

# Offshoring and the Onshore Composition of Tasks and Skills

(just) published in J Intl Econ 2013, Vol. 90(1), 91-106

*Sascha O. Becker*<sup>1</sup>, Karolina Ekholm<sup>2</sup>  
and Marc-Andreas Muendler<sup>3</sup>

<sup>1</sup>CAGE @ U Warwick

<sup>2</sup>Sveriges Riksbank

<sup>3</sup>UC San Diego

PEUK13

# Background

- ▶ Studies of the effect of FDI (in-house offshoring) on the composition of labor demand typically find small or negligible effects.
  - ▶ E.g. work by Slaughter (2000), Head and Ries, (2002)
- ▶ Offshoring of intermediate inputs contributes to an increased relative demand for high-skilled workers.
  - ▶ US imports contribute 15-40 percent to an increased relative demand for non-production workers (Feenstra and Hanson, 1999).

# Background

- ▶ Studies of the effect of FDI (in-house offshoring) on the composition of labor demand typically find small or negligible effects.
  - ▶ E.g. work by Slaughter (2000), Head and Ries, (2002)
- ▶ Offshoring of intermediate inputs contributes to an increased relative demand for high-skilled workers.
  - ▶ US imports contribute 15-40 percent to an increased relative demand for non-production workers (Feenstra and Hanson, 1999).

# Background

- ▶ Potential explanations for weak correlation between offshoring and changes in the skill composition of the work force:
  - ▶ Offshoring may increase the relative demand for unskilled workers, depending on effect on productivity (Jones and Kierzkowski, 2001, Grossman and Rossi-Hansberg, 2008, Kohler, 2008).
  - ▶ The ease to which jobs can be offshored may be only weakly correlated with its skill content (Markusen, 2006)
  - ▶ Computer programmer versus janitor.

# Background

- ▶ Potential explanations for weak correlation between offshoring and changes in the skill composition of the work force:
  - ▶ Offshoring may increase the relative demand for unskilled workers, depending on effect on productivity (Jones and Kierzkowski, 2001, Grossman and Rossi-Hansberg, 2008, Kohler, 2008).
  - ▶ The ease to which jobs can be offshored may be only weakly correlated with its skill content (Markusen, 2006)
  - ▶ Computer programmer versus janitor.

# Background

- ▶ Potential explanations for weak correlation between offshoring and changes in the skill composition of the work force:
  - ▶ Offshoring may increase the relative demand for unskilled workers, depending on effect on productivity (Jones and Kierzkowski, 2001, Grossman and Rossi-Hansberg, 2008, Kohler, 2008).
  - ▶ The ease to which jobs can be offshored may be only weakly correlated with its skill content (Markusen, 2006)
  - ▶ Computer programmer versus janitor.

# Background

- ▶ Potential explanations for weak correlation between offshoring and changes in the skill composition of the work force:
  - ▶ Offshoring may increase the relative demand for unskilled workers, depending on effect on productivity (Jones and Kierzkowski, 2001, Grossman and Rossi-Hansberg, 2008, Kohler, 2008).
  - ▶ The ease to which jobs can be offshored may be only weakly correlated with its skill content (Markusen, 2006)
  - ▶ Computer programmer versus janitor.

## The tradability of tasks

- ▶ The *tradability* of tasks is related to whether they:
  - ▶ are routine tasks that can be easily summarized by deductive rules (Levy and Murnane, 2004)
  - ▶ require codifiable rather than tacit information (Leamer and Storper, 2001).
  - ▶ do not require physical contact and geographic proximity (Blinder, 2006).
- ▶ Evidence that IT has had effects on the nature of tasks performed on the job.
  - ▶ Autor, Levy, and Murnane (2003): US computerization associated with reduced inputs of workers carrying out *routine manual* and *cognitive* tasks and increased inputs of workers carrying out *nonroutine cognitive* tasks.



## The tradability of tasks

- ▶ The *tradability* of tasks is related to whether they:
  - ▶ are routine tasks that can be easily summarized by deductive rules (Levy and Murnane, 2004)
  - ▶ require codifiable rather than tacit information (Leamer and Storper, 2001).
  - ▶ do not require physical contact and geographic proximity (Blinder, 2006).
- ▶ Evidence that IT has had effects on the nature of tasks performed on the job.
  - ▶ Autor, Levy, and Murnane (2003): US computerization associated with reduced inputs of workers carrying out *routine manual* and *cognitive* tasks and increased inputs of workers carrying out *nonroutine cognitive* tasks.

