Online Appendix

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January 11, 2021

This appendix provides supporting information for the paper "*The Role of Wages in the Euro-zone*". Tables A1-A2 and Figures A1-A4 report descriptive statistics and delineate descriptive trends. Tables A3-A14 summarize additional empirical results.

1 Descriptive statistics and trends

Table A1: Descriptive statistics: Determinants of nominal wage growth.

Variable	Obs	Mean	SD	Min	Max
Nominal wages per hour worked	176	127.00	18.31	79.97	172.76
Level of coordination	176	3.49	1.16	1	5
Loans from nonresident banks as % of GDP	176	63.50	38.09	15.83	219.75
Total private credit (domestic) as % of GDP	176	93.82	29.27	36.20	170.28
Gross value added per hour worked at constant prices	176	110.21	7.49	88.13	131.68
Unemployment	176	0.09	0.04	0.03	0.28
Inflation rate	176	4.79	0.10	4.55	4.96
Government partisanship	175	2.59	1.43	1	5
Trade union density	156	0.31	0.18	0.08	0.76

Table A2: Descriptive statistics: Wage sensitivity of exports in Austria, Germany, and the Netherlands.

Variable	Obs	Mean	SD	Min	Max
Austria					
Bilateral exports	160	4.49	8.18	0.16	32.51
Imports	160	2.08e+08	1.83e+08	2.81e+07	7.92e+08
Relative productivity	160	102.44	5.82	85.91	117.82
Relative wages	160	94.63	7.61	72.73	111.26
Germany					
Bilateral exports	160	31.97	25.31	2.80	94.47
Imports	160	1.27e+08	9.64e+07	2.39e+07	3.62e+08
Relative productivity	160	101.35	5.49	84.26	115.10
Relative wages	160	89.03	8.10	65.85	101.90
Netherlands					
Bilateral exports	160	14.87	19.34	1.05	86.78
Imports	160	1.82e+08	1.73e+08	2.69e+07	7.32e+08
Relative productivity	160	99.65	5.40	82.46	112.66
Relative wages	160	101.24	7.89	78.84	119.73

Figure A1: Wage bargaining coordination in 11 euro countries, 1999-2014.

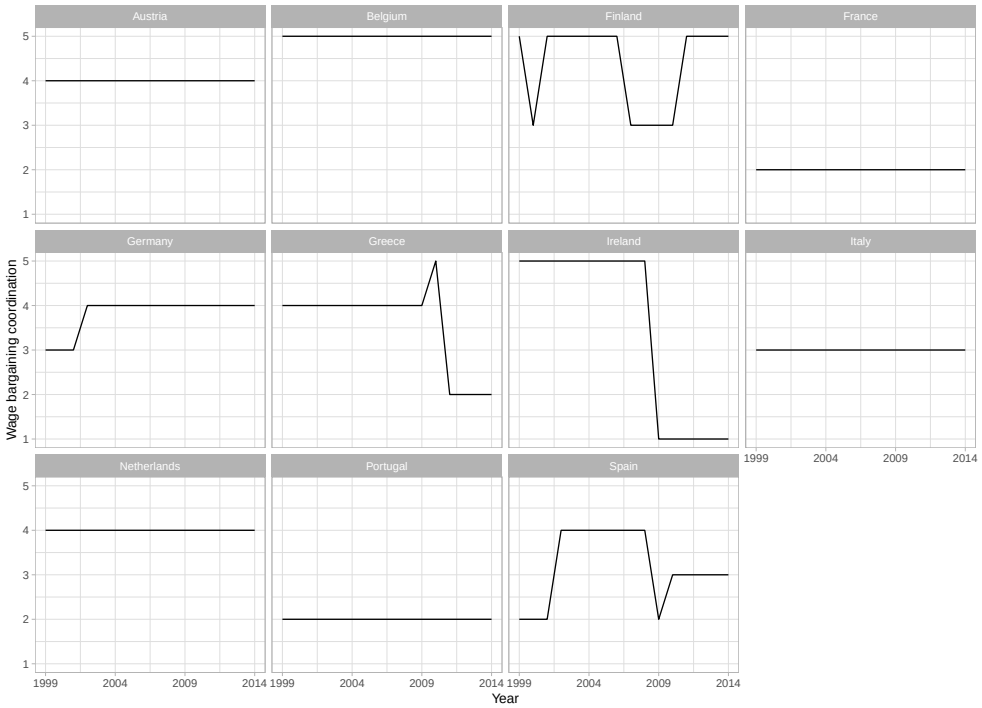


Figure A2: Loans from nonresident banks as percentage of GDP in 11 euro countries, 1999-2014.

