



Firm-Level Labour Demand: Adjustment in Good Times and During the Crisis

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Motivation

- The recent situation on the Czech firms' labor demand side is surprisingly unexplored, firm-level data evidence:
 - Basu, Estrin, Svejnar (2005): 1989-1992
 - Onaran (2008): 1999-2004
- Do firm change their behavior during crisis?
 - Are the sort term “expansion” elasticities different from “crisis” ones?
- Are the firms really demand-constrained?
- Do we have losers only?
 - Can someone benefit?
- Preliminary results
 - Part of Project D1/10: Firm-level Labour Demand And Labour Costs: Adjustment In Good Times And During The Crisis; Jan Babecký, Kamil Galuščák, Lubomír Lízal

- Basu, Estrin, and Svejnar (2005):

$$\ln L_t = \alpha_0 + \alpha_1 \ln\left(\frac{W}{P}\right)_t + \alpha_2 \ln\left(\frac{W}{P}\right)_{t-1} + \alpha_3 \ln Q_t + \alpha_4 \ln Q_{t-1} + \alpha_5 X_t + \alpha_6 X_{t-1} + \alpha_7 \ln L_{t-1}$$

- W=wage bill/employment => measurement error, also some employers may have latitude in setting wages
 - Find instruments for wage
- Hausman test for exogeneity of sales Q
- X=ownership, legal status, industry dummies
- Estimate 2-year panels using annual data in the early transition until 1992

- Onaran (2008):
 - Estimate labour demand elasticity to output and real wage for high and medium to low-skilled industries in 1999-2004
 - First difference model estimated using GMM (Arellano, Bond, 1991), instruments for real wage
- For CR: output elasticity short-term 0.57, long-term 0.51
 - Significantly lower elasticities than in BSE
- The effect of real wage on labour demand is mixed across countries and sectors

- We estimate a first difference model using 2SLS on two year panels:

$$d \ln L_t = \alpha_1 d \ln\left(\frac{W}{CPI}\right)_t + \alpha_2 d \ln\left(\frac{Q}{PPI}\right)_t + \sum \beta_j ind_{jt} + \varepsilon_t$$

- L: 1) own workers (full-time equivalent) 2) own+hired workers
- W: 1) average wage=wagebill incl. other personnel expenses/number of own workers, 2) a. w. including hired workers with the same wage as own workers, 3) a. w. including hired workers with a lower wage (excl. other personnel expenses)
- Ind: industry dummies
- Instruments for wage and sales: district dummies, industry dummies, foreign owner dummy, lagged total assets*industry dummies, next 3-digit industry average values within the same 2-digit industry for labour, average wage, lagged average wage, lagged total assets

Data I – Full Time Equivalent

- CZSO yearly data on manufacturing firms in 2005-2009

Table: Summary statistics

	2006			2007			2008			2009		
	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.
llab1	2647	4.70	1.06	2643	4.74	1.06	1146	5.27	1.09	755	5.52	0.97
lagp	474	2.82	1.40	534	2.84	1.46	377	3.02	1.48	310	3.14	1.49
law1	2647	5.34	0.31	2643	5.39	0.31	1146	5.44	0.32	755	5.47	0.31
law2	2647	5.34	0.31	2643	5.39	0.31	1146	5.44	0.32	755	5.46	0.31
law3	2647	5.37	0.31	2643	5.44	0.31	1146	5.56	0.32	755	5.59	0.31
lsal	2647	11.98	1.46	2643	12.07	1.48	1146	12.72	1.49	755	12.99	1.44

Note: llab1=log(own workers), lagp=log(hired workers), law1=log(aw1), law2=log(aw2), law3=log(aw3), lsal=log(sales).

Data Ia – Physical Persons

- CZSO yearly data on manufacturing firms in 2005-2009

Table: Summary statistics

	2006			2007			2008			2009		
	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.
llab1	2897	4.66	1.05	2917	4.68	1.06	3069	4.58	1.08	3442	4.41	1.05
lagp	486	2.82	1.40	550	2.83	1.46	568	2.72	1.49	566	2.77	1.49
law1	2897	5.32	0.32	2917	5.37	0.32	3069	5.38	0.35	3442	5.38	0.35
law2	2897	5.32	0.32	2917	5.37	0.32	3069	5.38	0.35	3442	5.38	0.35
law3	2897	5.34	0.32	2917	5.42	0.32	3069	5.49	0.35	3442	5.50	0.35
lsal	2897	11.92	1.47	2917	12.00	1.48	3069	11.86	1.50	3442	11.65	1.50

Note: lab1= log(own workers), lagp=log(hired workers), law1=log(aw1), law2=log(aw2), law3=log(aw3), lsal=log(sales).