## Our contribution

- ▶ Revisit the issue of how FDI affects the composition of labor demand at parent firms.
- ▶ Use data that enable us to distinguish between:
  - ▶ (i) occupations (white-collar versus blue-collar),
  - ▶ (ii) education (at least upper-secondary education versus at most lower secondary education), and
  - ▶ (iii) tasks (non-routine versus routine/interactive versus non-interactive).
- ▶ Provide empirical evidence on the relevance of a focus on tasks when analyzing effects of offshoring on relative labor demand.
- ▶ Provide evidence for the service sector as well as the manufacturing sector.

## Our contribution

- ▶ Revisit the issue of how FDI affects the composition of labor demand at parent firms.
- ▶ Use data that enable us to distinguish between:
  - ▶ (i) occupations (white-collar versus blue-collar),
  - ▶ (ii) education (at least upper-secondary education versus at most lower secondary education), and
  - ▶ (iii) tasks (non-routine versus routine/interactive versus non-interactive).
- ▶ Provide empirical evidence on the relevance of a focus on tasks when analyzing effects of offshoring on relative labor demand.
- ▶ Provide evidence for the service sector as well as the manufacturing sector.

## Our contribution

- ▶ Revisit the issue of how FDI affects the composition of labor demand at parent firms.
- ▶ Use data that enable us to distinguish between:
  - ▶ (i) occupations (white-collar versus blue-collar),
  - ▶ (ii) education (at least upper-secondary education versus at most lower secondary education), and
  - ▶ (iii) tasks (non-routine versus routine/interactive versus non-interactive).
- ▶ Provide empirical evidence on the relevance of a focus on tasks when analyzing effects of offshoring on relative labor demand.
- ▶ Provide evidence for the service sector as well as the manufacturing sector.

## Our contribution

- ▶ Revisit the issue of how FDI affects the composition of labor demand at parent firms.
- ▶ Use data that enable us to distinguish between:
  - ▶ (i) occupations (white-collar versus blue-collar),
  - ▶ (ii) education (at least upper-secondary education versus at most lower secondary education), and
  - ▶ (iii) tasks (non-routine versus routine/interactive versus non-interactive).
- ▶ Provide empirical evidence on the relevance of a focus on tasks when analyzing effects of offshoring on relative labor demand.
- ▶ Provide evidence for the service sector as well as the manufacturing sector.

# Data

- ▶ We match data from the Deutsche Bundesbank on affiliate activities of German MNEs (MIDI-USTAN database) with worker-level social security data from the German Federal Labor Agency (Bundesagentur für Arbeit, BA).
  - ▶ Use information at plant level.
  - ▶ Use commercial database MARKUS (from Verband der Vereine Creditreform) to identify all German affiliates of MIDI-USTAN firms, to which we then link BA plants.
  - ▶ Panel at plant level 1998-2001 containing 1,252 plants at about 500 MNEs.
- ▶ Task content of occupations based on information from survey conducted by the German Federal Institute for Vocational Training (BIBB) and the Research Institute of BA (IAB).

# Data

- ▶ We match data from the Deutsche Bundesbank on affiliate activities of German MNEs (MIDI-USTAN database) with worker-level social security data from the German Federal Labor Agency (Bundesagentur für Arbeit, BA).
  - ▶ Use information at plant level.
  - ▶ Use commercial database MARKUS (from Verband der Vereine Creditreform) to identify all German affiliates of MIDI-USTAN firms, to which we then link BA plants.
  - ▶ Panel at plant level 1998-2001 containing 1,252 plants at about 500 MNEs.
- ▶ Task content of occupations based on information from survey conducted by the German Federal Institute for Vocational Training (BIBB) and the Research Institute of BA (IAB).

## Task content of occupations

- ▶ Inferred from 81 questions about:
  - ▶ tools, instruments and other equipment used by the employee.
  - ▶ the extent to which the work is related to computer programming, repairing and supervision.
- ▶ Create indicators of whether a job implies:
  - ▶ non-routine (NR) tasks.
  - ▶ tasks requiring personal interaction (Int) with other workers in the firm and/or with the firm's customers.
- ▶ Suppose maximum number of NR tasks carried out by any occupation is 20 and secretaries report an average of 5.
  - ▶ We assign secretaries the value  $5/20=0.25$ .
  - ▶ 25% of the wagebill of secretaries at a plant is wages paid for NR tasks.
  - ▶ 25% of the labor input of secretaries at a plant is input of NR tasks.