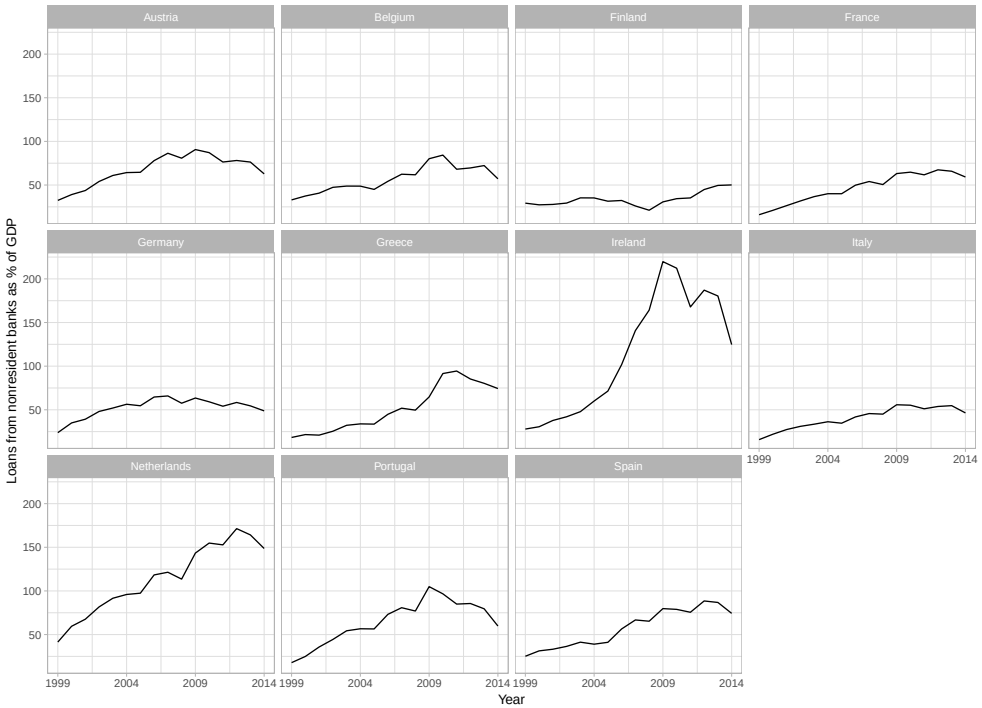


Figure A3: Credit to the private non-financial sector from domestic banks as percentage of GDP in 11 euro countries, 1999-2014.

