


Export, Female Comparative Advantage and the Gender Wage Gap

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³The opinions expressed and arguments employed herein are those of the author and do not necessarily reflect the official views of the OECD or of its Member countries. 

Motivation

- among major policy concerns (even more after Covid-19)
 - ▶ persistent wage gap between men and women
 - ▶ globalization's backfire
- trade is known to induce reallocations (winners vs losers)
 - ▶ e.g. comparative advantage and heterogeneous firms models
- does trade affect the gender wage gap (GWG)?
 - ▶ what's the role of comparative advantage?
 - ▶ little and mixed evidence at sector and firm level

This Paper

- estimate the effect of firm's export on the GWG at employee level
 - ▶ how export affect the wage gap between any male-female coworkers
 - ▶ use matched employer-employee annual data for Germany: 1993-2007
- explore the role of gender-based comparative advantage by tasks
 - ▶ heterogeneous effects on GWG across occupations/tasks reflect CA
 - ★ advantage in interactive & analytical (I&A) tasks
mainly white collar (WC) occupations
 - ★ disadvantage in manual tasks
mainly blue collar (BC) occupations
 - ▶ heterogeneous response of employment and promotion probability

Data

- LIAB dataset matches data on employees and employers:
 - ▶ Integrated Employment Biographies (IEB)
 - ★ social security data on all workers, trainees, job-seekers & benefits recipients in 1975-2014
 - ★ info on employment status, type of contract, 3-digit occupation, labor earnings (censored), basic biographics, workers' establishment identifier
 - ▶ IAB Establishment Panel
 - ★ longitudinal yearly survey: 65,180 establishments since 1993
 - ★ info on establishment's workforce composition, total sales, share of export on total sales (until 2007), age, location, industry (3 digit)
- our sample covers
 - ▶ West-Germany in years from 1993 to 2007
 - ▶ 18-54 years old full-time workers
 - ▶ establishments >5 employees
 - ▶ 14,757 firms & 3,070,311 workers - 199 sectors & 342 occupations
- little firm-level variation in exporter status → focus on intensive margin

Empirical Strategy

- estimate the following wage equation:

$$\ln w_{ijst} = \beta_1 \text{Exp}_{jt} + \beta_2 \text{fem}_i * \text{Exp}_{jt} + \mathbf{C}'_{it} \pi_1 + \mathbf{F}'_{jt} \pi_2 + \eta_{st} + \eta_{ij} + \varepsilon_{ijst}$$

- ▶ w_{ijst} = daily real wage of worker i at firm j in sector s in year t
- ▶ Exp_{jt} = export to sales ratio (or log-export)
- ▶ fem_i = dummy for female worker
- ▶ \mathbf{C}_{it} = worker's characteristics (education, experience, ...)
- ▶ \mathbf{F}_{jt} = firm's controls (size, location...)
- ▶ η_{st} = sector \times year FE
- ▶ η_{ij} = firm-worker FE
- ▶ cluster s.e. at firm level

Empirical Strategy: Identification

- control for firm-worker FE
 - ▶ $\beta_2 \sim$ effect of time variation in Exp_j on relative wage of any female vs male employee at j
 - ▶ purge effects on workforce composition at firm and sector level
- threats to identification & solutions
 - ▶ a worker i 's unobserved characteristics affect both w_{ijt} and Exp_{jt}
 - ★ quite unlikely
 - ▶ unobserved variable (e.g. productivity shock) affects both w_{ijt} and Exp_{jt}
 - ★ control for firm's sales and interaction with Fem_i
 - ★ control for η_{jt} firm-year FE \rightarrow lose β_1
 - ★ control for trend*initial firm's export, sales, size, GWG, female employment
- IV alternative?
 - ▶ not suited for interaction analysis

