

LOCAL IMPACTS OF GLOBAL MARKETS

Tasks, Occupations, and Wage Inequality in an Open Economy

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Division of Labor, Plant Size and Prosperity

“[M]aking a pin is . . . **divided** into about **eighteen distinct operations**. . . . [T]en persons . . . could make among them upwards of forty-eight thousand pins in a day. But if they had all wrought separately and independently . . . they certainly could not each of them have made twenty, perhaps not one pin in a day.”

“It is the great multiplication of the productions of all the different arts, in consequence of the **division of labour**, which **occasions**, in a well-governed society, that universal **opulence which extends itself to the lowest ranks** of the people.”

Adam Smith, *The Wealth Of Nations*, Book I, Chapter I

Tasks, Wage Inequality, and Trade

- Nexus between globalization and wage inequality
within sectors and occupations
- Wage dispersion between plants, *and within plants*
- In worker cross section: commanding component of wage variation
within employers (and occupations)
- **This paper:** Optimal internal labor market organization
in response to globalization

Plant-Worker Data 1996-2014: Residual Wage Inequality

Contribution of component (%)		Subsamples			
		high w	age ≥ 45	skilled	manager
within industry*	88	97	88	88	88
within occupation	84	87	82	86	92
within plant	71	88	68	79	77
within plant-layer	65	71	60	72	73
within plant-layer-occupation	54	60	46	61	63
<i>within plant-occupation</i>	54	60	46	61	63

Source: LIAB 1996-2014. Residual log daily wage from Mincer regression—including demographic, education and tenure as well as time, industry and region effects ($R^2 = 53\%$). (* Mincer regression excludes industry effects, $R^2 = 0.42$.) Occupations: 3-digit KldB-88. Subsample (1): above-median wage; (2): 45 years old and older; (3): high skilled (Abitur or equivalent); (4): supervisors & managers.

Task Imputation to Plant-Worker Data

- Combine BIBB-BAuA task information with LIAB plant-worker data
- Preserve within-occupation and time variation
- In BIBB-BAuA data, regress indicator for task on worker, occupation and plant attributes also observed in LIAB
- Impute with out-of-sample prediction into LIAB data at worker level
Also: Reverse imputation into BIBB-BAuA data for robustness

Frequency of “What” Tasks (*Operations*) at the Workplace

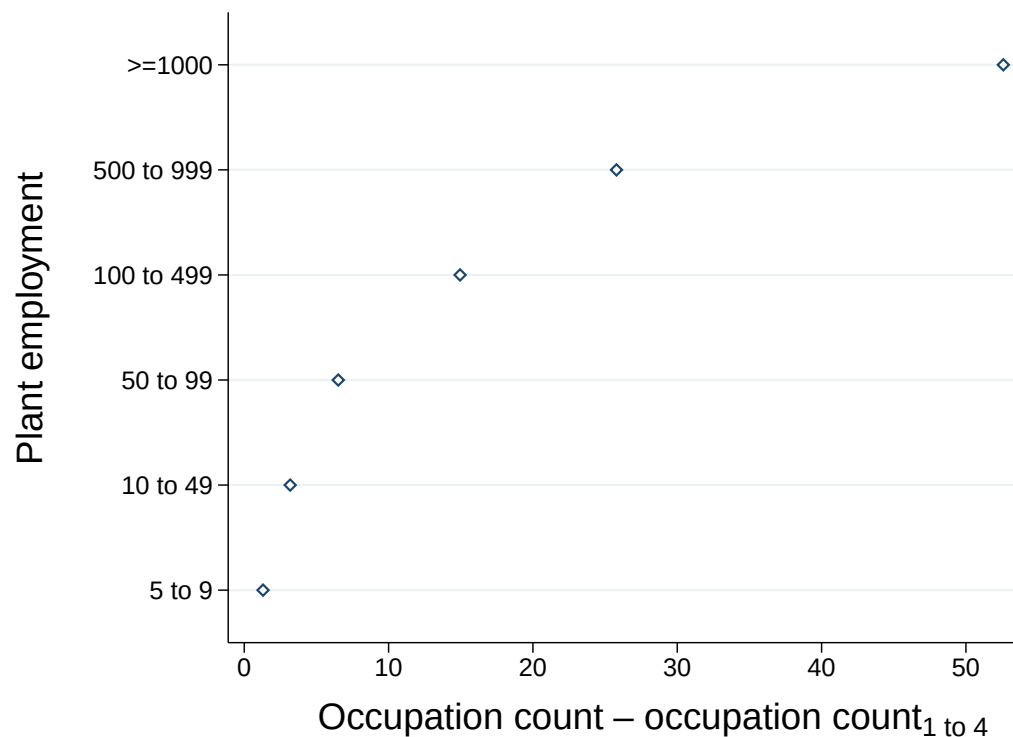
Workplace Operations (Tasks)		Subsamples			
		high w	age ≥ 45	skilled	manager
1. Manufacture, Produce Goods	0.185	0.182	0.171	0.138	0.139
2. Repair, Maintain	0.360	0.350	0.344	0.286	0.310
3. Entertain, Accommodate	0.281	0.247	0.256	0.231	0.297
4. Transport, Store, Dispatch	0.451	0.435	0.452	0.361	0.391
5. Measure, Inspect, Control Quality	0.602	0.624	0.599	0.631	0.638
6. Gather Inform., Develop, Research	0.748	0.819	0.785	0.907	0.900
7. Purchase, Procure, Sell	0.462	0.476	0.462	0.475	0.509
8. Program a Computer	0.102	0.123	0.091	0.163	0.149
9. Apply Legal Knowledge	0.526	0.591	0.596	0.681	0.654
10. Consult and Inform	0.844	0.883	0.856	0.938	0.938
11. Train, Teach, Instruct, Educate	0.509	0.566	0.520	0.646	0.643
12. Nurse, Look After, Cure	0.265	0.263	0.268	0.285	0.342
13. Advertise, Promote	0.397	0.454	0.417	0.541	0.516
14. Organize, Plan Others' Work	0.655	0.705	0.645	0.765	0.766
15. Control Mach. & Techn. Proc.	0.352	0.347	0.331	0.283	0.313
<i>Total Number of Tasks</i>	6.667	7.010	6.750	7.286	7.442

Source: BIBB-BAuA 1999, 2006, 2012 (inverse sampling weights). Subsample (1): above-median wage; (2): 45 years old and older; (3): high skilled (Abitur or equivalent); (4): supervisors & managers.