## Task content of occupations

- ▶ Inferred from 81 questions about:
  - ▶ tools, instruments and other equipment used by the employee.
  - ▶ the extent to which the work is related to computer programming, repairing and supervision.
- ▶ Create indicators of whether a job implies:
  - ▶ non-routine (NR) tasks.
  - ▶ tasks requiring personal interaction (Int) with other workers in the firm and/or with the firm's customers.
- ▶ Suppose maximum number of NR tasks carried out by any occupation is 20 and secretaries report an average of 5.
  - ▶ We assign secretaries the value  $5/20=0.25$ .
  - ▶ 25% of the wagebill of secretaries at a plant is wages paid for NR tasks.
  - ▶ 25% of the labor input of secretaries at a plant is input of NR tasks.

## Task content of occupations

- ▶ Inferred from 81 questions about:
  - ▶ tools, instruments and other equipment used by the employee.
  - ▶ the extent to which the work is related to computer programming, repairing and supervision.
- ▶ Create indicators of whether a job implies:
  - ▶ non-routine (NR) tasks.
  - ▶ tasks requiring personal interaction (Int) with other workers in the firm and/or with the firm's customers.
- ▶ Suppose maximum number of NR tasks carried out by any occupation is 20 and secretaries report an average of 5.
  - ▶ We assign secretaries the value  $5/20=0.25$ .
  - ▶ 25% of the wagebill of secretaries at a plant is wages paid for NR tasks.
  - ▶ 25% of the labor input of secretaries at a plant is input of NR tasks.

# Descriptives

- ▶ Higher levels and larger increases in the share of all four "advanced" work types (non-routine/interactive/upper-sec. education/white-collar) in MNEs compared to non-MNEs.
- ▶ Changes in the composition of tasks relatively small in comparison with the other measures.
- ▶ Increases in wage-bill shares of "advanced" work types larger in services than in manufacturing.

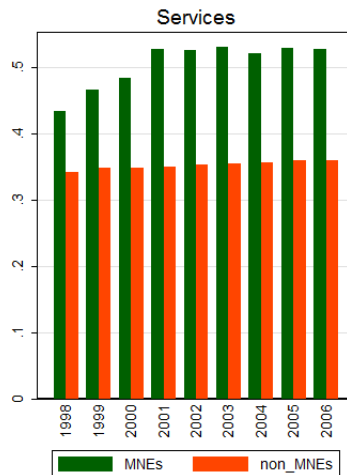
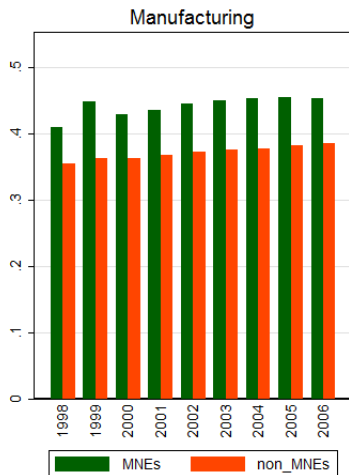
# Descriptives

- ▶ Higher levels and larger increases in the share of all four "advanced" work types (non-routine/interactive/upper-sec. education/white-collar) in MNEs compared to non-MNEs.
- ▶ Changes in the composition of tasks relatively small in comparison with the other measures.
- ▶ Increases in wage-bill shares of "advanced" work types larger in services than in manufacturing.

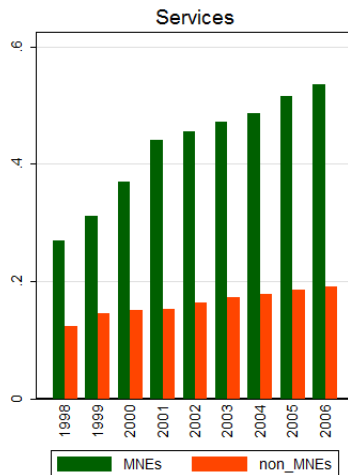
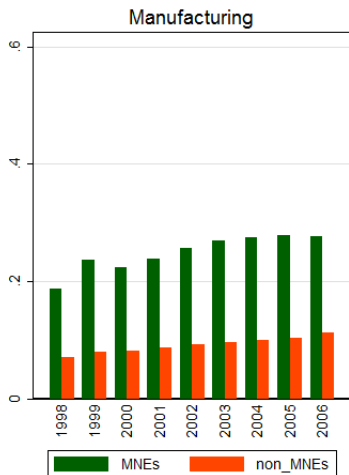
# Descriptives

