

How fast do product market reforms pay off?

Industry-level evidence from past deregulation of network industries



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* Views are those of the authors and do not necessarily represent those of the IMF or its member countries

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- ▶ Introduction
 - ▶ Data & Methodology
 - ▶ Baseline Results
 - ▶ Country-Time & Country-Sector FE
 - ▶ Including Sector-Time FE
 - ▶ IV: Instruments and Results
 - ▶ Barriers to Entry vs. Public Ownership
 - ▶ Conclude

Introduction: long-term gains

- ▶ 3 broad product market reform priorities in number of advanced economies: network industries, retail, professional services
- ▶ Estimated *long-term* gains are sizeable—as large as / larger than those from all labor market reforms combined:
 - ▶ Bouis and Duval (2011): 5-8% rise in GDP/capita level over decade in DEU, FRA, ESP, ITA, leaving out induced capital accumulation
 - ▶ Cetto, Lopez, and Mairesse (NBER 2015): numbers in same ballpark
- ▶ Channels:
 - ▶ Pro-competition effect, input channel, innovation channel (more elusive, e.g. ICT diffusion)
- ▶ Need to remain realistic though:
 - ▶ Slowdown in potential growth rate in AEs = 1pp since early 2000s
 - ▶ Scope for reform less than 25 years ago: regulatory convergence

Introduction: short-term effects

- ▶ Theory unsettled—product and labor market frictions could imply ST costs (Cacciatore and Fiori, 2015; Cacciatore, Duval, and Fiori, 2012):
 - ▶ Standard DSGE models fail to capture the relevant frictions
 - ▶ Entry costs and displacement of incumbents
 - ▶ Reallocation of labor in presence of search and matching frictions
 - ▶ Other considerations: non-profit maximization and X-inefficiency, firm strategic behavior (strategic capital accumulation vs. scrapping)
- ▶ Persistent slack and binding zero lower bound have added a new twist: could product (and labor) market reform be contractionary at the ZLB?
 - ▶ Eggertsson, Raffer, Ferrero (2013), Krugman (2009 blog): yes
 - ▶ Cacciatore, Duval, Fiori, and Ghironi (2015/16): not because of ZLB per se (reforms not deflationary), but possibly because of slack

Introduction: this paper

- ▶ Empirical evidence also very limited:
 - ▶ ... mostly at macro level (Bouis, Causa, Demmou and Duval, 2012; Bordon, Ebeke and Shirono, 2015)...
 - ▶ ... at country level for retail trade (Bertrand and Kramarz 2002; Skuterud, 2005)
 - ▶ ... while recent country-sector analysis focuses on input channel and does not explore dynamic effects (Bourles et al. 2013; Barone and Cingano 2011)
- ▶ This paper:
 - ▶ Focuses explicitly on dynamic effects of product market reforms (Jorda AER 2005 approach used e.g. by Romer and Romer AER 2010 for fiscal shocks)
 - ▶ At the country-sector level for 32 countries, 5 network industries, spanning over 3 decades
 - ▶ Based on unique mapping between OECD STAN ISIC Rev-4 data on outcomes (Y, L, Y/L, I, P) and large reforms database derived from OECD indicators of PMR in non-manufacturing industries.