Three Facts and a Hypothesis

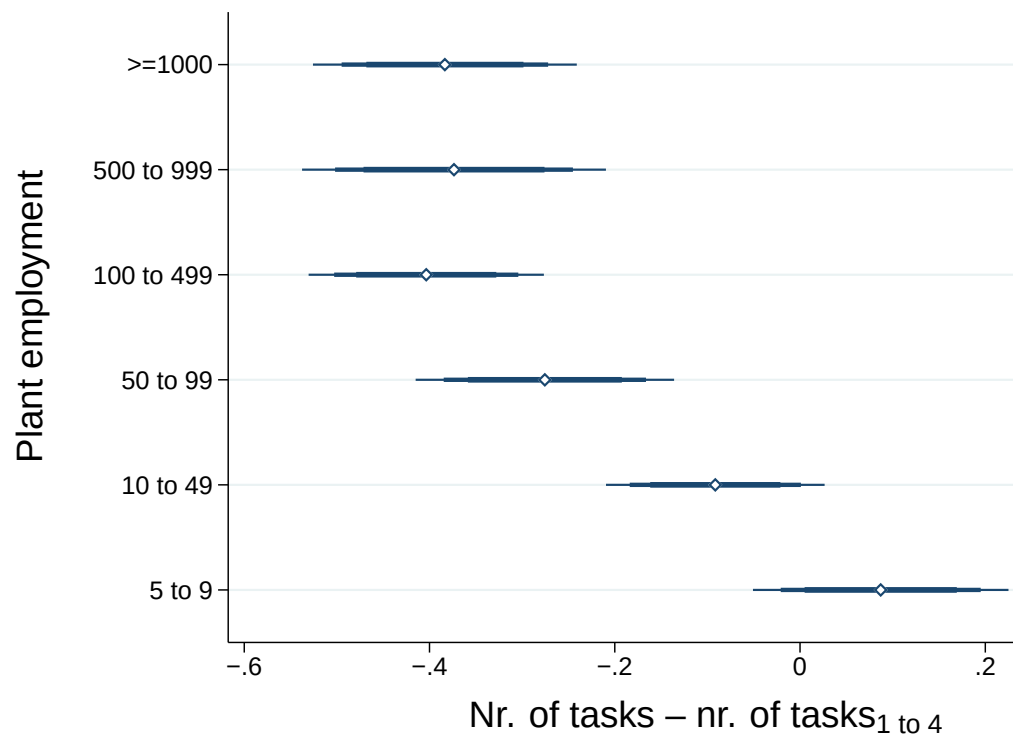
1. Larger plants and exporters adopt more occupations.
 2. Workers at larger plants perform *fewer* tasks *within* occupations.
 3. Wages are more dispersed in plant-occupations with fewer tasks.
- Hypothesis: Workers at larger plants are more specialized in fewer tasks. Their abilities are better matched to these tasks, and their wages more dispersed given their higher surplus variation.

Fact 1: Number of Occupations by Plant Employment



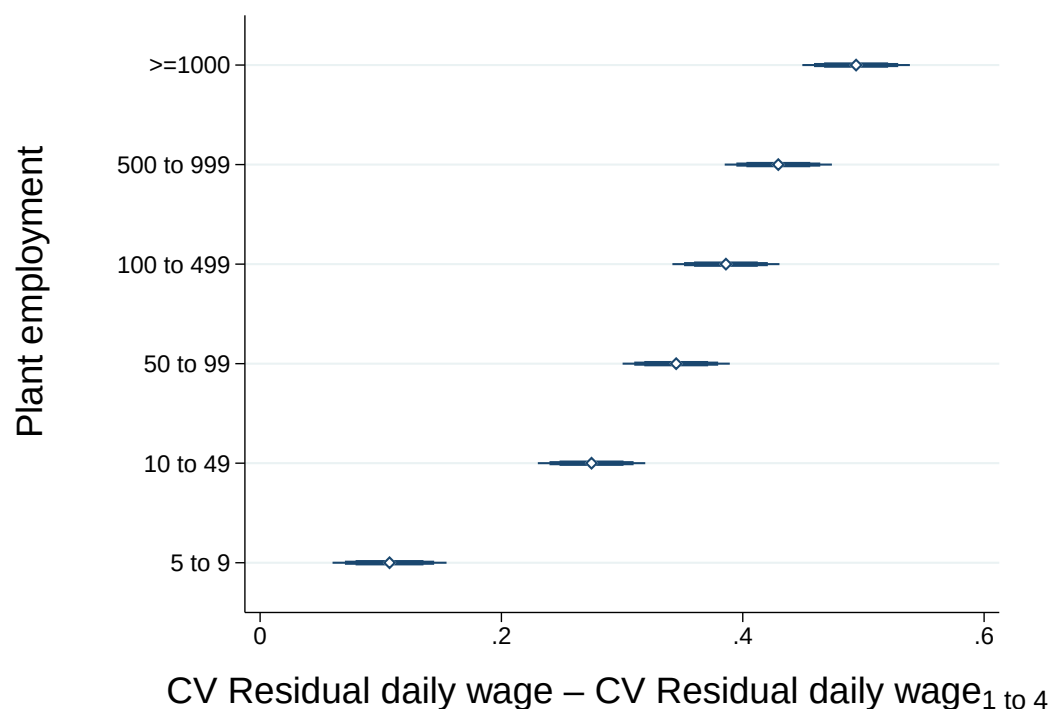
Source: LIAB 1996-2012. Prediction of occupation count n by plant employment category, controlling for sector, region, occupation and worker characteristics. Results are differences to smallest plant-size category (1 to 4 workers). Thick, medium, and thin lines represent the 99, 95, and 90 percent confidence intervals.

Fact 2: Number of Tasks per Occupation by Plant Employment



Source: BIBB-BAuA 1999, 2006 and 2012. Prediction of number of tasks b within plant-occupation by plant employment category, controlling for sector, region, occupation and worker characteristics. Results are differences to smallest plant-size category (1 to 4 workers). Thick, medium, and thin lines represent the 99, 95, and 90 percent confidence intervals.

Fact 3: *Within-occupation Wage Inequality by Plant Employment*



Source: LIAB 1996-2014. Prediction of (log) coefficient of variation of daily wage residual (exponentiated Mincer residual) CV within plant-occupation by plant employment category, controlling for sector, region, occupation and worker characteristics. Results are differences to smallest plant-size category (1 to 4 workers). Thick, medium, and thin lines represent the 99, 95, and 90 percent confidence intervals.