- ▶ Higher levels and larger increases in the share of all four "advanced" work types (non-routine/interactive/upper-sec. education/white-collar) in MNEs compared to non-MNEs.
- ▶ Changes in the composition of tasks relatively small in comparison with the other measures.
- ▶ Increases in wage-bill shares of "advanced" work types larger in services than in manufacturing.

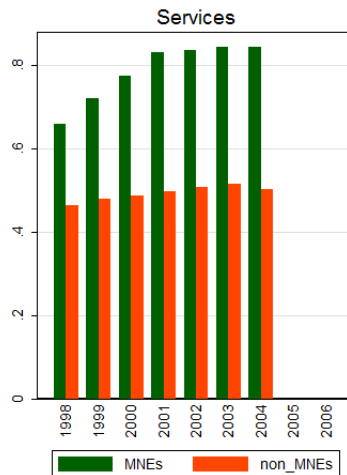
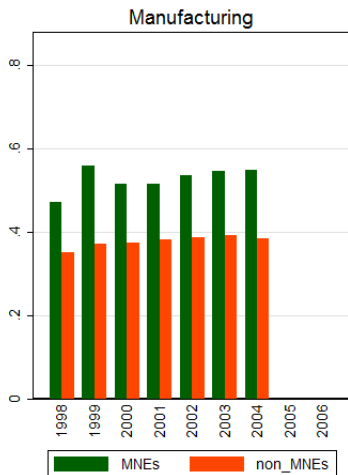
## Non-routine tasks



## Upper-secondary education



## White-collar occupations





## Correlations between wage-bill shares

	NR tasks	IA tasks	Upp.-sec. educ.
Interact. tasks	.519 (.000)		
Upp.-sec. educ.	.615 (.000)	.302 (.000)	
White-collar	.198 (.000)	.109 (.000)	.229 (.000)

# Estimation Strategy

- ▶ Estimating equation based on translog cost function:

$$\theta_{ijt} = \alpha_j + \beta_K \ln \frac{K_{kt}}{Y_{kt}} + \beta_Y \ln Y_{jt} + \beta_w \ln \frac{w_{ijt}}{w_{-ijt}} + \sum_l \gamma_l OE_{klt} + \delta_t + \varepsilon_{ijt},$$

- ▶ "FDI-exposure"  $OE$  measured as the foreign share of the firm's employment (distinguishing between high-income and low-income countries)
- ▶ Control for sector-level offshoring, R&D intensity and import penetration
- ▶ Use different measures for non-routine and interactive tasks (more restrictive, less restrictive, Spitz-Oener (2006))

# Estimation Strategy

- ▶ Estimating equation based on translog cost function:

$$\theta_{ijt} = \alpha_j + \beta_K \ln \frac{K_{kt}}{Y_{kt}} + \beta_Y \ln Y_{jt} + \beta_w \ln \frac{w_{ijt}}{w_{-ijt}} + \sum_l \gamma_l OE_{klt} + \delta_t + \varepsilon_{ijt},$$

- ▶ "FDI-exposure"  $OE$  measured as the foreign share of the firm's employment (distinguishing between high-income and low-income countries)
- ▶ Control for sector-level offshoring, R&D intensity and import penetration
- ▶ Use different measures for non-routine and interactive tasks (more restrictive, less restrictive, Spitz-Oener (2006))

# Estimation Strategy

- ▶ Estimating equation based on translog cost function:

$$\theta_{ijt} = \alpha_j + \beta_K \ln \frac{K_{kt}}{Y_{kt}} + \beta_Y \ln Y_{jt} + \beta_w \ln \frac{w_{ijt}}{w_{-ijt}} + \sum_l \gamma_l OE_{klt} + \delta_t + \varepsilon_{ijt},$$