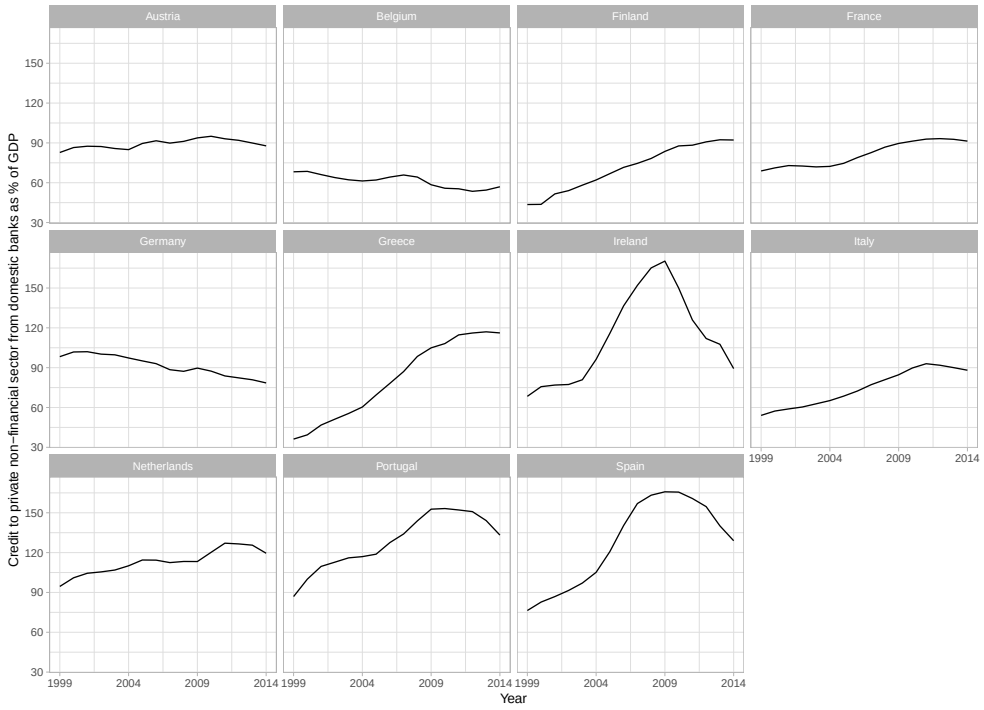


Figure A4: Manufacturing labor productivity in 11 euro countries, 1995-2015.

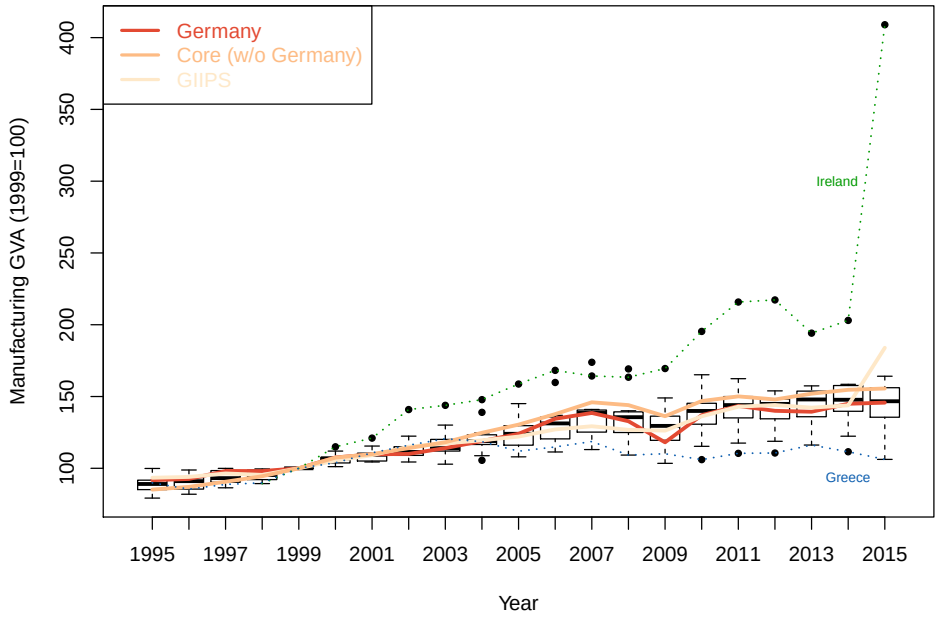
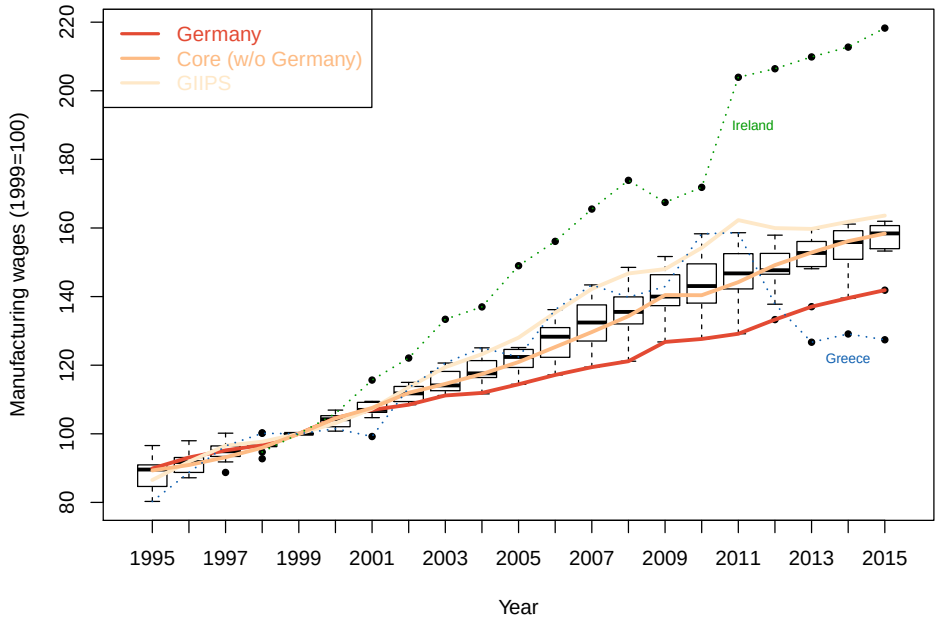