Model

- Tasks and workers around segment of unit circle
- Employer splits task range into occupations
- More occupations mean narrower task range per occupation, so workers more specialized in fewer tasks
- Workers have core ability, most efficient at specific task in full range
Workers monotonically less efficient at tasks away from core ability

Ability-Occupation Mismatch and Worker Efficiency

- Worker allocates same amount of time to tasks in occupation.
Worker efficiency falls linearly in distance to core ability i .
Mistakes worse in narrower task ranges, magnifying mismatch

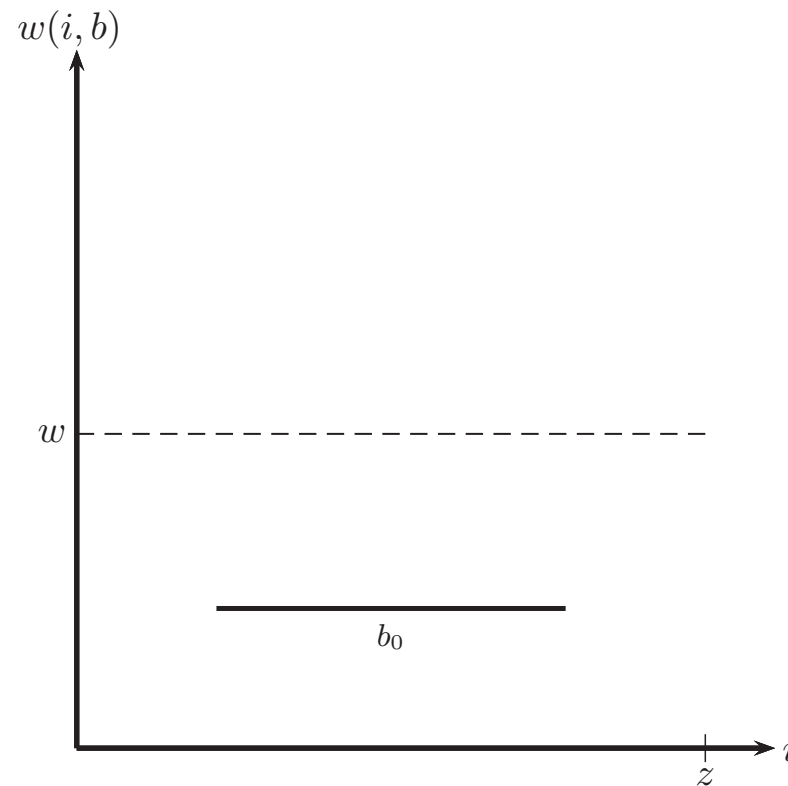
- Mismatch:
$$m(i, b) = \frac{1}{b} \left[\int_0^i (i - t) dt + \int_i^b (t - i) dt \right] = \frac{b^2 + 2i(i - b)}{2b}$$

- Worker efficiency:

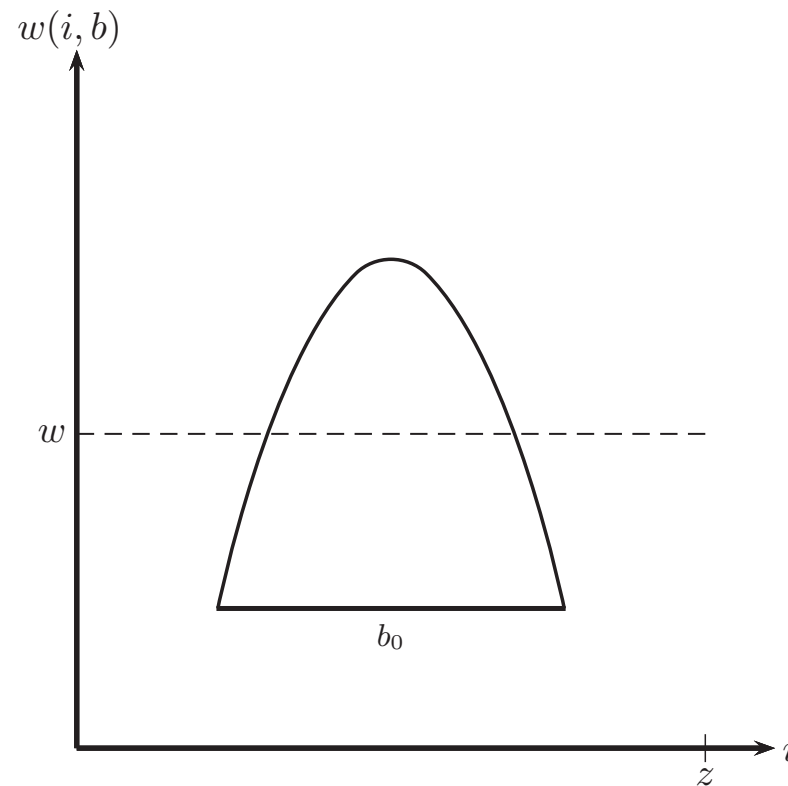
$$\lambda(i, b) \equiv \frac{\tilde{\eta}}{\tilde{z}} + \frac{1}{m(i, b)} = \frac{\tilde{\eta}}{\tilde{z}} + \frac{2b}{b^2 + 2i(i - b)}$$

with **sensitivity of performance** $\tilde{\eta} > -2\tilde{z}$.

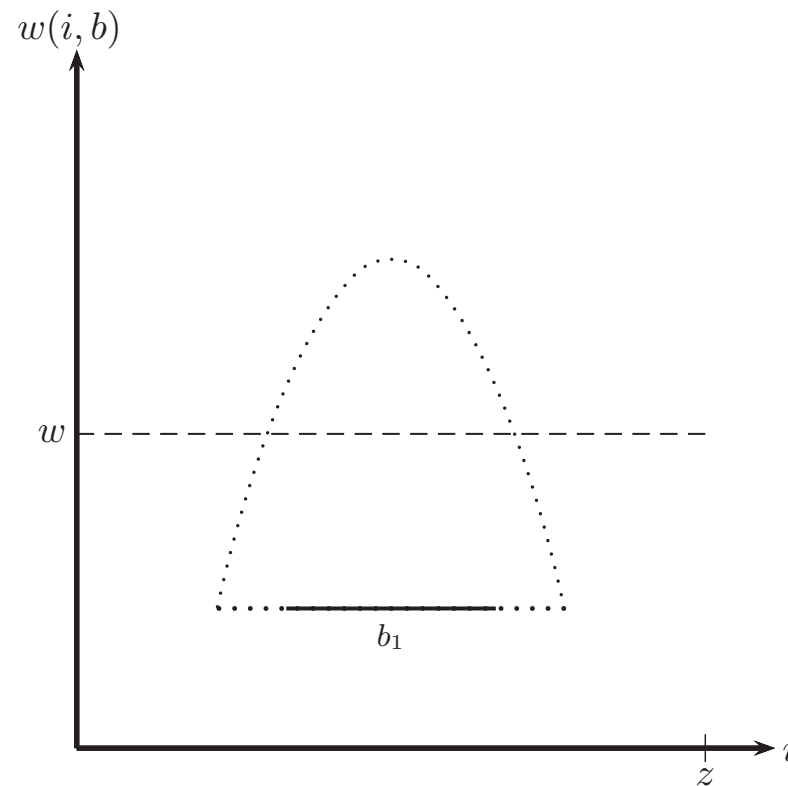
Within-occupation Wage Schedule by Plant Type