Results: All workers

	(1)	(2)	(3)	(4)
Export share	0.003 (0.004)	-0.001 (0.006)	-0.001 (0.006)	
Fem* Export share	0.002 (0.005)	0 (0.006)	0 (0.006)	0.005 (0.005)
Log(tot sales)		0.009*** (0.002)	0.009*** (0.002)	
Fem* log(tot sales)			-0.001 (0.002)	0.001 (0.001)
Exper./10	0.245*** (0.020)	0.240*** (0.021)	0.240*** (0.021)	0.359*** (0.023)
Exper. sq./100	-0.045*** (0.001)	-0.045*** (0.001)	-0.045*** (0.001)	-0.045*** (0.001)
White collar	0.027*** (0.002)	0.028*** (0.002)	0.028*** (0.002)	0.027*** (0.003)
Log(firm size)	0.030*** (0.004)	0.023*** (0.004)	0.023*** (0.004)	
Constant	4.089*** (0.041)	3.972*** (0.046)	3.972*** (0.046)	4.114*** (0.036)
R-squared	0.95	0.94	0.94	0.95
N firms	9,766	8,641	8,641	8,437
N obs.	9,464,764	8,202,304	8,202,304	8,201,355
Region FE	Yes	Yes	Yes	Yes
Sector-Time FE	Yes	Yes	Yes	No
Match FE	Yes	Yes	Yes	Yes
Firm-Time FE	No	No	No	Yes

Results: White vs Blue Collars

	(1)	(2)	(3)	(4)	(5) Only exp	(6) Elasticity
Export	-0.001 (0.005)	-0.005 (0.007)	-0.005 (0.007)			
Fem*Export	-0.015** (0.007)	-0.020** (0.008)	-0.019** (0.008)	-0.012* (0.007)	-0.016* (0.008)	-0.003* (0.002)
WC*Export	0.012* (0.006)	0.016** (0.008)	0.016* (0.008)	0.013* (0.007)	0.024** (0.010)	0.002 (0.002)
Fem*WC*Export	0.028*** (0.008)	0.034*** (0.010)	0.034*** (0.010)	0.029*** (0.008)	0.035*** (0.011)	0.008*** (0.002)
Log(sales)		0.009*** (0.002)	0.011*** (0.002)			
Fem*log(sales)			-0.004 (0.003)	-0.002 (0.002)	-0.003 (0.002)	0.002 (0.002)
WC*log(sales)			-0.007*** (0.002)	-0.005** (0.003)	-0.007** (0.003)	-0.007*** (0.002)
Fem*WC*log(sales)			0.008** (0.003)	0.006** (0.003)	0.011*** (0.004)	-0.002 (0.002)
Constant	4.087*** (0.042)	3.971*** (0.047)	3.964*** (0.047)	4.114*** (0.041)	4.174*** (0.043)	4.171*** (0.044)
R-squared	0.95	0.95	0.95	0.95	0.95	0.95
N firms	9,763	8,639	8,639	8,419	3,395	3,367
N obs.	9,129,116	7,899,708	7,899,708	7,898,708	5,998,254	5,981,514
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Time FE	Yes	Yes	Yes	No	No	No
Match FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Time FE	No	No	No	Yes	Yes	Yes

White vs Blue Collars: Taking Stock

- firm's export rise
 - ▶ GWG increases among blue collar workers
 - ★ female blue collars lose relative to their male co-workers (and in absolute terms)
 - ★ firm from median to Q4 export share
 - average female employee loses € 21 relative to average male co-worker
 - ▶ GWG falls among white collar workers
 - ★ female white collars gains relative to their male co-workers (and in absolute terms)
 - ★ firm from median to Q4 export share
 - average female employee gains € 39 relative to average male co-worker

Task Content by Occupations

- classify occupations according to their “task content”
 - ▶ survey on qualification and working conditions (BiBB/IAB and BIBB/BAuA)
 - ▶ how often each task is performed
- assign each of 342 occupation in LIAB to one category based on most frequent task
 - ▶ manual routine: 64.5% of BC and 3% of WC
 - ▶ manual non-routine: 8% of BC and 5.5% of WC
 - ▶ analytic non-routine: 6% of BC and 21.5% of WC
 - ▶ interactive non-routine: 21% of BC and 70% of WC