Figure A5: Nominal manufacturing wages in 11 euro countries, 1995-2015.



2 Additional empirical results

Table A3: Determinants of nominal manufacturing wage growth in the Eurozone, 1999–2014.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Coordination$_t$	.005*	.005*	.004*	.001	−.000	.000
	(.002)	(.002)	(.002)	(.002)	(.003)	(.002)
Δ ln(Loans$_{t-1}$)		.008	−.005	−.008	−.008	−.033
		(.019)	(.019)	(.019)	(.019)	(.018)
Δ ln(Credit$_{t-1}$)			.086	.073	.043	.120*
			(.053)	(.054)	(.058)	(.031)
Δ ln(Inflation$_{t-1}$)				−.089	.075	.408*
				(.225)	(.240)	(.180)
Δ ln(Manufacturing				.154*	.170*	.101
Productivity$_{t-1}$)				(.056)	(.059)	(.083)
Unemployment$_{t-1}$				−.174*	−.175*	−.163*
				(.075)	(.070)	(.082)
Partisanship$_t$					.001	.001
					(.001)	(.001)
Union density$_t$					.003	.004
					(.012)	(.010)
Constant	.013	.012	.013	.036*	.035*	.031*
	(.008)	(.009)	(.008)	(.011)	(.011)	(.012)
Observations	176	176	176	173	152	91
H_0: no autocorrelation	.019*	.013*	.105	.240	.710	.621
H_0: no cointegration	.002*	.023*	.090	.281	—	—
R^2	.036	.037	.060	.160	.171	.250

* $p < .05$. Westerlund cointegration tests for Models 5 and 6 are missing because `Stata` does not allow to run these tests with more than seven regressors.

Table A4: The effect of country-specific wage bargaining structures on nominal manufacturing wage growth, 1999–2007 (short) and 1999–2014 (long).

	Austria		Belgium		Finland		France		Germany		Greece	
	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long
Country-specific	−.002	−.002	.001	.000	.001	−.002	.007*	.002	−.001	−.002*	−.005	−.006
coordination	(.001)	(.001)	(.001)	(.001)	(.002)	(.002)	(.002)	(.003)	(.002)	(.001)	(.007)	(.006)
Linear	−.002	−.002	.001	−.000	.002	−.002	.009*	.002	−.000	−.002	−.003	−.006
combination	(.003)	(.003)	(.002)	(.003)	(.002)	(.004)	(.003)	(.006)	(.002)	(.003)	(.006)	(.006)
Remaining variables	Yes		Yes		Yes		Yes		Yes		Yes	
Observations	91	152	91	152	91	152	91	152	91	152	91	152
R^2	.262	.178	.252	.171	.232	.172	.276	.173	.253	.178	.277	.197

	Ireland		Italy		Netherlands		Portugal		Spain	
	Short	Long	Short	Long	Short	Long	Short	Long	Short	Long
Country-specific	.004	.006	.001	.002	−.001	−.002	−.006	−.003	.002	.007*
coordination	(.003)	(.004)	(.002)	(.002)	(.001)	(.003)	(.002)	(.003)	(.003)	(.003)
Linear	.003	.004	.001	.002	−.000	−.002	−.008	−.004	.002	.004
combination	(.002)	(.005)	(.003)	(.004)	(.002)	(.002)	(.005)	(.006)	(.002)	(.003)
Remaining variables	Yes		Yes		Yes		Yes		Yes	
Observations	91	152	91	152	91	152	91	152	91	152
R^2	.288	.216	.250	.173	.252	.176	.262	.173	.256	.208

* $p < .05$.