Table: Number of observations in manufacturing industries

okec2	2006	2007	2008	2009
15	436	419	386	416
16	1	1	2	2
17	161	158	144	128
18	45	53	61	62
19	40	41	40	40
20	108	112	112	116
21	62	54	57	67
22	73	54	61	69
23	3	3	4	3
24	119	120	118	121
25	154	173	205	225
26	179	184	180	176
27	101	102	104	118
28	294	326	363	499
29	411	424	469	609
30	15	16	16	13
31	230	219	287	305
32	34	32	40	69
33	89	86	85	83
34	166	172	176	170
35	68	70	60	53
36	98	89	89	89
37	10	9	10	9
Total	2897	2917	3069	3442

Data III – Full Time Equivalent

Table: Change in employment by manufacturing industry groups in % - firms from the 2009 sample

Industry	07/06	08/06	09/06	Industry	07/06	08/06	09/06
15 Own empl.	0.6	7.1	6.6	27 Own empl.	10.1	13.2	-11.0
Hired empl.	15.9	13.7	12.4	Hired empl.	36.4	27.7	22.5
All	1.1	7.3	6.7	All	11.6	14.0	-9.2
17 Own empl.	-2.2	-8.5	-24.2	29 Own empl.	1.6	1.3	-9.9
Hired empl.				Hired empl.	59.8	46.9	59.1
All	-2.1	-8.2	-23.9	All	4.6	3.6	-6.4
20 Own empl.	18.9	21.5	9.3	30 Own empl.	5.9	15.1	-8.6
Hired empl.	36.3	-11.9	-15.6	Hired empl.	43.7	63.6	58.7
All	19.3	20.8	8.8	All	8.6	18.6	-3.8
24 Own empl.	3.8	2.8	-4.0	34 Own empl.	12.9	14.3	-0.5
Hired empl.	40.4	70.5	68.6	Hired empl.	40.4	37.2	34.2
All	4.8	4.7	-2.0	All	14.3	15.5	1.3
25 Own empl.	-0.3	2.6	-6.2	36 Own empl.	-3.6	-4.1	-17.6
Hired empl.	23.6	158.2	135.6	Hired empl.	-16.4	41.4	30.8
All	0.4	7.4	-1.8	All	-3.7	-3.8	-17.2
26 Own empl.	-1.9	-2.0	-11.6	Total Own empl.	5.8	8.7	-6.3
Hired empl.	37.2	40.7	36.1	Hired empl.	41.0	47.5	45.1
All	-1.3	-1.4	-10.9	All	7.5	10.5	-4.0

Data IIIa – Physical Persons

Table: Change in employment by manufacturing industry groups in %

Industry	07/06	08/06	09/06	Industry	07/06	08/06	09/06
15 Own empl.	-3.3	11.9	9.3	27 Own empl.	6.6	32.9	11.8
Hired empl.	19.1	52.0	30.6	Hired empl.	34.4	35.8	30.7
All	-2.8	13.0	9.9	All	7.7	33.0	12.5
17 Own empl.	-5.1	-8.8	-22.8	29 Own empl.	3.1	21.0	7.6
Hired empl.	19.3	58.5	-17.0	Hired empl.	47.0	62.9	50.6
All	-5.0	-8.6	-22.8	All	4.6	22.4	9.0
20 Own empl.	-3.4	29.0	22.7	30 Own empl.	5.2	19.0	3.4
Hired empl.	36.1	28.0	-14.3	Hired empl.	44.0	59.7	53.0
All	-3.0	29.0	22.2	All	7.1	21.0	5.8
24 Own empl.	1.6	5.3	1.9	34 Own empl.	6.9	14.1	4.8
Hired empl.	40.4	44.7	45.1	Hired empl.	21.5	13.0	7.5
All	2.2	5.9	2.5	All	7.9	14.0	5.0
25 Own empl.	2.4	30.4	16.4	36 Own empl.	-2.1	15.7	10.3
Hired empl.	32.3	101.1	71.2	Hired empl.	-27.9	26.5	25.5
All	3.2	32.2	17.8	All	-2.7	16.0	10.6
26 Own empl.	-2.4	-3.6	-21.7	Total Own empl.	2.3	17.2	4.8
Hired empl.	21.5	31.6	-5.6	Hired empl.	31.1	42.0	31.8
All	-2.1	-3.1	-21.5	All	3.3	18.1	5.7