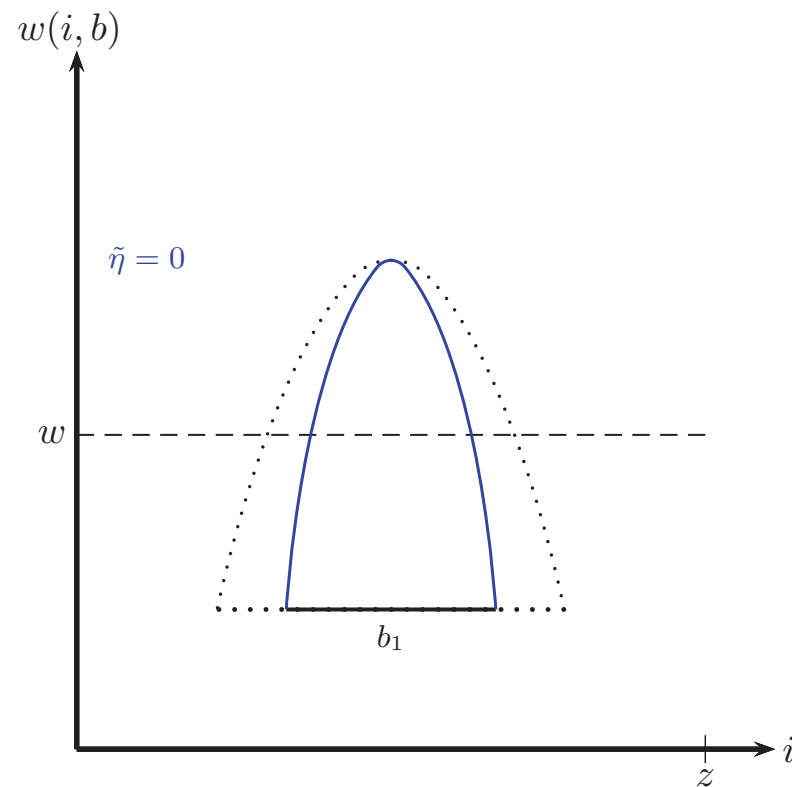
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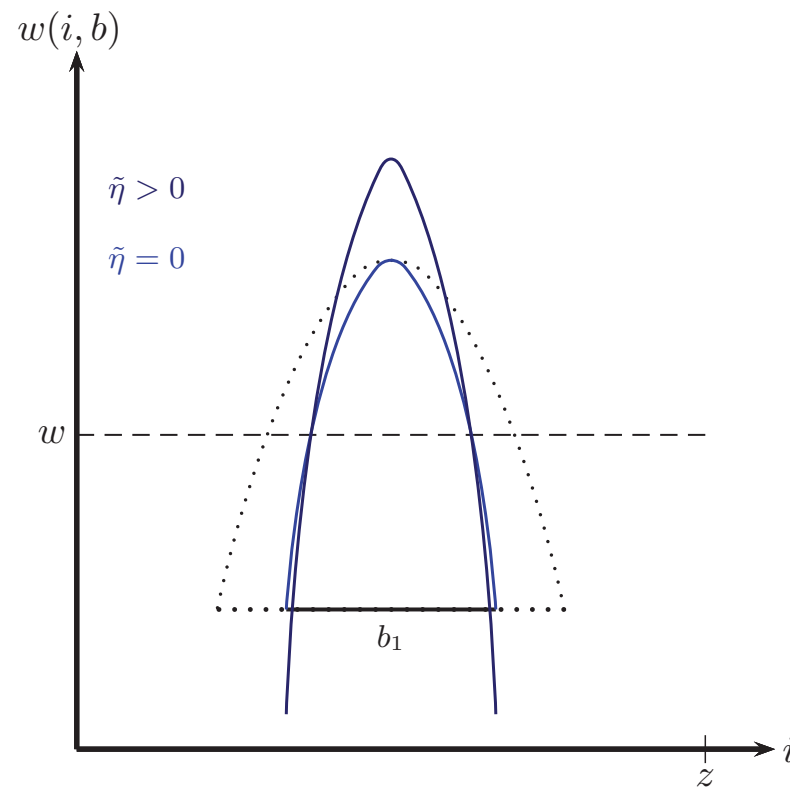
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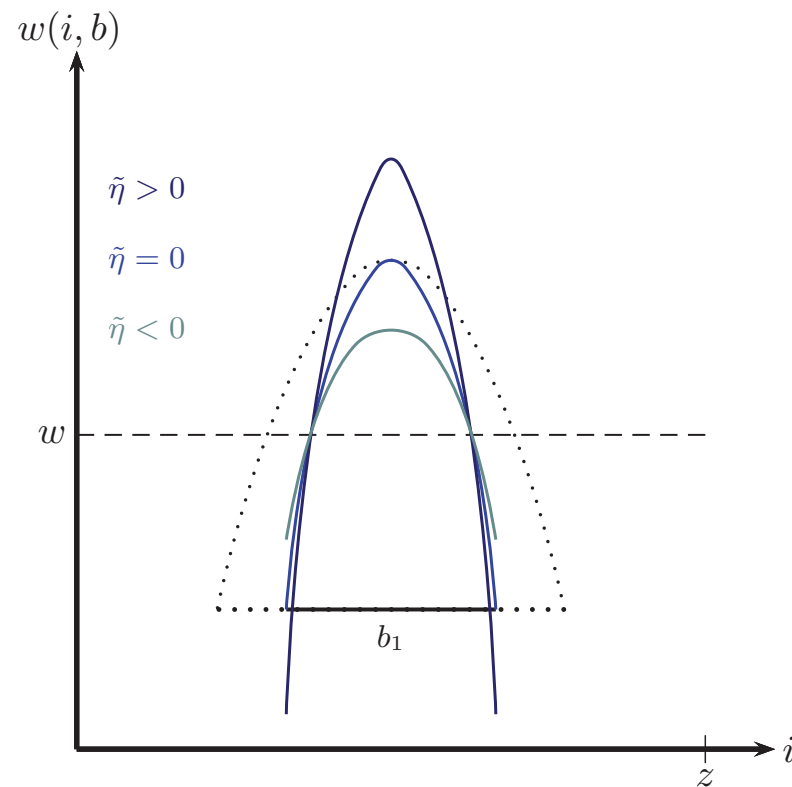
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Within-occupation Wage Schedule by Plant Type