Table A5: Empirical estimates of price elasticity of German exports in the extant literature.

Article	Frequency	Time period	Estimator	Estimate	Measure of relative price
Clostermann (1998)	Quarterly	1975q1–1995q4	ECM	-0.74	Px/GDP deflator
Deutsche Bundesbank (1998)	Quarterly	1975q1–1997q2	ECM	-0.70	deflators of total sales
Strauß (2000)	Quarterly	1975q1–1999q4	ECM	-0.58; -0.39	CPI
Meurers (2004)	Quarterly	1975q1-1999q4	VECM	-0.69	Px/CPI
Allard et al. (2005)	Quarterly	1992q3-2004q3	ECM	-0.32; -0.81	mULC/GDP deflators; CPI/GDP deflators
Stephan (2005)	Quarterly	1981q1-2003q2	ECM	**-1.05**	CPI
	Quarterly	1981q1-2003q2	ECM	**-0.37**	REEVpifc
	Quarterly	1981q1-2003q2	ECM	**-0.69**	REEVpimeq
Stahn (2006)	Quarterly	1980q1–2004q3	ECM	**-0.92**; -0.63	REER/deflators of total sales
	Quarterly	1993q1–2004q3	ECM	**Ins.**; -0.30	REER/deflators of total sales
Danninger and Joutz (2008)	Quarterly	1993q1–2005q4	VECM	-0.42; -0.14	REER/ULC
Stockhammer, Hein, and Grafl (2011)	Annual	1970–2005	First Differences	-0.78	Px/Pm
	Annual	1970–1987	First Differences	-0.67	Px/Pm
	Annual	1987–2005	First Differences	-1.24	Px/Pm
Onaran and Galanis (2012)	Annual	1971–2007	First Differences	-0.43	Px/Pm
Storm and Naastepad (2012)	Annual	1960–2000	First Differences	-0.12	rULC
Thorbecke and Kato (2012)	Quarterly	1980q2–2011q1	Dynamic OLS	-1	REER/CPI
	Quarterly	1980q2–2009q3	Dynamic OLS	-0.64	REER/CPI
Breuer and Klose (2013)	Quarterly	1995q1–2012q2	SURE ECM	-0.82	REER/ULC
European Commission (2014)	Quarterly	1994q1–2014q1	Fractional VECM	-0.81	REER/export prices
Lebrun and Ruiz (2014)	Quarterly	1995q1-2013q3	Fully modified OLS	-0.24	deflators of total sales
Onaran and Galanis (2014)	Annual	1971-2007	ECM	-0.43	Px/Pm
Storm and Naastepad (2015)	Quarterly	1996q2–2008q4	First Differences	Ins.	rULC
Onaran and Obst (2016)	Annual	1960-2013	ECM	-0.38	Px/Pm
Horn and Watt (2017)	Quarterly	1980q1-2016q2	ECM	-0.51	export goods deflators
Neumann (2020)	Quarterly	1995q1-2014q1	ECM	**ins.**; -0.70	REER/ULC (control: $GFCF_{t-1}$)
	Quarterly	1995q1-2014q1	ECM	**0.61**; -0.52	REER/ULC (control: GDP_{t-1})

Notes: **Bold** indicates estimates for Eurozone (otherwise: rest of the world). This review heavily draws on Baccaro and Benassi (2017) and Table 2 in Neumann (2020). CPI=consumer price index; (V)ECM=(vector) error correction model; GDP=gross domestic product; GFCF=gross fixed capital formation; OLS=ordinary least squares; Pm=import prices; Px=export prices; REER=real effective exchange rate; REEVpifc=real effective external value based on prices of investment in fixed capital; REEVpimeq=real effective external value based on prices of investment in machinery and equipment; SURE=seemingly unrelated regression equations; (r/m)ULC=(relative/manufacturing) unit labor costs.

Table A6: Wage sensitivity of exports in remaining countries, 1999–2014.