Data IVa – Physical Persons

Table: Change in employment by manufacturing industry groups in % - firms from the 2009 sample

Industry	07/06	08/06	09/06	Industry	07/06	08/06	09/06
15 Own empl.	4.1	9.2	6.7	27 Own empl.	7.3	16.2	-4.0
Hired empl.	30.9	24.9	24.2	Hired empl.	29.1	27.8	21.9
All	4.7	9.6	7.1	All	8.1	16.6	-2.9
17 Own empl.	-1.0	-5.1	-22.2	29 Own empl.	4.9	13.3	-0.2
Hired empl.	36.2	75.9	-39.0	Hired empl.	61.8	54.9	61.7
All	-1.0	-4.9	-22.2	All	6.9	14.8	2.0
20 Own empl.	3.7	15.3	2.9	30 Own empl.	6.9	16.3	-2.1
Hired empl.	28.7	-16.5	-29.5	Hired empl.	37.4	65.6	59.9
All	4.0	14.9	2.4	All	8.4	18.7	0.9
24 Own empl.	4.4	2.8	-3.7	34 Own empl.	12.3	16.8	1.4
Hired empl.	45.9	76.1	74.2	Hired empl.	37.7	34.7	31.9
All	5.3	4.3	-2.1	All	13.6	17.8	3.0
25 Own empl.	4.5	17.7	6.2	36 Own empl.	-3.8	6.9	-2.9
Hired empl.	26.2	120.3	102.5	Hired empl.	-78.7	-18.7	-12.7
All	5.0	20.3	8.6	All	-6.7	5.9	-3.2
26 Own empl.	3.5	6.4	-5.5	Total Own empl.	5.8	12.7	-1.6
Hired empl.	18.8	19.8	11.3	Hired empl.	35.9	45.5	42.3
All	3.7	6.5	-5.3	All	6.8	13.8	-0.1

Results I – Full Time Equivalent Own Workers Only

Table: Unweighted and weighted regressions: own workers

	Unweighted				Weighted				Weighted, firms from 2009 sample			
	2006	2007	2008	2009	2006	2007	2008	2009	2006	2007	2008	2009
dlaw1	-0.7136*** [0.1400]	-0.5445*** [0.1020]	-0.3390*** [0.1241]	-0.3700*** [0.1128]	-0.5737*** [0.1996]	-0.3895*** [0.1174]	-0.3309* [0.1843]	-0.3218*** [0.1101]	-0.4249** [0.1855]	-0.3554** [0.1629]	-0.1593 [0.1214]	-0.3218*** [0.1101]
dlsal	0.3230*** [0.0889]	0.3971*** [0.0540]	0.2095*** [0.0538]	0.4784*** [0.0625]	0.1918** [0.0937]	0.3242*** [0.0883]	0.6158*** [0.1422]	0.4820*** [0.0670]	0.2207*** [0.0760]	0.2812*** [0.0993]	0.3163*** [0.0567]	0.4820*** [0.0670]
N	2647	2643	1146	755	2647	2643	1146	755	602	631	694	755

Note: *** p<0.01, ** p<0.05, * p<0.1, robust standard errors in brackets.

Results II – Full Time Equivalent Agency Workers Included

Table: Unweighted and weighted regressions: own+hired workers, hired workers earning the same wage

	Unweighted				Weighted				Weighted, firms from 2009 sample			
	2006	2007	2008	2009	2006	2007	2008	2009	2006	2007	2008	2009
dlaw2	-0.6984*** [0.1432]	-0.5274*** [0.1161]	-0.2838** [0.1223]	-0.3639*** [0.1130]	-0.2027 [0.2354]	-0.2726*** [0.0988]	-0.2449 [0.1737]	-0.3106*** [0.1095]	-0.1801 [0.2307]	-0.1892 [0.1554]	-0.0813 [0.1151]	-0.3106*** [0.1095]
dlsal	0.3423*** [0.0934]	0.4259*** [0.0664]	0.1999*** [0.0495]	0.4618*** [0.0614]	0.2470** [0.1083]	0.3238*** [0.0901]	0.6037*** [0.1490]	0.4214*** [0.0613]	0.2714*** [0.0885]	0.2816*** [0.0922]	0.3335*** [0.0638]	0.4214*** [0.0613]
N	2647	2643	1146	755	2647	2643	1146	755	602	631	694	755

Note: *** p<0.01, ** p<0.05, * p<0.1, robust standard errors in brackets.