Within-occupation Wage Schedule by Plant Type



Sensitivity of Performance and Financial Losses from Mistakes

Dependent variable: $\tilde{\eta}$	for Wages		for Residual wages	
	(1)	(2)	(3)	(4)
Financial losses from small mistakes				
seldom	.304 (.031)***	.456 (.029)***	.401 (.027)***	.536 (.026)***
occasionally	.347 (.033)***	.577 (.031)***	.495 (.030)***	.704 (.028)***
frequently	.725 (.031)***	.997 (.029)***	.833 (.028)***	1.084 (.026)***
Plant size FE		yes		yes
Adj. R^2	.0005	.006	.001	.010
Observations	43,029	41,389	46,406	44,733

Source: LIAB 1996-2014 and BIBB-BAuA 1999, 2006 and 2012. Plants with more than 2 full-time workers.

Note: Sensitivity of performance: $\tilde{\eta}(\omega) = \left[\sqrt{4 - \pi(\pi - 2)} / CV(\omega) - \pi \right] \cdot z(\omega) / b(\omega)$.

Financial losses from small mistakes in four categories as reported in BIBB-BAuA, omitted category: never or almost never. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Towards Estimation and Quantification

- Plant-level Maximum Likelihood

$$\ln r(\omega) = \alpha_0 + \alpha_1 \mathbf{1}_x(\omega) + \xi \ln \tilde{\varphi}$$

$$\ln CV(\omega) + \ln b(\omega)/z(\omega) = \beta_0 - (1/\gamma) \ln r(\omega) + \ln \tilde{\zeta}$$

$$\mathbf{1}_x(\omega) = 1 \Leftrightarrow \gamma_0 + \xi \ln \tilde{\varphi} \geq \ln \tilde{f}_x(\omega)/f_0$$

$$\ln r(\omega) = . \Leftrightarrow \xi \ln \tilde{\varphi} < a$$

- Variables: $r(\omega), \mathbf{1}_x(\omega), CV(\omega), b(\omega)/z(\omega)$

Stochastic terms: $\tilde{\varphi}^\xi, \tilde{\zeta}, \tilde{f}_x; \tilde{\eta}$

Parameters: $a; \gamma; \alpha_0, \beta_0, \alpha_1, \gamma_0, f_0$ (functions of fundamentals)

Challenges for Structural Estimation

- Normality requires common ranking of outcome-variable variances between exporters and non-exporters (unless selection into existence)
- Selection into existence not a conventional Tobit because censoring on threshold for residual, not for variable
- Identification from first and second moments
- Implementation

Concluding Remarks

- Task ranges within occupations markedly negatively associated with plant size and occupation counts per plant
- Firm-level model of endogenous division of labor with worker sorting to occupations by ability yields related predictions
- Reduced-form estimation of collection of structural relationships offers promise for quantification
- Globalization may be associated with increasing within-plant wage dispersion in all economies

BACKUP

Related Literature

- **Tasks.** Polarization (Autor, Katz, Kearney 06), offshoring (Levy, Murnane 04)
- **Tasks and trade.** Heckscher-Ohlin (Grossman, Rossi-Hansberg 08), Ricardian (Rodriguez-Clare 10; Acemoglu, Autor 11); Krugman (Chaney & Ossa 2012).
- **Tasks and worker performance.** Ability-job match quality reduces training costs (Barron, Black, Loewenstein 89) and raises efficiency (Meyer 94; Burgess et al. 10)
- **Human resource practices.** Management quality (Bloom, van Reenen 11) or hierarchies (Caliendo, Monte, Rossi-Hansberg 12) and effort incentives (Cunat, Guadalupe 09)
- **Between-firm matching.** Trade-induced changes in match quality (Amiti, Pissaridis 05; Davidson, Heyman, Matusz, Sjöholm, Zhu 14)
- **Within-firm matching.** Lazear, Shaw 09: Wage structure more dependent on employer-internal sorting to occupations than on sorting to employers.
Bombardini, Orefice, Tito (15): Permanent wage component in firm-worker sorting model based on Eeckhout, Kircher (11)

Plant-Worker and Additional Data

- Federal Employment Office, Institute for Employment Research (IAB): Linked plant-worker data extract for plant random sample
- LIAB: Administrative worker-level data (social security records) combined with plant survey information since 1996
- UN Comtrade: Bilateral merchandise trade, World Bank TSD: Bilateral services trade.
- Consolidated data with 39 longitudinally consistent industries, based on an aggregation of NACE 1.1

Mean Daily Wages by Task Numbers and Plant Sizes

No. of Tasks	Plant Sizes						
	1-4	5-9	10-49	50-99	100-499	500-999	≥1000
0-1	19.8	31.7	31.6	29.6	30.1	29.7	30.6
1-2	30.0	27.4	33.1	37.4	41.4	44.9	49.7
2-3	37.0	45.3	44.9	44.8	49.2	55.7	64.2
3-4	42.8	53.4	55.8	57.1	61.9	69.3	80.6
4-5	44.6	49.9	58.0	63.7	68.9	76.6	85.8
5-6	50.4	54.3	62.6	70.4	77.3	86.3	98.1
6-7	61.9	61.4	73.2	82.9	92.6	101.6	115.9
7-8	74.0	77.2	90.1	106.4	116.4	124.3	152.1
8-9	88.6	90.4	108.3	121.3	136.4	150.5	185.0
9-10	72.1	73.5	101.6	112.7	130.6	143.3	177.2
11-15	182.5	163.8	107.0	127.1	135.7	148.4	164.2

Source: LIAB 1996-2014, with imputed task information per plant-occupation from BIBB-BAuA 1999, 2006 and 2012. Daily wage deflated to 1998.

