Are Routine Jobs Moving South?
Evidence from Changes in the Occupational Structure of Employment in the U.S. and Mexico

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Diego M. Morris (Nottingham Trent University)

May 2019
Motivation

- Falling share of employment in routine task-intensive, middle-wage jobs

- Widely documented across developed countries (Goos, Manning & Salomons, 2009; Acemoglu & Autor, 2011)

- Potential driving forces:
  - Routine-replacing technological change: e.g. Autor, Levy & Murnane (2003), Goos & Manning (2007)

- These two driving forces have very different implications in terms of patterns that should be observed in developing countries
Motivation

1. Falling trade/offshoring costs:
   - Routine jobs moving South
   - Should observe an increase in routine employment in countries such as Mexico
     - “Our jobs are fleeing the country, they are going to Mexico, and many other countries” (Donald Trump, 2016)

2. Routine-replacing technological change:
   - Routine jobs disappearing everywhere
   - Should observe a decrease in routine employment in countries such as Mexico
Our Paper

- Contrast changes in occupational structure of employment in the U.S. and Mexico

- Use detailed (~185) job categories based on matching of occupational codes (job titles)

- Compare evolution of employment across common occupational categories, not along the occupational wage distribution
  - Routine-intensive jobs need not be middle-wage jobs in Mexico

- Determine whether routine-intensive occupations are growing or shrinking in Mexico
Preview of Findings

For 2001–2011:
- Employment share changes positively correlated across the two countries
- Routine manual jobs generally declining in both countries

For 2013–2018:
- Routine manual jobs as a whole are stable in US; growing in Mexico
- Patterns across detailed job categories remain positively correlated, even when focusing on auto industry (which grows strongly in Mexico)

Overall:
- No support for hypothesis that routine jobs have moved from the U.S. to Mexico
- Common shocks seem a more likely driver of the changes
Contributions to the Literature

**Polarization Literature:**
- So far, limited evidence on de-routinization outside of high-income countries [exceptions: World Bank (2016), Ariza & Raymond Bara (2018), Reijnders & de Vries (2018)]
- New evidence for Mexico; much finer level of detail; US-Mexico comparison

**Offshoring Literature:**
- So far, mainly focused on impacts on skill premium [e.g. Goldberg & Pavcnik (2007), Autor, Dorn & Hanson (2013), Acemoglu, Gancia & Zilibotti (2015), Burstein & Vogel (2017), Hummels, Munch & Xiang (2018)]
- Alternative approach to explore basic underlying idea that certain jobs are moving to developing countries due to falling trade/offshoring costs

**Impacts of Trade on Mexican Labor Market:** e.g. Iacovone, Rauch & Winters (2013), Utar & Torres Ruiz (2013), Mendez (2015)
Data

National Labor Force Survey micro-data for both countries

Mexico:
- Encuesta Nacional de Empleo (ENE); Encuesta Nacional de Ocupación y Empleo (ENOE)
- Quarterly frequency; 2001–2018
- $\sim 594,000$ obs per year

United States:
- Current Population Survey (CPS)
- Monthly frequency
- $\sim 730,000$ obs per year
Sample Restrictions

- Civilian workers aged 16–65
- Non-missing information on current occupation
- Exclude workers in agriculture and farming occupations
- Mexican data includes both formal and informal sector workers
## Table: Descriptive Statistics for Employed Workers

<table>
<thead>
<tr>
<th></th>
<th>U.S.</th>
<th>Mexico</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2005 2018</td>
<td>2005 2018</td>
</tr>
<tr>
<td>Average Age</td>
<td>39.63 40.63</td>
<td>35.98 38.16</td>
</tr>
<tr>
<td>Fraction Female</td>
<td>46.77 47.39</td>
<td>40.82 42.41</td>
</tr>
<tr>
<td>Average Real Wage (2009 USD)</td>
<td>19.92 21.43</td>
<td>2.32 2.04</td>
</tr>
<tr>
<td>Manufacturing Share of Emp</td>
<td>11.71 10.26</td>
<td>19.57 19.15</td>
</tr>
</tbody>
</table>

**Educational Composition:**

<table>
<thead>
<tr>
<th>Educational Level</th>
<th>U.S.</th>
<th>Mexico</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementary Education or Less</td>
<td>1.95 1.46</td>
<td>31.31 18.89</td>
</tr>
<tr>
<td>Middle School</td>
<td>8.06 5.35</td>
<td>27.09 29.18</td>
</tr>
<tr>
<td>High School</td>
<td>60.07 55.38</td>
<td>24.05 27.52</td>
</tr>
<tr>
<td>College Education or Higher</td>
<td>29.93 37.80</td>
<td>17.55 24.41</td>
</tr>
</tbody>
</table>

| Nr of Observations (Unweighted) | 764,197 651,179 | 572,500 592,236 |
Matching Occupation Codes

We match occupation codes across the two countries in order to compare the evolution of employment by occupation.