Results: Export and the GWG by Tasks

	(1)	(2)	(3) Only exp	(4) Elasticity
Export	-0.011 (0.01)			
Fem*Export	-0.015* (0.01)	-0.008 (0.01)	-0.013 (0.01)	-0.004** (0.00)
I & A*Export	0.025*** (0.01)	0.022*** (0.01)	0.036*** (0.01)	0.003** (0.00)
Fem*I & A*Export	0.020** (0.01)	0.015** (0.01)	0.024*** (0.01)	0.008*** (0.00)
I & A	0.191*** (0.03)	0.172*** (0.04)	0.199*** (0.04)	0.195*** (0.04)
Fem*I & A	-0.221*** (0.05)	-0.209*** (0.05)	-0.280*** (0.05)	-0.211*** (0.04)
Log(sales)	0.012*** (0.00)			
Fem*log(sales)	-0.005** (0.00)	-0.004* (0.00)	-0.005* (0.00)	0 (0.00)
I & A*log(sales)	-0.008*** (0.00)	-0.007*** (0.00)	-0.009*** (0.00)	-0.011*** (0.00)
Fem*I & A*log(sales)	0.010*** (0.00)	0.009*** (0.00)	0.012*** (0.00)	0.002 (0.00)
Constant	3.911*** (0.05)	4.097*** (0.04)	4.158*** (0.04)	4.155*** (0.04)
R-squared	0.94	0.95	0.95	0.95
N firms	8,640	8,419	3,397	3,369
N obs	7,856,194	7,855,189	5,970,410	5,953,681
Region FE	Yes	Yes	Yes	Yes
Sector-Time FE	Yes	No	No	No
Match FE	Yes	Yes	Yes	Yes
Firm-Time FE	No	Yes	Yes	Yes

Results: Export and Promotions by Tasks

	(1)	(2)	(3) Only Exp	(4) Elasticity
Export	-0.005 (0.01)			
Fem*Export	0.004 (0.01)	-0.003 (0.01)	-0.005 (0.01)	-0.001 (0.00)
I & A*Export	-0.002 (0.01)	-0.003 (0.01)	-0.021** (0.01)	-0.006*** (0.00)
Fem*I & A*Export	0.013 (0.01)	0.016 (0.01)	0.033** (0.02)	0.009*** (0.00)
I & A	0.078 (0.05)	0.150*** (0.05)	0.142*** (0.05)	0.106** (0.04)
Fem*I & A	-0.092 (0.07)	-0.124* (0.06)	-0.140** (0.07)	-0.101* (0.06)
Log(sales)	-0.007** (0.00)			
Fem*log(sales)	0.002 (0.00)	0.001 (0.00)	0 (0.00)	0 (0.00)
I & A*log(sales)	-0.002 (0.00)	-0.005** (0.00)	-0.005* (0.00)	0.002 (0.00)
Fem*I & A*log(sales)	0.004 (0.00)	0.005 (0.00)	0.005 (0.00)	-0.004 (0.00)
Constant	0.451*** (0.06)	0.268*** (0.03)	0.227*** (0.03)	0.231*** (0.03)
R-squared	0.28	0.29	0.28	0.28
N firms	6,014	5,822	2,462	2,451
N observations	5,099,868	5,098,989	3,943,989	3,934,858
Region	Yes	Yes	Yes	Yes
Sector-Time	Yes	No	No	No
Match	Yes	Yes	Yes	Yes
Firm-Time	No	Yes	Yes	Yes

Results: Export and Relative Employment

	log(tot)	log(I& A)	log(I& A) Fem	log(I& A) Male	I& A (share)	I& A -Fem (share)
log(export)	0.078*** (0.01)	0.073*** (0.01)	0.069*** (0.01)	0.069*** (0.01)	-0.042 (0.00)	0.001 (0.00)
log(domestic sales)	0.152*** (0.02)	0.151*** (0.02)	0.145*** (0.02)	0.147*** (0.02)	-0.002 0.00	0.002 (0.00)
F share(t-1)	-0.152 (0.17)	0.092 (0.15)	0.631*** (0.14)	-0.317** (0.15)	0.109**	0.283*** (0.03)
Constant	1.183*** (0.34)	0.173 (0.36)	-0.926*** (0.34)	0.006 (0.36)	-0.003 0.383*** -0.058	0.224*** (0.05)
R-squared	0.98	0.98	0.97	0.98	0.97	0.92
N firms	2,367	2,367	2,367	2,367	2,367	2,325
N obs	10,913	10,913	10,913	10,913	10,912	10,732
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector-time FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