- ▶ "FDI-exposure"  $OE$  measured as the foreign share of the firm's employment (distinguishing between high-income and low-income countries)
- ▶ Control for sector-level offshoring, R&D intensity and import penetration
- ▶ Use different measures for non-routine and interactive tasks (more restrictive, less restrictive, Spitz-Oener (2006))

# Estimation Strategy

- ▶ Estimating equation based on translog cost function:

$$\theta_{ijt} = \alpha_j + \beta_K \ln \frac{K_{kt}}{Y_{kt}} + \beta_Y \ln Y_{jt} + \beta_w \ln \frac{w_{ijt}}{w_{-ijt}} + \sum_l \gamma_l OE_{klt} + \delta_t + \varepsilon_{ijt},$$

- ▶ "FDI-exposure"  $OE$  measured as the foreign share of the firm's employment (distinguishing between high-income and low-income countries)
- ▶ Control for sector-level offshoring, R&D intensity and import penetration
- ▶ Use different measures for non-routine and interactive tasks (more restrictive, less restrictive, Spitz-Oener (2006))

**Table 6**

Offshoring and non-routine and interactive tasks.

Sources: Linked STATISTIK-BA/MIDI data 1998–2001 and BIBB-IAB worker survey 1998/99, balanced panel of M

Sectors estimator	Non-routine tasks				
	All	All	Manuf.	Serv.	Comm.
	FE	Random effects			
	(1)	(2)	(3)	(4)	(5)
Offshore empl. share	2.693 (.686)***	2.505 (.585)***	3.671 (2.214)*	4.317 (2.030)**	.735 (1.474)
LogCap./val. add.	.033 (.165)	.524 (.144)***	.139 (.314)	−.423 (.458)	.503 (.271)*
Log value added	−.331 (.126)***	.322 (.102)***	−.221 (.435)	−.411 (.456)	.782 (.390)**
Year 1999	.270 (.124)**	.206 (.125)*	.527 (.189)***	.653 (.420)	−.217 (.193)
Year 2000	.305 (.125)**	.243 (.126)*	.592 (.186)***	.781 (.503)	−.170 (.190)
Year 2001	.275 (.127)**	.197 (.127)	.613 (.210)***	.654 (.489)	−.177 (.222)
Hausman test ( <i>F</i> statistic)	.187				
$\gamma^{FE} - \gamma^{RE}$	(.359)				
Obs.	5008	5008	1876	1020	2112
<i>R</i> <sup>2</sup> (within)	.010	.004	.026	.023	.002
<i>R</i> <sup>2</sup> (between)	.003	.069	.012	.001	.098
<i>R</i> <sup>2</sup> (overall)	.002	.064	.013	.002	.093

Notes: Wage-bill shares in percent, varying between zero and 100. Estimators are plant fixed (FE) and random effects (RE) against FE specification. Standard errors in parentheses: \* significance at 10%, \*\* 5%, and \*\*\* 1%.

FE plants.

Interactive tasks				
All	All	Manuf.	Serv.	Comm.
FE	Random effects			
(6)	(7)	(8)	(9)	(10)
1.319	1.653	2.265	2.594	.683
(.352)***	(.293)***	(1.429)	(.974)***	(.587)
.025	.042	-.053	-.477	.029
(.085)	(.072)	(.167)	(.208)**	(.177)
.044	-.072	-.125	-.212	.204
(.065)	(.051)	(.215)	(.187)	(.191)
.088	.087	.292	.272	-.167
(.064)	(.063)	(.092)***	(.158)*	(.094)*
.103	.092	.254	.363	-.126
(.064)	(.064)	(.110)**	(.195)*	(.098)
-.001	-.016	.198	.209	-.228
(.065)	(.065)	(.119)*	(.265)	(.126)*
-.334				
(.195)				
5008	5008	1876	1020	2112
.006	.005	.025	.007	.015
.013	.024	.022	.067	.00002
.013	.023	.022	.061	.0001

## Statistical and economic significance

- ▶ Estimated coefficients for offshore employment in Table 6 are positive and (mostly) statistically significant, except in commerce.
- ▶ Offshore employment increased by .059 across all sectors between 1998 and 2001.
- ▶ Coefficient estimate in column 2, for instance, implies a .15 ( $2.505 * .059$ ) percentage point increase in the wage-bill share of non-routine tasks across all sectors.
- ▶ That corresponds to 10 percent of the observed 1.5 percentage point increase in the wage-bill share of non-routine tasks.