Matching based on job titles: e.g., “accountants and auditors”, “engineers and scientists”

~185 occupational categories matched across the two countries.
## Occupation Matching: Examples

<table>
<thead>
<tr>
<th>Code</th>
<th>Occupation Description</th>
<th>occ1990dd Codes</th>
<th>CMO Codes</th>
<th>SINCO Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>33</td>
<td>Physicians</td>
<td>84</td>
<td>1130</td>
<td>2411, 2412, 2424</td>
</tr>
<tr>
<td>34</td>
<td>Dentists</td>
<td>85</td>
<td>1132</td>
<td>2413</td>
</tr>
<tr>
<td>35</td>
<td>Veterinarians</td>
<td>86</td>
<td>1151, 1241</td>
<td>2232, 2614</td>
</tr>
<tr>
<td>36</td>
<td>Optometrists</td>
<td>87, 677</td>
<td>1133, 1222</td>
<td>2422</td>
</tr>
<tr>
<td>37</td>
<td>Nurses, Therapists and Other Health Occupations</td>
<td>89, 88, 83, 95, 98, 99, 103, 104, 105, 106</td>
<td>1139, 1131</td>
<td>2425, 2817, 2823, 2824, 2825, 2826, 2426</td>
</tr>
<tr>
<td>38</td>
<td>Pharmacists</td>
<td>96</td>
<td>1121, 1231</td>
<td>2428, 2814</td>
</tr>
<tr>
<td>39</td>
<td>Dieticians and Nutritionists</td>
<td>97</td>
<td>1134, 1223</td>
<td>2423, 2816</td>
</tr>
<tr>
<td>40</td>
<td>Subject Instructors (College)</td>
<td>154</td>
<td>1300</td>
<td>2321</td>
</tr>
<tr>
<td>41</td>
<td>Kindergarten and Earlier School Teachers</td>
<td>155</td>
<td>1340</td>
<td>2335</td>
</tr>
</tbody>
</table>
## Occupation Matching: Examples

<table>
<thead>
<tr>
<th>Code</th>
<th>Occupation Description</th>
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<th>CMO Codes</th>
<th>SINCO Codes</th>
</tr>
</thead>
<tbody>
<tr>
<td>67</td>
<td>Airplane Pilots and Traffic Controllers</td>
<td>226, 227</td>
<td>5530, 8102</td>
<td>8311, 5231</td>
</tr>
<tr>
<td>68</td>
<td>Technicians, n.e.c.</td>
<td>235</td>
<td>1242, 1252, 1290, 1209, 1249</td>
<td>2511, 2512, 2532, 2991, 2992</td>
</tr>
<tr>
<td>69</td>
<td>Salespersons</td>
<td>274, 275, 256</td>
<td>7100, 7110, 7120, 7121, 7190, 7111</td>
<td>4111, 4231, 9723, 4999, 4221, 4211, 4213</td>
</tr>
<tr>
<td>70</td>
<td>Cashiers and Account Collectors</td>
<td>276, 328, 338, 378, 383</td>
<td>6210, 6211, 6219</td>
<td>3121, 3122, 9732</td>
</tr>
<tr>
<td>71</td>
<td>Door-to-door Sales, Street Sales, and News Vendors</td>
<td>277</td>
<td>7200, 7201, 7210, 7211, 7213, 7209, 7219, 7290</td>
<td>9511, 9512, 9521, 9624, 4224</td>
</tr>
<tr>
<td>72</td>
<td>Supervisors and Inspectors, n.e.c.</td>
<td>303, 361</td>
<td>6102, 6120, 6130, 6131, 6132, 6150, 6180, 6139</td>
<td>1621, 1622, 1721, 1524, 1722, 1624, 1629, 3201, 3101</td>
</tr>
</tbody>
</table>
### Grouping of Occupations