Conclusions

- estimate the effects of firm's export on GWG between its employees
 - ▶ tight identification from German employer-employee matched data
- heterogeneous effects across occupations
 - ▶ export reduces wage gap between male and female WC co-workers
 - ▶ export raises wage gap between male and female BC co-workers
- gender-based CA may explain this
 - ▶ losses for female workers in manual tasks
 - ▶ gains for female workers in I&A tasks
 - ▶ relative promotion probability increases for female in I&A
 - ▶ relative employment reacts little (extensive margin)

Robustness: Controlling for Trends (BC)

	(1)	(2)	(3)	(4)	(5)
Export share	0.002 (0.007)	0.004 (0.007)	0.002 (0.007)	0.003 (0.007)	0.003 (0.007)
Female * export share	-0.021*** (0.008)	-0.021*** (0.008)	-0.021*** (0.008)	-0.021*** (0.008)	-0.022*** (0.008)
Log (total sales)	0.010*** (0.002)	0.010*** (0.002)	0.010*** (0.002)	0.010*** (0.002)	0.010*** (0.002)
Female *Log (total sales)	-0.004 (0.003)	-0.003* (0.002)	-0.003* (0.002)	-0.004* (0.002)	-0.004* (0.002)
Observations	5,604,275	5,779,526	5,779,526	5,779,526	5,779,526
R-sq.	0.934	0.934	0.934	0.934	0.934
Federal State FE	Yes	Yes	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	Yes	Yes	Yes
Match-FE	Yes	Yes	Yes	Yes	Yes
Firm-Year FE	No	No	No	No	No
Trend*initial value of	GWG	Export	Sales	Size	Female Empl. Share

Robustness: Controlling for Trends (WC)

	(1)	(2)	(3)	(4)	(5)
Export share	-0.006** (0.003)	-0.005 (0.004)	-0.005 (0.003)	-0.005 (0.003)	-0.005* (0.003)
Female * export share	0.014*** (0.005)	0.014*** (0.005)	0.014*** (0.005)	0.014*** (0.005)	0.014*** (0.005)
Log (total sales)	0.004*** (0.001)	0.004*** (0.001)	0.004*** (0.001)	0.004*** (0.001)	0.004*** (0.001)
Female *Log (total sales)	0.005** (0.002)	0.005** (0.002)	0.005** (0.002)	0.005** (0.002)	0.005** (0.002)
Observations	2,258,733	2,394,257	2,394,257	2,394,257	2,394,257
R-sq.	0.947	0.950	0.950	0.950	0.95
Federal State FE	Yes	Yes	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	Yes	Yes	Yes
Match-FE	Yes	Yes	Yes	Yes	Yes
Firm-Year FE	No	No	No	No	No
Trend*initial value of	GWG	Export	Sales	Size	Female Empl. Share

Robustness: Lags & 3Year+ Tenure

	Lagged Controls			Workers with 3+ Year Tenure		
	(1)	(2)	Elasticity (3)	(4)	(5)	Elasticities (6)
Exp	-0.012 (0.008)			-0.005 (0.007)		
Female * Exp	-0.007 (0.009)	-0.010 (0.008)	-0.002 (0.002)	-0.018** (0.008)	-0.010 (0.007)	-0.002 (0.002)
White collar * Exp	0.019** (0.009)	0.016** (0.008)	0.003 (0.002)	0.012 (0.009)	0.010 (0.008)	0.000 (0.002)
Female* White collar * Exp	0.025** (0.01)	0.025*** (0.009)	0.008*** (0.002)	0.035*** (0.01)	0.029*** (0.009)	0.009*** (0.002)
Sales	0.007** (0.003)			0.012*** (0.002)		
Female * Sales	-0.005* (0.003)	-0.003 (0.002)	0.000 (0.002)	-0.005* (0.003)	-0.002 (0.002)	0.001 (0.002)
White collar * Sales	-0.003 (0.003)	-0.002 (0.002)	-0.005** (0.002)	-0.009*** (0.002)	-0.007** (0.003)	-0.008*** (0.003)
Female* White collar * Sales	0.009** (0.004)	0.006** (0.003)	-0.003* (0.002)	0.011*** (0.003)	0.009*** (0.003)	-0.001 (0.002)
Observations	5,022,162	5,021,014	3,736,806	6,325,589	6,323,303	4,708,571
R-sq.	0.95	0.95	0.95	0.95	0.95	0.95
Federal State FE	Yes	No	No	Yes	No	No
Industry-Year FE	Yes	No	No	Yes	No	No
Match-FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Robustness: Manufacturing Only