	Belgium	Finland	Greece	Italy
$\Delta \ln\left(\frac{Wages_c}{Wages_p}\right)$	.568	−.866	−.530	−.308
	(.520)	(.734)	(.581)	(.325)
$\Delta \ln\left(\frac{Productivity_c}{Productivity_p}\right)$	−1.199	.983	1.296	.266
	(.634)	(.863)	(.922)	(.460)
$\Delta \ln(Imports_{p-c})$	.578*	1.130*	.481	1.059*
	(.196)	(.122)	(.330)	(.090)
Constant	.005	−.018	−.004	−.027*
	(.011)	(.016)	(.024)	(.008)
Observations	150	150	150	150
H_0: no autocorrelation	.226	.167	.457	.091
H_0: no cointegration	.169	.073	.096	.097
R^2	.368	.426	.144	.650

* $p < .05$.

Table A7: ULC sensitivity of exports, 1999–2014.

	Austria	France	Germany	Ireland	Netherlands	Portugal	Spain
$\Delta \ln\left(\frac{ULC_c}{ULC_p}\right)$	−.708	.414	−.853*	.226	−.176	−.467	−.196
	(.815)	(.251)	(.292)	(.331)	(.452)	(.324)	(.247)
$\Delta \ln(Imports_{p-c})$	.968*	.718*	.632*	−.075	.745*	.583*	.594*
	(.143)	(.054)	(.077)	(.233)	(.177)	(.090)	(.129)
Constant	−.003	−.011	.003	.039*	.026	.012	.009
	(.009)	(.004)	(.007)	(.010)	(.016)	(.008)	(.010)
Observations	150	150	150	150	150	150	150
H_0: no autocorrelation	.000*	.823	.764	.104	.539	.636	.406
H_0: no cointegration	.016*	.048*	.071	.120	.025*	.045*	.036*
R^2	.401	.590	.596	.002	.303	.223	.290

* $p < .05$.

Table A8: Wage sensitivity of quarterly exports in Austria, Germany, and the Netherlands .

	Austria		Germany		Netherlands	
	1999–2007	1999–2014	1999–2007	1999–2014	1999–2007	1999–2014
$\Delta \ln\left(\frac{Wages_c}{Wages_p}\right)$						
Δ_t	.043	.192	−.066	−.071	−.032	.049
	(.167)	(.145)	(.053)	(.041)	(.090)	(.080)
Δ_{t-1}	−.242	.021	−.258*	−.170*	−.201	−.144
	(.205)	(.164)	(.063)	(.052)	(.121)	(.110)
Δ_{t-2}	.076	−.004	−.145*	−.078*	.135	.109
	(.179)	(.147)	(.053)	(.041)	(.095)	(.084)
Linear combination	−.123	.208	−.468*	−.318*	−.097	.015
	(.457)	(.371)	(.141)	(.112)	(.249)	(.225)
$\Delta \ln\left(\frac{Productivity_c}{Productivity_p}\right)$						
Δ_t	−.750*	−.606*	−.215	.213	−.041	.243
	(.335)	(.282)	(.177)	(.126)	(.172)	(.135)
Δ_{t-1}	.086	−.086	−.114	.197	.248	.197
	(.409)	(.355)	(.208)	(.146)	(.222)	(.177)
Δ_{t-2}	.304	.135	.175	.339*	.111	−.064
	(.301)	(.261)	(.170)	(.125)	(.169)	(.131)
Linear combination	−.360	−.557	−.154	.750*	.317	.377
	(.824)	(.716)	(.434)	(.300)	(.447)	(.354)
$\Delta \ln(Imports_{p-c})$						
Δ_t	.358*	.662*	.249*	.430*	.462*	.522*
	(.127)	(.104)	(.057)	(.043)	(.069)	(.055)
Δ_{t-1}	−.100	.204	.135*	.213*	.048	.224*
	(.145)	(.111)	(.065)	(.045)	(.074)	(.058)
Δ_{t-2}	−.128	−.013	.078	.130*	.044	−.049
	(.129)	(.101)	(.057)	(.041)	(.070)	(.055)
Linear combination	.131	.852*	.462*	.773*	.554*	.697*
	(.312)	(.214)	(.135)	(.090)	(.154)	(.116)
Quarter 2	.071	.044	−.009	−.007	−.099*	−.031
	(.044)	(.036)	(.023)	(.018)	(.027)	.022
Quarter 3	−.014	.028	−.053*	−.049*	−.030	.032
	(.037)	(.031)	(.019)	(.013)	(.035)	(.029)
Quarter 4	.095*	.095*	.058*	.048*	−.058*	.002
	(.044)	(.036)	(.023)	(.018)	(.027)	(.022)
Constant	−.023	−.037	.010	.004	.056*	.005
	(.026)	(.021)	(.015)	(.011)	(.019)	(.015)
Observations	330	610	330	610	330	610
R^2	.505	.370	.638	.594	.694	.540