<table>
<thead>
<tr>
<th>Occupation Group</th>
<th>Occupation Codes (occ_mxus)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Non-Routine Cognitive (NRC)</strong></td>
<td></td>
</tr>
<tr>
<td>Executive and Managerial Occupations</td>
<td>1 – 9</td>
</tr>
<tr>
<td>Management Related Occupations</td>
<td>10 – 18</td>
</tr>
<tr>
<td>Professional Specialty Occupations</td>
<td>19 – 60</td>
</tr>
<tr>
<td>Technicians and Related Occupations</td>
<td>61 – 68</td>
</tr>
<tr>
<td><strong>Routine Cognitive (RC)</strong></td>
<td></td>
</tr>
<tr>
<td>Sales Occupations</td>
<td>69 – 71</td>
</tr>
<tr>
<td>Administrative Support Occupations</td>
<td>72 – 88</td>
</tr>
<tr>
<td><strong>Routine Manual (RM)</strong></td>
<td></td>
</tr>
<tr>
<td>Mechanics and Repairers</td>
<td>117 – 123</td>
</tr>
<tr>
<td>Construction Occupations</td>
<td>124 – 136</td>
</tr>
<tr>
<td>Extractive Occupations</td>
<td>137 – 140</td>
</tr>
<tr>
<td>Precision Production Occupations</td>
<td>141 – 156</td>
</tr>
<tr>
<td>Machine Operators, Assemblers, and Inspectors</td>
<td>157 – 175</td>
</tr>
<tr>
<td>Transportation and Material Moving Occupations</td>
<td>176 – 185</td>
</tr>
<tr>
<td><strong>Non-Routine Manual (NRM)</strong></td>
<td></td>
</tr>
<tr>
<td>Housekeeping and Cleaning Occupations</td>
<td>89 – 90</td>
</tr>
<tr>
<td>Protective Service Occupations</td>
<td>91 – 96</td>
</tr>
<tr>
<td>Other Service Occupations</td>
<td>97 – 111</td>
</tr>
</tbody>
</table>
Cross-Country Comparability
Similar Occupational Mix within Industries

Occupational Employment Shares
By industry, 2005

Non–Routine Cognitive Share
Routine Cognitive Share
Routine Manual Share
Non–Routine Manual Share
Wages across Detailed Occ Categ: US vs MX

Panel A: Median Log Real Wages, 2005

U.S. Median Log Real Wage in 2005 (2009 USD)

Mexico Median Log Real Wage in 2005 (2009 USD)
Panel B: Median Log Real Wages, 2018

- U.S. Median Log Real Wage in 2018 (2009 USD)
- Mexico Median Log Real Wage in 2018 (2009 USD)
Employment Changes: Broad Occupation Groups
Employment Share Changes: US

Panel B: 2001–2018

Change in Employment Share (p.p.)

NRC RC RM NRM

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Employment Share Changes: Mexico

Mexico: 2001–2018

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Employment Share Changes: Mexico, 2001–2011

Changes in Employment Share, 2001–2011

Non Routine Cognitive

Routine Cognitive

Routine Manual

Non Routine Manual

Change in Employment Share (p.p. change)

-8, -6  (-6, -4]  (-4, -2]  (-2, 0]  (0, 2]  (2, 4]  (4, 6]  (6, 8]

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Employment Share Changes: Mexico, 2013–2018

Changes in Employment Share, 2013–2018

- Non Routine Cognitive
- Routine Cognitive
- Routine Manual
- Non Routine Manual

Change in Employment Share (p.p. change)

- [-8, -6] (0, 2]
- (-6, -4] (2, 4]
- (-4, -2] (4, 6]
- (-2, 0] (6, 8]

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Change in Emp Share

-2 -1 0 1 2

Other Service
Housekeeping, Cleaning
Protective Service
Transp, Material Moving
Machine Operators
Precision Production
Construction
Mechanics, Repairers
Extractive
Sales
Admin Support
Technicians
Management Related
Executive, Managerial
Professional Specialty

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Employment Share Changes: Mexico, 2001–2011

Mexico: 2001–2011

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Employment Share Changes: Mexico, 2013–2018

Mexico: 2013–2018

Change in Emp Share

Other Service
Housekeeping, Cleaning
Protective Service
Transp, Material Moving
Machine Operators
Precision Production
Construction
Extractive
Sales
Admin Support
Technicians
Management Related
Executive, Managerial
Professional Specialty

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Employment Changes: Detailed Occupation Groups
Main Result: Emp Share Chgs, 2003–11, US vs MX

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NRC RC RM NRM

Graph showing the employment share change for the U.S. and Mexico from 2003 to 2011, with different symbols representing different categories.
Table: Occupations with largest declines in emp shares in the U.S., 2003–11