	All Workers		Blue Collar		White Collar	
	(1)	(2)	(3)	(4)	(5)	(6)
Export share	-0.002 (0.006)		0.001 (0.007)		-0.009*** 0.003	
Female * export share	0.001 (0.006)	0.006 (0.005)	-0.021*** (0.008)	-0.018** (0.008)	0.018*** 0.006	0.020*** 0.007
Log (total sales)	0.008*** 0.002		0.009*** (0.002)		0.003*** 0.001	
Female * log (total sales)	-0.001 (0.002)	0.001 (0.002)	-0.004 (0.003)	-0.003 (0.002)	0.006*** 0.002	0.008*** 0.003
Observations	6,598,075	6,597,920	4,895,291	4,330,966	1,679,887	1,449,156
N Firms	3,520	3,491	3,475	2,299	3,281	2,182
R-sq.	0.94	0.946	0.927	0.936	0.94	0.94
Federal State FE	Yes	Yes	Yes	Yes	Yes	Yes
Sector-Year FE	Yes	No	Yes	No	Yes	No
Match FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Year FE	No	Yes	No	Yes	No	Yes

Robustness: Wage Censoring

	(1)	(2)	(3)	Elasticity (4)
Export	0.007** (0.003)			
Female * Export	0.008** (0.004)	0.007* (0.004)	0.012* (0.007)	0.005** (0.002)
Censored wage at (t-1)	0.017*** (0.002)	0.013*** (0.002)	0.019*** (0.003)	0.022* (0.012)
Female * Censored wage at (t-1)	0.001 (0.003)	0.003 (0.003)	0.008* (0.004)	0.015 (0.021)
Export * Censored wage at (t-1)	-0.023*** (0.004)	-0.018*** (0.003)	-0.028*** (0.005)	-0.005*** (0.001)
Female * Export * Censored wage at (t-1)	0.013** (0.006)	0.011** (0.005)	0.005 (0.006)	0.002* (0.001)
Female * Domestic sales				0.002 (0.002)
Domestic sales * Censored wage at (t-1)				0.004*** (0.001)
Female * Domestic sales * Censored wage at (t-1)				-0.002* (0.001)
Observations	1,583,254	1,578,584	983,636	916,983
R-sq	0.96	0.96	0.95	0.96
Federal State FE	Yes	No	No	No
Sector-Year FE	Yes	No	No	No
Match FE	Yes	Yes	Yes	Yes
Firm-Year FE	No	Yes	Yes	Yes

Classifying Occupations by Task

- define intensity of activities belonging to task category c for individual i (employed in occupation k) at time t

$$\text{Intensity Index}_{ikt}^c = \frac{\sum_a (\text{task } a \text{ in category } c)_{ikt}}{\sum_a (\text{all tasks } a)_{ikt}}.$$

- take average of Intensity Index c across all individuals employed in occupation k

$$\text{Task Index}_{c,k,t} = \frac{\sum_i \text{Intensity Index}_{ikt}^c}{N_k}.$$

- assign occupation k to category c if the maximum value of Task Index $_{c,k,t}$ across all categories is attached to category c .

Task Content by Occupations

Category	Task
Manual	Manufacture, Produce Goods Transport, Store, Dispatch Oversee, Control Machinery and Techn. Processes Repair, Maintain Entertain, Accommodate, Prepare Foods Nurse, Look After, Cure
Interactive and Analytic	Gather Information, Develop, Research, Construct Program a Computer Apply Legal Knowledge Interactive Purchase, Procure, Sell Advertise, Promote, Conduct Marketing and PR Organize, Plan, Prepare (others' work) Consult and Inform Train, Teach, Instruct, Educate