Shares of Simultaneous “What” Tasks at the Workplace

	1999	2006	2012
	(1)	(2)	(3)
0	.034	.008	.008
1	.063	.016	.014
2	.087	.028	.028
3	.114	.049	.046
4	.121	.072	.071
5	.127	.101	.099
6	.119	.123	.121
7	.110	.135	.134
8	.085	.125	.130
9	.062	.114	.116
10	.038	.092	.092
11	.025	.068	.068
12 or more	.015	.070	.073
<i>Average</i>	5.250	7.261	7.316
<i>Observations</i>	27,634	16,964	16,718

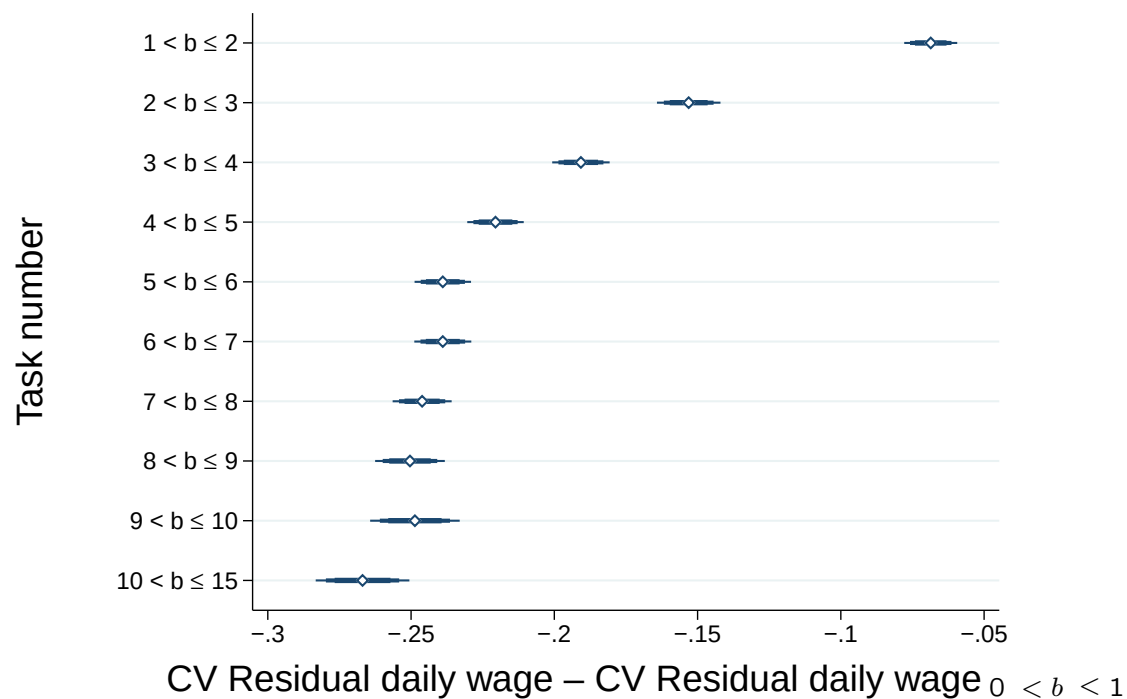
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Source: LIAB 1996-2014, with imputed task information per plant-occupation from BIBB-BAuA 1999, 2006 and 2012. Prediction of coefficient of variation of daily wage residual (exponentiated Mincer residual) CV within plant-occupation by task number, controlling for sector, region, occupation and worker characteristics. Results are differences to smallest task-number category (0 to 1 tasks). Thick, medium, and thin lines represent the 99, 95, and 90 percent confidence intervals.

Consumers

- L identical risk-neutral individuals (heterogeneous budget sets)
- CES preferences over continuum of differentiated goods $\omega \in \Omega$
- Economy-wide demand for variety ω : $x(\omega) = \left(\frac{p(\omega)}{P} \right)^{-\sigma} \frac{Y}{P}$,
where $P \equiv \left[\int_{\omega \in \Omega} p(\omega)^{1-\sigma} d\omega \right]^{1/(1-\sigma)}$ is the CES price index
- Each variety produced by unique monopolistically competitive plant, labor is only input

Production and Occupations

- Cobb-Douglas combination of individual occupation outputs $q_j(\omega)$:

$$q(\omega) = \tilde{\varphi} \tilde{z} [n(\omega) + 1] \exp \left\{ \frac{1}{n(\omega) + 1} \sum_{j=1}^{n(\omega)+1} \ln q_j(\omega) \right\}$$

with parameter $\tilde{z} < 1$ standardizing production quantity

- Plants can raise output by creating additional occupations
(Plants may also outsource: $\tilde{z} = z(\omega) \cdot \tilde{\zeta}$)
- Distinct possible tasks located around unit circle
Worker core abilities differentiated, also around unit circle

Tasks in Production

- Production: Workers perform tasks in occupations
- Plant ω has elemental productivity $\tilde{\varphi}$ and chooses:
 - count of occupations $n(\omega) + 1$, with $[n(\omega) + 1] = 1, 2, \dots$,
implying occupation-invariant range of tasks $b(\omega)$ per occupation,
 - wage schedule $w(i, b)$ for worker with *core ability* i ,
 - employment $\ell_j(\omega)$ per occupation j .

Task Assignment to Occupations

- Plants must select tasks from (different) subinterval with length $\tilde{z} < 1$
- Plants bundle adjacent tasks into occupations: range $b < \tilde{z}$
- If division of task space mutually exclusive: $b = \frac{\tilde{z}}{n + 1}$
- If tasks overlap between occupations: $b = \frac{\tilde{z}}{\nu n + 1}$ with $\nu \in (0, 1]$
(In limit $\nu = 0$, each occupation exhausts whole task range, regardless of n .)

Summary of Remaining Model

- Cobb-Douglas production: combine occupation outputs into product
- Plants can raise output by creating additional occupations.
Match quality raises occupation-level efficiency in addition
- Stole-Zwiebel wage bargaining over surplus: $w(i, b)/w = \lambda(i, b)/\lambda$
- Span-of-control fixed cost dampen occupation creation in Melitz model
- Larger plants more unequal. Trade raises inequality globally

Employment and Occupation-level Worker Efficiency

- Worker efficiency: $\lambda(i, b) = \tilde{\eta}/\tilde{z} + 1/m(i, b)$
- Plant employs $\ell_j(i, b)$ workers with ability i in occupation j
 Workers per occupation $\ell_j(b) \equiv \int_0^b \ell_j(i, b) \, di$ (plant with task range b).
- Occupation-level efficiency: $\lambda_j(b) = \frac{1}{\ell_j(b)} \int_0^b \lambda(i, b) \ell_j(i, b) \, di$.
- Occupation-level output: $q_j = \lambda_j(b) \ell_j(b)$.
 (If $\ell_j(i, b)$ same for all workers i in occupation j , then q_j same for all j .)

