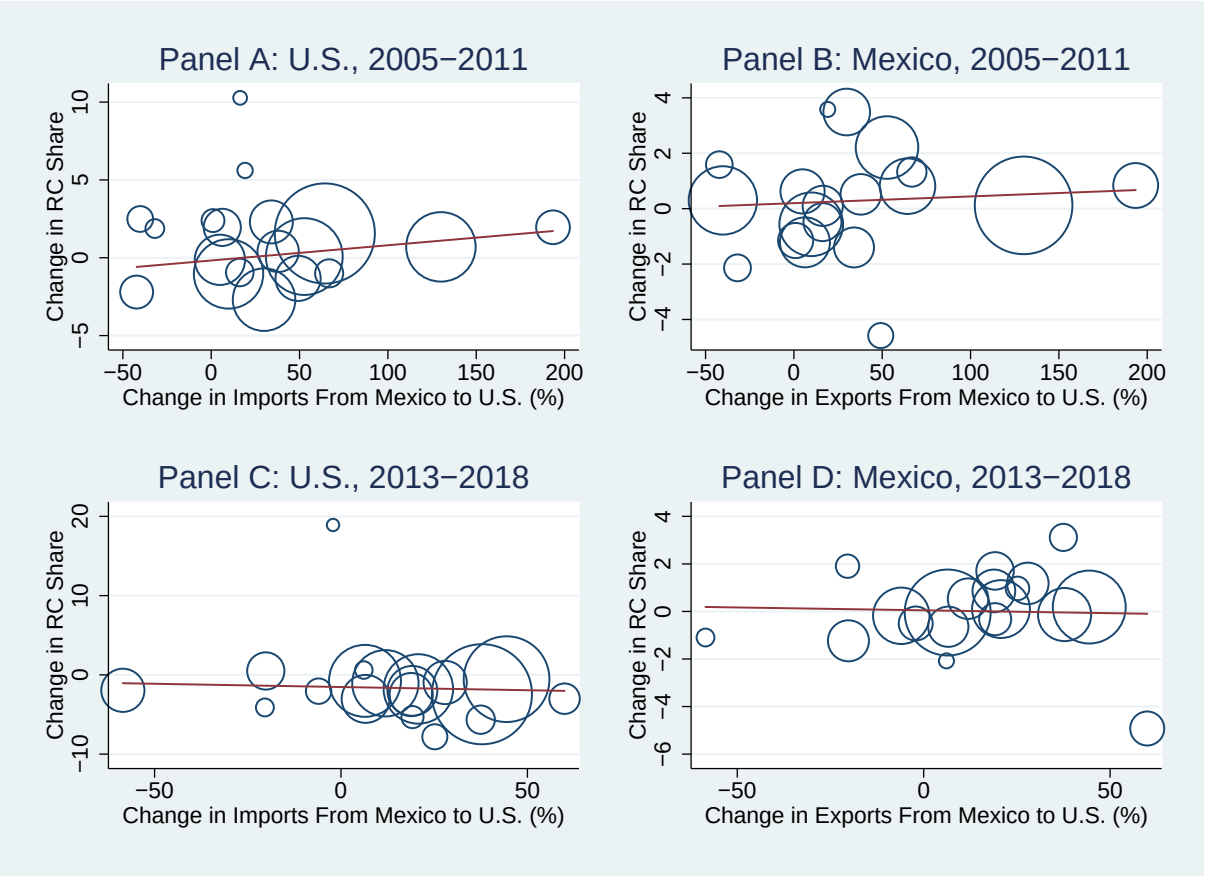
Note: the aggregation to the four broad task clusters is described in Appendix Table A2. The figure uses 2005 as the base year due to a change in that year in the way in which informality status is recorded in the Mexican labour force survey.
Source: authors, based on data from the Mexican ENOE.