## Statistical and economic significance

- ▶ Estimated coefficients for offshore employment in Table 6 are positive and (mostly) statistically significant, except in commerce.
- ▶ Offshore employment increased by .059 across all sectors between 1998 and 2001.
- ▶ Coefficient estimate in column 2, for instance, implies a .15 ( $2.505 * .059$ ) percentage point increase in the wage-bill share of non-routine tasks across all sectors.
- ▶ That corresponds to 10 percent of the observed 1.5 percentage point increase in the wage-bill share of non-routine tasks.

## Statistical and economic significance

- ▶ Estimated coefficients for offshore employment in Table 6 are positive and (mostly) statistically significant, except in commerce.
- ▶ Offshore employment increased by .059 across all sectors between 1998 and 2001.
- ▶ Coefficient estimate in column 2, for instance, implies a .15 ( $2.505 * .059$ ) percentage point increase in the wage-bill share of non-routine tasks across all sectors.
- ▶ That corresponds to 10 percent of the observed 1.5 percentage point increase in the wage-bill share of non-routine tasks.

## Statistical and economic significance

- ▶ Estimated coefficients for offshore employment in Table 6 are positive and (mostly) statistically significant, except in commerce.
- ▶ Offshore employment increased by .059 across all sectors between 1998 and 2001.
- ▶ Coefficient estimate in column 2, for instance, implies a .15 ( $2.505 * .059$ ) percentage point increase in the wage-bill share of non-routine tasks across all sectors.
- ▶ That corresponds to 10 percent of the observed 1.5 percentage point increase in the wage-bill share of non-routine tasks.

**Table 7**

Offshoring and non-routine and interactive tasks: four world regions.

Sources: Linked STATISTIK-BA/MIDI data 1998–2001 and BIBB-IAB worker survey 1998/99, MNE plants only.

	Non-routine tasks			Interactive tasks		
	All	Manuf.	Serv.	All	Manuf.	Serv.
	(1)	(2)	(3)	(4)	(5)	(6)
Offshore empl. share in CEE	–.541 (1.182)	–2.240 (1.481)	.922 (2.427)	.343 (.465)	–.392 (.675)	2.642 (1.110)**
Offshore empl. share in DEV	7.008 (4.819)	11.330 (6.582)*	8.394 (4.353)*	4.020 (2.716)	6.904 (4.372)	2.017 (2.744)
Offshore empl. share in OIN	4.178 (2.413)*	6.080 (2.248)***	1.149 (3.730)	2.636 (.970)***	2.879 (.977)***	3.170 (2.430)
Offshore empl. share in WEU	3.074 (1.788)*	3.389 (2.272)	6.210 (2.768)**	1.615 (.679)**	1.444 (1.211)	2.599 (1.278)**

**Table 8**

Offshoring, education and occupations.

Source: Linked STATISTIK-BA/MIDI data 1998–2001, MNE plants only.

	Highly educated ( <i>Abitur</i> +) <hr/>			
	Manuf.	Manuf.	Serv.	Serv.
	(1)	(2)	(3)	(4)
Offshore empl.	7.486 (3.573)**		12.328 (4.724)***	
Offshore empl. share in CEE		1.658 (3.159)		2.587 (7.835)
Offshore empl. share in DEV		16.803 (11.713)		23.706 (9.579)**
Offshore empl. share in OIN		5.753 (3.997)		–2.737 (10.757)
Offshore empl. share in WEU		7.477 (4.341)*		20.404 (9.330)**

White-collar occupations			
Manuf.	Manuf.	Serv.	Serv.
(5)	(6)	(7)	(8)
9.726 (5.056)*		2.233 (3.748)	
	.636 (3.427)		3.479 (3.582)
	25.002 (15.848)		5.691 (7.249)
	14.323 (4.464)***		-.688 (15.546)
	6.071 (4.320)		1.090 (4.438)

**Table 10**

Offshoring predictions of wage bill shares.

Sources: Linked STATISTIK-BA/MIDI data 1998–2001 and BIBB-IAB worker survey 1998/99, balanced panel of MNE plants.