Occupation-level and Plant-level Efficiency

- Occupation-level efficiency in j : $\lambda_j(b) = \frac{1}{\ell_j(b)} \int_0^b \lambda(i, b) \ell_j(i, b) di$

- Differentiate with respect to the task range b per occupation

$$\lambda'_j(b) = \frac{\ell_j(b, b)}{\ell_j(b)} [\lambda(b, b) - \lambda_j(b)] < 0.$$

- Smith's *Division of Labor*:
Average worker efficiency higher in specialized occupations
- **Plant-level efficiency:** $\tilde{z} \lambda(\omega) = [\tilde{\eta} + \pi(\nu n(\omega) + 1)]$

Economics after Physics: Plant-level Trade-Offs

- Workers assortatively match to occupations that include core ability
- At plant with narrower task range, less ability-occupation mismatch
At plant with narrower task range, average worker more efficient
- Finite occupation counts at plants because
fixed cost of operation increases with count of occupations
- Coordinating more occupations raises span-of-control cost
- Melitz (2003): Productive plants (exporters) offer more occupations

The Plant's Problem

- Stage four. Stole-Zwiebel bargaining over individual wages.
- Stage three. Plant employment $\ell(\omega)$, same in all occupations.
Price: $p(\omega) = \frac{\sigma}{\sigma-1} \frac{w}{\tilde{\varphi} \tilde{z} \lambda(\omega)}$.
- Stage two. Number of occupations $n(\omega)$,
positively related to revenues in optimum.
- Stage one. Participation in draws of $\tilde{\varphi}, \tilde{\zeta}, \tilde{\eta}, \tilde{f}_x$; entry decisions.

Stole-Zwiebel Bargaining and Wage Dispersion

- Employer could pay same wage to all workers within occupation despite mismatches (profit maximizing)
- By filled vacancy, plant and worker bargain under bilateral monopoly
- Plant pays worker-specific wage (ability observed in job interview):

$$w_j(i, b) = w \frac{\lambda(i, b)}{\lambda_j(b)}$$

Employer is indifferent between all workers in a specific occupation.

(Workers uniformly distributed, so indifference implies $\ell_j(i, b)$ same for all i in j .)

Plant-level Relationships and Outcomes

- Plant-level efficiency: $\tilde{z} \lambda(\omega) = [\tilde{\eta} + \pi(\nu n(\omega) + 1)]$
- Fixed cost of operation: $f(\omega) = f_0 + [\tilde{\eta} + \pi(\nu n(\omega) + 1)]^\gamma \quad (\gamma > 0)$
- Profits: $\psi(\omega) = r(\omega)/(2\sigma - 1) - f(\omega)$
- Wage dispersion: $var(\omega) = w^2 [4 - \pi(\pi - 2)] \frac{(\nu n(\omega) + 1)^2}{[\tilde{\eta} + \pi(\nu n(\omega) + 1)]^2}$.

Open-economy Equilibrium

- Trade opening leads productive plants into exporting, raising welfare
- Variance of wages increases at exporters (if wage dispersion high at productive plants), declines at non-exporters
- Asymmetry implies counteracting effects on economy-wide inequality
- Economy-wide wage inequality higher in the open than in the closed one if and only if (common) sensitivity of performance positive
- Globalization may aggravate wage inequality in all open economies

Evidence to Date

- **Financial Losses from Small Mistakes**

Sensitivity of worker performance to task mismatch $\tilde{\eta}$
positively related to reported losses from small mistakes

- Number of tasks in occupation *negatively* related to plant revenues
(IV: trade predicted revenues)
- Within-occupation wage inequality *positively* related to plant revenues
(IV: trade predicted revenues)

Tests of the Model

Hypothesis 1. Number of tasks per occupation and revenues inversely related.

Hypothesis 2. Within-occupation wage dispersion positively related to plant size iff $\tilde{\eta} \geq 0$.

- Linear predictions
- Instruments for exporting: Foreign market shocks in China, Eastern Europe (Autor, Dorn, Hanson 13; Dauth, Findeisen, Suedekum 14)

Tests of the Model

Hypothesis 1. $r(\omega) = \frac{\sigma}{\sigma-1} \gamma w \{ \tilde{\eta} + \pi z / b(\omega) \}^\gamma$

Hypothesis 2. $var(\omega) = w^2 \frac{[4 - \pi(\pi - 2)](\nu n(\omega) + 1)^2}{[\tilde{\eta} + \pi(\nu n(\omega) + 1)]^2}.$

- Linear predictions
- Instruments for exporting: Foreign market shocks in China, Eastern Europe (Autor, Dorn, Hanson 13; Dauth, Findeisen, Suedekum 14)

Descriptive Statistics in joint BIBB-BAuA/LIAB data 1996-2014

	Obs.	Mean	Median	StDev.	Min.	Max.
log Revenues	144,775	13.45	13.22	1.40	8.54	24.63
log Export revenues	39,771	17.05	16.95	2.16	10.31	29.01
Export indicator	144,775	0.14	0	0.34	0	1
Employment	144,775	15.87	5	96.85	2	55,040
log Daily wage	144,775	3.95	3.99	0.48	0.35	6.37
CV Residual daily wage	136,379	0.24	0.20	0.19	0	2.72
Plant-level occupations	144,775	3.61	2	4.55	1	157
Plant-level tasks per occ. b	144,775	5.18	5.22	1.10	0.01	9.21
Plant-level no. of tasks z	144,775	10.87	11.10	2.76	0.98	15
Normalized no. of tasks b/z	144,775	0.50	0.48	0.12	0.001	1

Source: LIAB 1996-2014 and BIBB-BAuA 1999, 2006 and 2012. Plants with more than 2 full-time workers. Occupations at 3-digit KldB-88 level.

Note: Annual plant observations, inverse probability weights for national representativeness. CV: coefficient of variation of observed daily wage. *CV Residual daily wage*: coefficient of variation of (exponentiated) daily (log) wage residual from Mincer regression, including demographic, education and tenure information as well as time, sector and region fixed effects and plant log revenues.