Results III - Full Time Equivalent Agency Workers Included

Table: Unweighted and weighted regressions: own+hired workers, hired workers earning a lower wage

	Unweighted				Weighted				Weighted, firms from 2009 sample			
	2006	2007	2008	2009	2006	2007	2008	2009	2006	2007	2008	2009
dlaw3	-0.5838*** [0.1137]	-0.3937*** [0.0881]	-0.2922*** [0.1057]	-0.3607*** [0.1103]	-0.2797 [0.1722]	-0.2196** [0.0859]	-0.2251 [0.1489]	-0.3040*** [0.1068]	-0.2552 [0.2040]	-0.1737 [0.1433]	-0.075 [0.1069]	-0.3040*** [0.1068]
dlsal	0.3472*** [0.0944]	0.4365*** [0.0680]	0.1974*** [0.0478]	0.4614*** [0.0613]	0.2518** [0.1100]	0.3243*** [0.0907]	0.6032*** [0.1490]	0.4216*** [0.0613]	0.2773*** [0.0904]	0.2835*** [0.0924]	0.3340*** [0.0641]	0.4216*** [0.0613]
N	2647	2643	1146	755	2647	2643	1146	755	602	631	694	755

Note: *** p<0.01, ** p<0.05, * p<0.1, robust standard errors in brackets.

Results Ia – Physical Persons Own Workers Only

Table: Unweighted and weighted regressions: own workers

	Unweighted				Weighted			
	2006	2007	2008	2009	2006	2007	2008	2009
dlaw1	-0.7355*** [0.1202]	-0.3787*** [0.1063]	-0.0564 [0.0753]	-0.3770*** [0.1164]	-0.6147*** [0.1813]	-0.2624** [0.1115]	-0.3283** [0.1396]	-0.4395*** [0.1432]
dlsal	0.2980*** [0.0783]	0.3696*** [0.0584]	0.2036*** [0.0411]	0.3810*** [0.0623]	0.1927** [0.0928]	0.3154*** [0.0855]	0.6247*** [0.1289]	0.3630*** [0.0683]
N	2897	2917	3069	3442	2897	2917	3069	3442

Note: *** p<0.01, ** p<0.05, * p<0.1, robust standard errors in brackets.

Results IIa – Physical Persons Agency Workers Included

Table: Unweighted and weighted regressions: hired workers earning the same wage

	Unweighted				Weighted			
	2006	2007	2008	2009	2006	2007	2008	2009
d _{law2}	-0.7264*** [0.1244]	-0.3432*** [0.1222]	-0.0487 [0.0760]	-0.3364*** [0.1071]	-0.3015 [0.2093]	-0.1934 [0.1376]	-0.3192** [0.1473]	-0.4288*** [0.1338]
d _{lsal}	0.3196*** [0.0829]	0.3990*** [0.0701]	0.1972*** [0.0384]	0.3766*** [0.0567]	0.2532** [0.1085]	0.3147*** [0.0893]	0.6467*** [0.1209]	0.3452*** [0.0604]
N	2897	2917	3069	3442	2897	2917	3069	3442

Note: *** p<0.01, ** p<0.05, * p<0.1, robust standard errors in brackets.

Results IIIa – Physical Persons Agency Workers Included

Table: Unweighted and weighted regressions: hired workers earning a lower wage

	Unweighted				Weighted			
	2006	2007	2008	2009	2006	2007	2008	2009
dlaw3	-0.6077*** [0.1006]	-0.2511*** [0.0908]	-0.1698*** [0.0650]	-0.3326*** [0.1038]	-0.3375** [0.1514]	-0.1412 [0.1140]	-0.2953*** [0.1085]	-0.4084*** [0.1274]
dlsal	0.3256*** [0.0840]	0.4047*** [0.0719]	0.2011*** [0.0406]	0.3731*** [0.0557]	0.2567** [0.1097]	0.3132*** [0.0894]	0.6476*** [0.1204]	0.3434*** [0.0597]
N	2897	2917	3069	3442	2897	2917	3069	3442

Note: *** p<0.01, ** p<0.05, * p<0.1, robust standard errors in brackets.