	Coefficient estimate	Change in offsh. emp.	Pred. change in wage-bill sh.	Obs. change in wage-bill sh.	Contrib. to obs. change
<b>All sectors</b>					
Non-routine tasks	2.51	.059	.148	1.44	10.2%
Interactive tasks	1.65	.059	.097	1.03	9.4%
Highly educated (Abitur+)	8.44	.059	.497	4.23	11.7%
White-collar occupations	6.45	.059	.380	4.56	8.3%
<b>Manufacturing</b>					
Non-routine tasks	3.67	.039	.145	1.03	14.1%
Interactive tasks	2.27	.039	.089	.94	9.5%
Highly educated (Abitur+)	7.49	.039	.295	3.08	9.6%
White-collar occupations	9.73	.039	.384	3.44	11.2%
<b>Services</b>					
Non-routine tasks	4.32	.090	.390	4.34	9.0%
Interactive tasks	2.59	.090	.235	1.37	17.1%
Highly educated (Abitur+)	12.33	.090	1.115	11.60	9.6%
White-collar occupations	2.23	.090	.202	9.84	2.1%

Notes: Wage-bill shares in percent, varying between zero and 100. Services exclude

# Summary

- ▶ The task-based measures have a statistically significant relationship to offshoring in the direction theory leads us to expect:
- ▶ parent-firm workers perform more non-routine and more interactive tasks at MNEs with more offshoring
- ▶ Offshoring is consistently associated with skill/education upgrading at the German plants:
- ▶ this is the case even when we control for the composition of tasks at plant level.
- ▶ Effects more pronounced for offshoring to low-wage locations (exception: CEE)



# Summary

- ▶ The task-based measures have a statistically significant relationship to offshoring in the direction theory leads us to expect:
- ▶ parent-firm workers perform more non-routine and more interactive tasks at MNEs with more offshoring
- ▶ Offshoring is consistently associated with skill/education upgrading at the German plants:
- ▶ this is the case even when we control for the composition of tasks at plant level.
- ▶ Effects more pronounced for offshoring to low-wage locations (exception: CEE)

# Summary

- ▶ The task-based measures have a statistically significant relationship to offshoring in the direction theory leads us to expect:
- ▶ parent-firm workers perform more non-routine and more interactive tasks at MNEs with more offshoring
- ▶ Offshoring is consistently associated with skill/education upgrading at the German plants:
- ▶ this is the case even when we control for the composition of tasks at plant level.
- ▶ Effects more pronounced for offshoring to low-wage locations (exception: CEE)

# Conclusion

- ▶ Our findings are consistent with the more traditional view that offshored tasks tend to be carried out by low-skilled rather than high-skilled workers.
- ▶ Skills measured by educational attainment is a more important workforce dimension than whether tasks are non-routine or interactive
- ▶ The estimated relationships (within plants over time) are relatively modest:
- ▶ 10 percent contribution of offshoring to changes in the wage-bill share of workers with upper-secondary education
- ▶ Salient differences in workforce compositions between MNEs and non-MNEs point to relevance of extensive margin

## Conclusion

- ▶ Our findings are consistent with the more traditional view that offshored tasks tend to be carried out by low-skilled rather than high-skilled workers.
- ▶ Skills measured by educational attainment is a more important workforce dimension than whether tasks are non-routine or interactive
- ▶ The estimated relationships (within plants over time) are relatively modest:
- ▶ 10 percent contribution of offshoring to changes in the wage-bill share of workers with upper-secondary education
- ▶ Salient differences in workforce compositions between MNEs and non-MNEs point to relevance of extensive margin

## Conclusion

- ▶ Our findings are consistent with the more traditional view that offshored tasks tend to be carried out by low-skilled rather than high-skilled workers.
- ▶ Skills measured by educational attainment is a more important workforce dimension than whether tasks are non-routine or interactive
- ▶ The estimated relationships (within plants over time) are relatively modest:
- ▶ 10 percent contribution of offshoring to changes in the wage-bill share of workers with upper-secondary education
- ▶ Salient differences in workforce compositions between MNEs and non-MNEs point to relevance of extensive margin

# Conclusion

- ▶ Our findings are consistent with the more traditional view that offshored tasks tend to be carried out by low-skilled rather than high-skilled workers.
- ▶ Skills measured by educational attainment is a more important workforce dimension than whether tasks are non-routine or interactive
- ▶ The estimated relationships (within plants over time) are relatively modest:
- ▶ 10 percent contribution of offshoring to changes in the wage-bill share of workers with upper-secondary education
- ▶ Salient differences in workforce compositions between MNEs and non-MNEs point to relevance of extensive margin