First Stage: Revenues, Jobs and Exports, Imports

Dep. var.	log Rev. (4.1)	log Rev. (5.1)	log Occ. (5.2)	Interac. (5.3)	log Rev. (6.1)	log Occ. (6.2)	Interac. (6.3)
export dum _{<i>t-1</i>}	0.125*** (0.006)	0.224*** (0.020)	0.169*** (0.016)	3.052*** (0.260)	0.223*** (0.018)	.169*** (0.016)	3.044*** (0.259)
× log exports _{<i>CHN</i>}							
log imports _{<i>CHN</i>}	-0.015 (0.010)				-0.173*** (0.006)	-0.074*** (0.006)	-1.239*** (0.081)
export dum _{<i>t-1</i>}		-0.201*** (0.020)	-0.141*** (0.017)	-2.575*** (0.273)	-0.203*** (0.018)	-0.140*** (0.017)	-2.553*** (0.270)
× log exports _{<i>EE</i>}							
mill. rev. dis. _{<i>t-1</i>}		0.001*** (0.000)	0.0004*** (0.000)	0.007*** (0.000)	0.001*** (0.000)	0.0004*** (0.000)	0.007*** (0.000)
× log imports _{<i>EE</i>}							
F-stat.	160.5	6,290.4	1,416.8	1,074.1	4674.5	1044.3	800.5
Obs.	71,562	71,781	71,781	71,781	71,562	71,562	71,562

Source: LIAB 1996-2014 and BIBB-BAuA 1999, 2006 and 2012. Plants with more than 2 full-time workers.
Note: Regressions include time, region, and sector fixed effects. IV estimation based on GMM. Standard errors in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Revenues and the Number of Tasks

	Dependent variable: log Normalized number of tasks b/z					
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	IV	IV	IV
log Revenues	-0.0917*** (0.002)	-0.080*** (0.002)	-0.063*** (0.005)	-0.066*** (0.008)	-0.294*** (0.108)	-0.295*** (0.111)
log Nr. of Occ.		-0.640*** (0.016)	-0.604*** (0.038)		4.476 (2.952)	4.755 (3.104)
log Revenues × log Nr. of Occ.		0.034*** (0.001)	0.031** (0.003)		-0.246 (0.163)	-0.256 (0.172)
Plant FE			yes			
Adj. R^2	0.314	0.442	0.876			
Hansen J (p-val.)				0.477	.	0.784
Obs.	144,775	144,775	144,775	71,562	71,781	71,562

Source: LIAB 1996-2014 and BIBB-BAuA 1999, 2006 and 2012. Plants with more than 2 full-time workers.

Note: Regressions include time, region, and sector fixed effects. IV estimation based on GMM. Standard errors in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Revenues and the Within-occupation Residual Wage Dispersion

Dependent variable: log CV Residual daily wage						
	(1) OLS	(2) OLS	(3) OLS	(4) IV	(5) IV	(6) IV
log Revenues	0.056*** (0.007)	0.063*** (0.015)	0.081*** (0.031)	0.124*** (0.033)	-0.303 (0.283)	-0.278 (0.267)
log Nr. of Occ.		-0.135* (0.079)	-0.071 (0.218)		3.215 (4.179)	2.808 (3.966)
log Revenues × log Nr. of Occ.		0.007 (0.006)	0.002 (0.015)		-0.148 (0.219)	-0.127 (0.208)
Plant FE			yes			
Adj. R^2	0.115	0.115	0.557			
Hansen J (p-val.)				0.943	.	0.782
Obs.	136,378	136,378	136,678	68,208	68,423	68,208

Source: LIAB 1996-2014 and BIBB-BAuA 1999, 2006 and 2012. Plants with more than 2 full-time workers.

Note: Regressions include time, region, and sector fixed effects. IV estimation based on GMM. Standard errors in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Revenues and the Within-plant Overall Wage Dispersion

	Dependent variable: log CV Daily wage					
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	OLS	OLS	IV	IV	IV
log Revenues	0.082*** (0.007)	0.109*** (0.016)	0.062* (0.034)	0.067* (0.036)	0.087 (0.245)	0.036 244
log Nr. of Occ.		0.046 (0.046)	-.205 (0.227)		0.091 (3.697)	0.887 (3.701)
log Revenues × log Nr. of Occ.		-0.006 (0.006)	-0.009 (0.016)		0.007 (0.195)	-0.049 (0.195)
Plant FE			yes			
Adj. R^2	0.113	0.113	0.686			
Hansen J (p-val.)	n.a.	n.a.	n.a.	0.172	n.a.	0.376
Obs.	136,702	136,702	136,7023	68,420	68,635	68,429

Source: LIAB 1996-2014 and BIBB-BAuA 1999, 2006 and 2012. Plants with more than 2 full-time workers.

Note: Regressions include time, region, and sector fixed effects. IV estimation based on GMM. Standard errors in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Towards Quantification

Hypothesis A. Sensitivity of performance positive if task range sensitive to small mistakes.

Hypothesis B. Average sensitivity of performance positive on average.

Hypothesis C. Fixed Cost Semi-elasticity strictly positive.

- Linear predictions

Sensitivity of Performance $\bar{\eta}$: $\frac{\sqrt{4-\pi(\pi-2)}}{CV(\omega)} - \pi = \bar{\eta} \cdot b(\omega)/z(\omega)$

Fixed Cost Semi-elasticity γ : $\ln CV(\omega)b(\omega)/z(\omega) = \ln \frac{\sqrt{4-\pi(\pi-2)}}{\gamma^{1/\gamma}} - \frac{1}{\gamma} \ln \ell(\omega)$

Dep. var.	$\sqrt{4-\pi(\pi-2)}/CV - \pi$			$\log CV \cdot b/z$		
	(1)	(2)	(3)	(4)	(5)	(6)
Nm. nr. tasks b/z	65.702*** (16.061)	75.534*** (17.650)	98.519*** (30.119)			
log Employment				-0.039*** (0.005)	-0.012*** (0.005)	0.163*** (0.021)
Sector, Region FE		yes	yes		yes	yes
Plant FE			yes			yes
Adj. R^2	0.003	0.005	0.045	0.004	0.127	0.569
Obs.	136,378	136,378	136,378	136,378	136,378	136,378

Source: LIAB 1996-2014 and BIBB-BAuA 1999, 2006 and 2012. Plants with more than 2 full-time workers.

Note: CV is coefficient of variation of Residual daily wage. Regressions include time, region, and sector fixed effects. IV estimation based on GMM. Standard errors in parentheses. Significance levels: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.