Figure A3: Industry contributions to changes in routine cognitive employment share



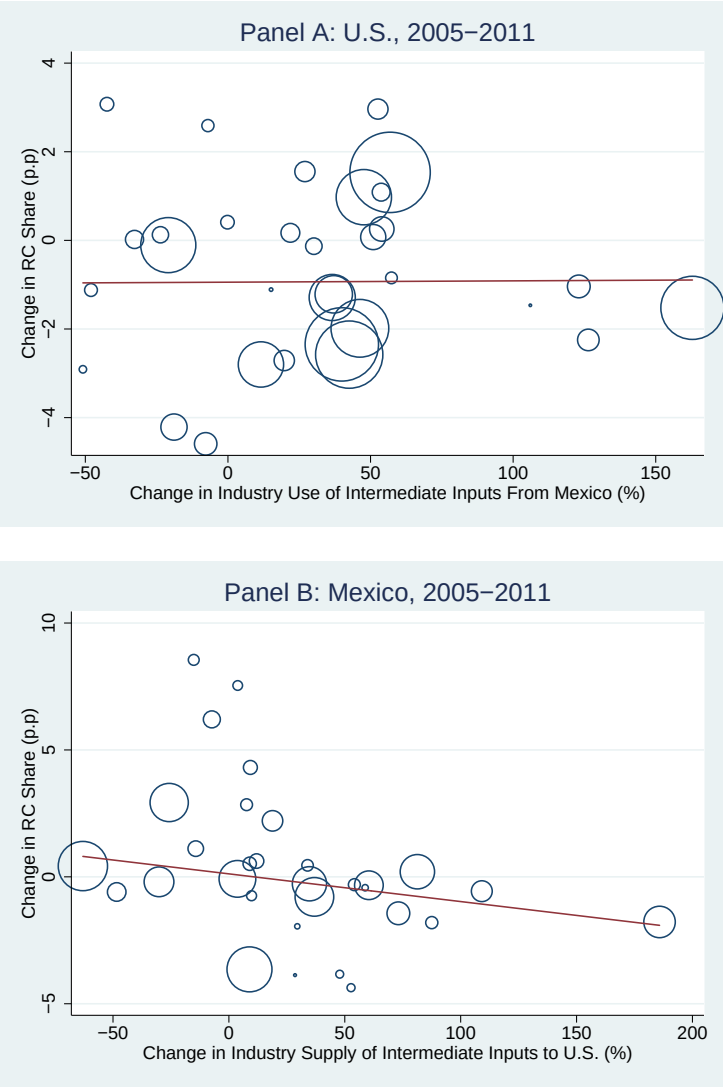
Note: each circle represents an ind_mxus industry, as detailed in Appendix Table A3. Panel A reports the contribution of each industry to the between-industry component of the change in the RC employment share, while Panel B reports the contribution of each industry to the within-industry component of the change in the RC employment share.
Source: authors, based on the decomposition in Equation (1) using US CPS and Mexican ENOE data.

Figure A4: Change in industrial routine cognitive employment share and trade between Mexico and the USA



Note: each circle represents a tradable industry, as detailed in Appendix Table A4, with the size scaled according to the industry's share of aggregate employment in the corresponding country in 2011 (Panels A and B) or 2018 (Panels C and D). The figure plots the relationship between the change in imports from Mexico to the USA in each industry, and the change in the share of RC employment within the industry. We exclude industries in the agricultural and forestry sectors (in line with our exclusion of workers in agriculture and farming occupations), as well as the metal ore mining industry, which is an outlier and corresponds to a very small fraction of overall employment in both countries.
Source: authors, based on trade data from Comtrade and employment data from the US CPS and the Mexican ENOE.

Figure A5: Change in industrial routine cognitive employment share and intermediate goods trade between Mexico and the USA



Note: each circle represents a tradable industry, as detailed in Appendix Table A5, with the size scaled according to the industry's share of aggregate employment in the corresponding country in 2011. Panel A plots the relationship between the change in each US industry's use of intermediate inputs from Mexico, and the change in its share of RC employment. Panel B plots the relationship between the change in each Mexican industry's supply of intermediate inputs to the USA, and the change in its share of RC employment. Panel A excludes publishing, which is an outlier and accounts for a very small proportion of employment in the USA; Panel B excludes mining support, which is an outlier and accounts for a very small proportion of employment in Mexico. The lines of best fit are computed including these outliers.
Source: authors, based on input–output from the OECD ICIO Tables and employment data from the US CPS and the Mexican ENOE.