<table>
<thead>
<tr>
<th>Group</th>
<th>Chg in Emp Share (p.p.)</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>U.S.</td>
<td>Mexico</td>
</tr>
<tr>
<td>Secretaries, Typists and Stenographers</td>
<td>RC</td>
<td>-0.790</td>
<td>-0.544</td>
</tr>
<tr>
<td>Chief Executive, Proprietors, Public Admin</td>
<td>NRC</td>
<td>-0.424</td>
<td>-0.181</td>
</tr>
<tr>
<td>Assemblers of Electrical Equipment</td>
<td>RM</td>
<td>-0.222</td>
<td>-0.279</td>
</tr>
<tr>
<td>Accountants and Auditors</td>
<td>NRC</td>
<td>-0.218</td>
<td>-0.023</td>
</tr>
<tr>
<td>Carpenters</td>
<td>RM</td>
<td>-0.209</td>
<td>-0.228</td>
</tr>
<tr>
<td>Supervisors of Construction Work</td>
<td>RM</td>
<td>-0.201</td>
<td>0.011</td>
</tr>
<tr>
<td>Truck, Delivery, and Tractor Drivers</td>
<td>RM</td>
<td>-0.177</td>
<td>0.266</td>
</tr>
<tr>
<td>Records Clerks</td>
<td>RC</td>
<td>-0.169</td>
<td>-0.020</td>
</tr>
<tr>
<td>Supervisors and Inspectors, n.e.c.</td>
<td>RC</td>
<td>-0.164</td>
<td>0.038</td>
</tr>
<tr>
<td>Supervisors, n.e.c.</td>
<td>RM</td>
<td>-0.162</td>
<td>0.026</td>
</tr>
<tr>
<td>Machine Operators, n.e.c.</td>
<td>RM</td>
<td>-0.151</td>
<td>0.015</td>
</tr>
<tr>
<td>Textile Sewing Machine Operators</td>
<td>RM</td>
<td>-0.148</td>
<td>-0.639</td>
</tr>
</tbody>
</table>
Table: Occupations with largest increases in emp shares in the U.S., 2003–11

<table>
<thead>
<tr>
<th>Group</th>
<th>Chg in Emp Share (p.p.)</th>
<th>U.S.</th>
<th>Mexico</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers, n.e.c.</td>
<td>NRC</td>
<td>0.134</td>
<td>-0.073</td>
</tr>
<tr>
<td>Guards and Police, Except Public Service</td>
<td>NRM</td>
<td>0.139</td>
<td>-0.031</td>
</tr>
<tr>
<td>Janitors and Pest Control Workers</td>
<td>NRM</td>
<td>0.141</td>
<td>0.155</td>
</tr>
<tr>
<td>Lawyers and Judges</td>
<td>NRC</td>
<td>0.149</td>
<td>0.169</td>
</tr>
<tr>
<td>Cooks</td>
<td>NRM</td>
<td>0.168</td>
<td>0.811</td>
</tr>
<tr>
<td>Primary School Teachers</td>
<td>NRC</td>
<td>0.190</td>
<td>-0.068</td>
</tr>
<tr>
<td>Bartenders and Waiters/Waitresses</td>
<td>NRM</td>
<td>0.195</td>
<td>0.202</td>
</tr>
<tr>
<td>Cashiers and Account Collectors</td>
<td>RC</td>
<td>0.202</td>
<td>0.084</td>
</tr>
<tr>
<td>Other Technicians</td>
<td>NRC</td>
<td>0.218</td>
<td>0.114</td>
</tr>
<tr>
<td>Management Support Occupations</td>
<td>NRC</td>
<td>0.263</td>
<td>-0.003</td>
</tr>
<tr>
<td>Managers and administrators, n.e.c.</td>
<td>NRC</td>
<td>0.304</td>
<td>-0.014</td>
</tr>
<tr>
<td>Nurses, Therapists and Other Health Occupations</td>
<td>NRC</td>
<td>1.088</td>
<td>0.114</td>
</tr>
</tbody>
</table>
Lagged Changes?


Mexico, Employment Share Change, 2003−2011 (p.p.)

NRC RC RM NRM

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Focusing on the Auto Industry

Manufacturing of Transp Vehicles and Related Equipment
Share of Aggregate Employment

- **US**
- **Mexico**

![Graph showing the share of aggregate employment in manufacturing of transport vehicles and related equipment from 2005 to 2020 for the US and Mexico. The graph indicates a trend where Mexico's share has increased over time, surpassing the US share by 2015.]
Focusing on the Auto Industry

Manufacturing of Transp Vehicles and Related Equipment


Mexico, Employment Share Change, 2013–2018 (p.p.)

NRC RC RM NRM

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May 2019
Summary

- We compare employment patterns across ~185 detailed occupational categories in the U.S. and Mexico.

- Generally positive correlation in employment share changes across the two countries, even when considering routine manual jobs within the auto manufacturing sector.

⇒ Little support for hypothesis that jobs have moved from the U.S. to Mexico in large numbers.

- Occupational inputs across countries seem more complementary than substitutable.

- Common shocks that drive changes in both countries a more likely explanation for the observed patterns.
Thank you!