Results IV

- We compare our results to CNB ad-hoc firm-level survey on wage and price setting conducted in 2007 and 2009 (the survey was organized within the ECB Wage Dynamics Network)
- For 2007 results, see for example:
 - Babecký, Galuščák, Dybczak (2008), „Survey on Wage and Price Formation of Czech Firms,“ CNB WP No. 12/2008.
 - Fabiani et al. (2010), „Wage Rigidities and Labor Market Adjustment in Europe,“ Journal of European Economic Association 8(2-3): 497-505.

Results V

Table: Which of the following strategies were relevant or very relevant to face a fall in demand

	Reduce prices		Reduce margins		Reduce output		Reduce costs	
	2007	2009	2007	2009	2007	2009	2007	2009
Total	51.3	34.0	54.4	40.0	52.1	48.5	86.7	88.3
- manufacturing	49.4	37.2	57.9	44.1	62.4	71.0	87.7	92.3
- other industries ^a	53.5	30.3	50.4	35.2	40.0	21.5	85.6	83.9
- small firms	38.1	28.4	44.0	28.4	33.7	39.6	90.1	84.2
- medium firms	54.6	34.0	63.7	45.3	45.1	45.0	83.5	76.0
- large firms	52.9	35.4	52.3	40.3	59.9	52.1	87.5	95.2
- exporters	53.2	39.1	52.6	42.7	64.8	67.4	85.8	93.9
- non-exporters	50.2	31.3	55.0	38.6	46.6	38.7	87.0	85.5

Note: Strategies adopted during the crisis (answers received in June and July 2009, columns 2009).

Answers to a hypothetical reaction to unexpected fall in demand as received in autumn 2007 (columns 2007).

Weighted answers in % from 241 firms with 20 and more employees.

^a Other industries in business sector. Small firms with 20-49 employees, medium firms with 50-199 employees, large firms with 200 and more employees.

Exporters: Firms with more than a half of revenue from sales of the main product on foreign markets in 2006.

Statistically significant differences from reference value (manufacturing, small firms, exporters) at 10% in bold.

Source: CNB ad-hoc survey.

Results VI

Table: Main channel through which the reduction of costs is achieved.

	Reduce base wages		Reduce flexible wage components		Reduce permanent employment		Reduce temporary employment		Adjust hours worked		Reduce non-labour costs	
	2007	2009	2007	2009	2007	2009	2007	2009	2007	2009	2007	2009
Total	0.0	3.9	18.3	25.1	18.7	42.9	26.6	37.5	3.5	12.2	42.4	54.6
- manufacturing	0.0	4.1	11.4	25.4	19.2	52.6	31.1	43.1	4.4	17.9	43.6	43.8
- other industries ^a	0.0	3.7	26.0	24.7	18.2	31.9	21.6	31.1	2.5	5.7	41.0	66.9
- small firms	0.0	2.8	23.3	17.9	17.3	27.8	26.5	29.3	0.0	2.8	54.8	49.3
- medium firms	0.0	6.7	23.9	39.7	17.9	36.6	20.4	44.0	7.1	17.3	36.6	57.4
- large firms	0.0	2.8	14.4	20.0	19.4	49.3	29.5	36.5	2.7	12.1	42.0	54.5
- exporters	0.0	7.3	10.0	27.0	16.5	55.4	35.6	41.0	2.6	25.3	39.9	49.0
- non-exporters	0.0	2.3	22.5	24.4	20.0	36.7	22.0	35.7	4.0	6.1	43.5	57.9

Notes: See the previous table.

Source: CNB ad-hoc survey.

Conclusions

- Survey evidence supported with preliminary population sample analysis
- Large firms took the hard hit
 - Exporting firms seem even worse off
 - Findings support the argument crisis was imported via the real cycle
 - Short-term sales elasticity increased as well as wage elasticity
- Crisis was an opportunity for smaller firms
 - They seem actually less constrained
- We need to control for agency workers
 - Results based on own employees only are often counter-intuitive

Thank you for your attention

Thank you

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