* $p < .05$.

Table A9: Manufacturing wage sensitivity of exports, 1999–2014.

	Austria	France	Germany	Ireland	Netherlands	Portugal	Spain
$\Delta \ln\left(\frac{ManufacturingWages_c}{ManufacturingWages_p}\right)$	−.296	.620*	−.453	−.039	−.777	−.243	−.151
	(.730)	(.249)	(.316)	(.424)	(.452)	(.428)	(.285)
$\Delta \ln\left(\frac{ManufacturingProductivity_c}{ManufacturingProductivity_p}\right)$	.175	−.343*	.484*	.587*	.387	.204	−.170
	(.495)	(.126)	(.167)	(.220)	(.274)	(.265)	(.221)
$\Delta \ln(Imports_{p-c})$	.961*	.650*	.587*	.089	.660*	.576*	.517*
	(.167)	(.063)	(.088)	(.250)	(.164)	(.099)	(.150)
Constant	−.003	−.007	.010	.019	.031*	.013	.010
	(.011)	(.004)	(.008)	(.016)	(.014)	(.008)	(.010)
Observations	150	150	150	150	150	150	
H_0: no autocorrelation	.056	.566	.916	.082	.253	.882	.365
H_0: no cointegration	.292	.223	.467	.267	.170	.211	.499
R^2	.391	.631	.596	.065	.352	.213	.295

* $p < .05$.

Table A10: Wage sensitivity of exports, 1999–2007.

	Austria	France	Germany	Ireland	Netherlands	Portugal	Spain
$\Delta \ln\left(\frac{Wages_c}{Wages_p}\right)$	−.718	.138	.134	−1.687	−.711	−.330	−.353
	(.792)	(.280)	(.448)	(1.588)	(.827)	(.676)	(.376)
$\Delta \ln\left(\frac{Productivity_c}{Productivity_p}\right)$	.683	.648*	−.409	1.627	.997	1.671*	.722
	(1.155)	(.317)	(.551)	(1.409)	(1.044)	(.756)	(.575)
$\Delta \ln(Imports_{p-c})$	.348	.303*	.332*	.053	.798*	.371	.064
	(.353)	(.122)	(.143)	(.644)	(.332)	(.263)	(.160)
Constant	.034	.010	.053*	.116	.043	.017	.046
	(.021)	(.010)	(.016)	(.074)	(.029)	(.020)	(.013)
Observations	80	80	80	80	80	80	80
H_0: no autocorrelation	.127	.432	.406	.010	.099	.197	.692
H_0: no cointegration	.170	.444	.226	.477	.261	.466	.406
R^2	.050	.189	.144	.016	.194	.083	.028

* $p < .05$.

Table A11: Wage sensitivity of exports controlling for domestic credit, 1999–2014.

	Austria	France	Germany	Ireland	Netherlands	Portugal	Spain
$\Delta \ln\left(\frac{Wages_c}{Wages_p}\right)$	−.931	.444	−.787*	.980*	−.067	−.242	−.541
	(1.018)	(.346)	(.303)	(.357)	(.553)	(.401)	(.292)
$\Delta \ln\left(\frac{Productivity_c}{Productivity_p}\right)$	.373	−.043	.833*	.938	.322	.938	−.583
	(1.775)	(.369)	(.413)	(.483)	(.838)	(.670)	(.455)
$\Delta \ln(Imports_{p-c})$	.955*	.726*	.635*	.073	.734*	.548*	.474*
	(.164)	(.058)	(.076)	(.220)	(.175)	(.102)	(.127)
$\Delta \ln(Credit_p)$	.012	−.080	.049	−.622	.031	.026	−.078
	(.512)	(.115)	(.147)	(.438)	(.281)	(.123)	(.196)
Constant	−.001	−.011	.002	.016	.026	.012	.014
	(.012)	(.004)	(.007)	(.016)	(.014)	(.008)	(.009)
Observations	150	150	150	150	150	150	150
R^2	.407	.596	.595	.039	.304	.230	.334

* $p < .05$.

Table A12: Wage sensitivity of Austrian exports across different levels of R&D intensity, 1999–2014.

	High & medium-high	High	Medium-high	Medium	Medium-low	Medium & medium-low	Low
$\Delta \ln\left(\frac{Wages_c}{Wages_p}\right)$	−.958	−4.853	−.248	−.547	−.928*	−.849	−4.143
	(1.310)	(3.577)	(.529)	(.626)	(.417)	(.930)	(2.127)
$\Delta \ln\left(\frac{Productivity_c}{Productivity_p}\right)$	1.215	5.052	.601	−1.785*	−.001	−.033	2.489
	(1.976)	(5.257)	(.765)	(.824)	(.498)	(1.122)	(3.394)
$\Delta \ln(Imports_{p-c})$	.950*	.652	1.040*	1.437*	.593*	.966*	1.083
	(.213)	(.520)	(.111)	(.133)	(.087)	(.277)	(.595)
Constant	.005	.072	−.006	−.007	.008	.012	.043
	(.016)	(.039)	(.007)	(.010)	(.007)	(.022)	(.048)
Observations	150	150	150	150	150	150	150
R^2	.216	.053	.474	.684	.529	.301	.052

* $p < .05$.

Table A13: Wage sensitivity of German exports across different levels of R&D intensity, 1999–2014.

	High & medium-high	High	Medium-high	Medium	Medium-low	Medium & medium-low	Low
$\Delta \ln \left(\frac{Wages_c}{Wages_p} \right)$	−.333	.051	−.459	−1.329	−.838	−2.157*	−1.851
	(.409)	(.755)	(.427)	(.765)	(.491)	(.695)	(1.062)
$\Delta \ln \left(\frac{Productivity_c}{Productivity_p} \right)$	.367	−.924	.893*	.774	.494	1.350	.398
	(.459)	(.940)	(.452)	(.855)	(.545)	(.754)	(1.288)
$\Delta \ln(Imports_{p-c})$	.663*	.563*	.706*	.725*	.286*	.325*	.716*
	(.094)	(.181)	(.096)	(.143)	(.092)	(.161)	(.184)
Constant	.003	.026	−.004	.002	.024	.024	.026
	(.008)	(.015)	(.009)	(.013)	(.010)	(.016)	(.019)
Observations	150	150	150	150	150	150	150
R^2	.483	.083	.605	.451	.276	.363	.193

* $p < .05$.

Table A14: Wage sensitivity of Dutch exports across different levels of R&D intensity, 1999–2014.

	High & medium-high	High	Medium-high	Medium	Medium-low	Medium & medium-low	Low
$\Delta \ln \left(\frac{Wages_c}{Wages_p} \right)$	−.233	.051	−.457	−.458	−.738	−1.145	−1.071
	(.594)	(.995)	(.523)	(1.059)	(.800)	(.871)	(.685)
$\Delta \ln \left(\frac{Productivity_c}{Productivity_p} \right)$	.914	2.148	−.189	−1.175	2.634*	1.564	−.611
	(.869)	(1.474)	(.737)	(1.278)	(.985)	(1.153)	(1.069)
$\Delta \ln(Imports_{p-c})$	.603*	.293	.852*	1.495*	.817*	1.010*	.338*
	(.186)	(.328)	(.156)	(.228)	(.210)	(.278)	(.223)
Constant	.026	.024	.027	.005	.036	.044	.050
	(.016)	(.028)	(.013)	(.015)	(.015)	(.022)	(.016)
Observations	150	150	150	150	150	150	150
R^2	.258	.069	.357	.376	.201	.219	.050

* $p < .05$.

References

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