Introduction: key findings

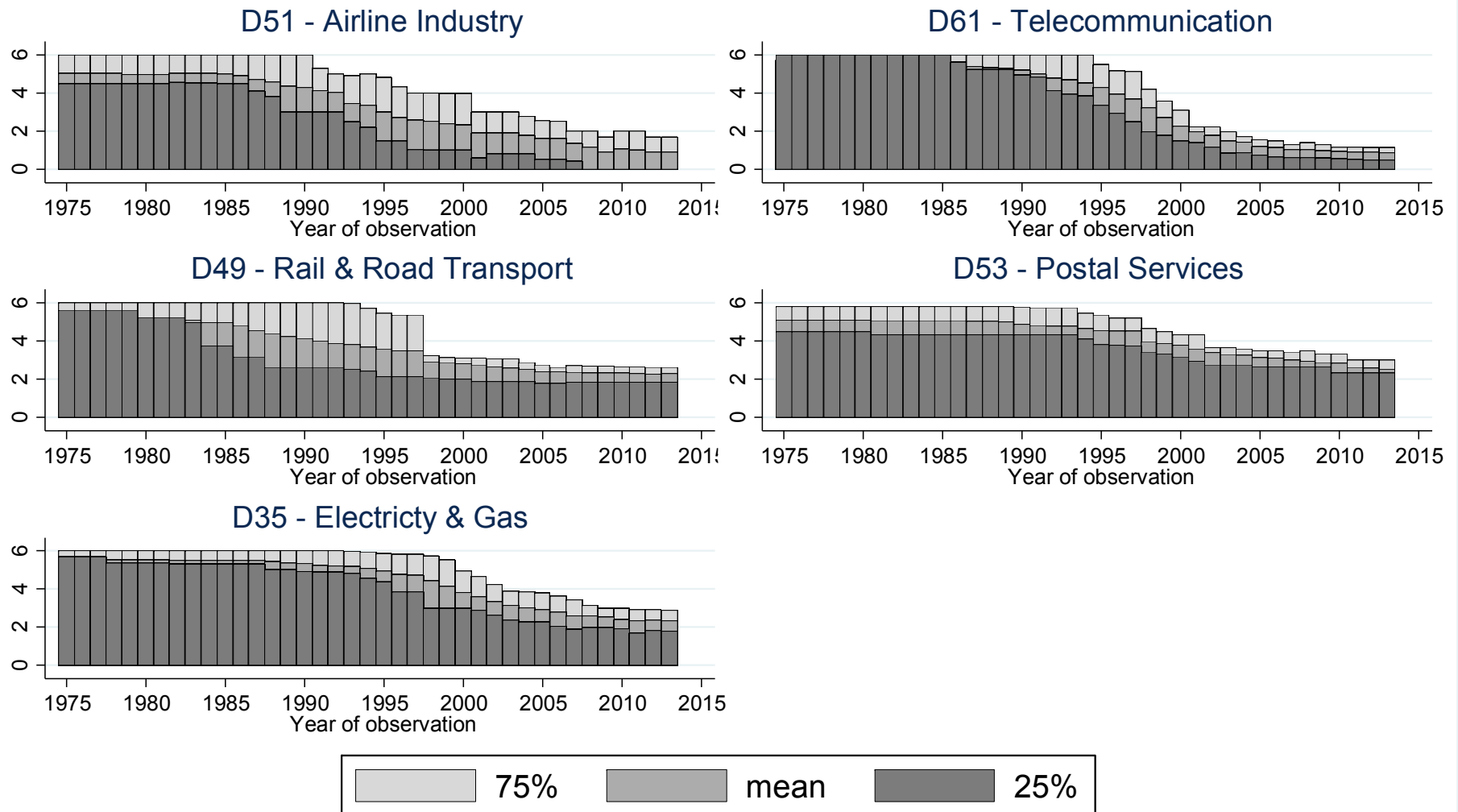
- ▶ Large reductions in barriers to entry in network industries yield sizeable output and productivity gains, concomitant with relative price decline
- ▶ Real VA gains: 7% to 17% on average after 5 years in deregulated industry considered, depending on specification, estimation technique and sample
- ▶ Gains take time to materialize (2-3 years) but NO evidence of short-term costs
- ▶ No significant effects at sector level on employment and investment: downsizing of incumbents vs. entry of new firms?
- ▶ No evidence of weaker effects in periods of economic slack at this stage—although still work in progress.

Main Data Sources

- ▶ **STAN STructural ANalysis Database – OECD**
annual industry level input and output data
 - ▶ Variables: Real value added, Prices (relative to GDP deflator), Employment, Gross Fixed Capital Investment, Labor Productivity (constructed, constrains sample)
 - ▶ Sectors: NACE Rev. 2 classification (electricity and gas, land transport, air transport, postal services, telecommunications)
 - ▶ Versions: ISIC Rev. 4, complemented by ISIC Rev. 3 and national sources (backward extrapolation via growth rates)
- ▶ **OECD Indicators of Product Market Regulation in network industries**
 - ▶ 6 to 0 scores for sectoral regulation; aggregate and components: barriers to entry & public ownership
 - ▶ Sectors: aggregation of “road & rail” and “electricity & gas”, weights of $\frac{3}{4}$ to $\frac{1}{4}$ weights)
 - ▶ Annual Series, 1975-2013
- ▶ **Directives by European Parliament and of the Council**
Competition relevant EU directives since last reform in sector as instrument for reforms
- ▶ **IMF WEO / WB WDI for macro variables**

Liberalization of Service Sectors

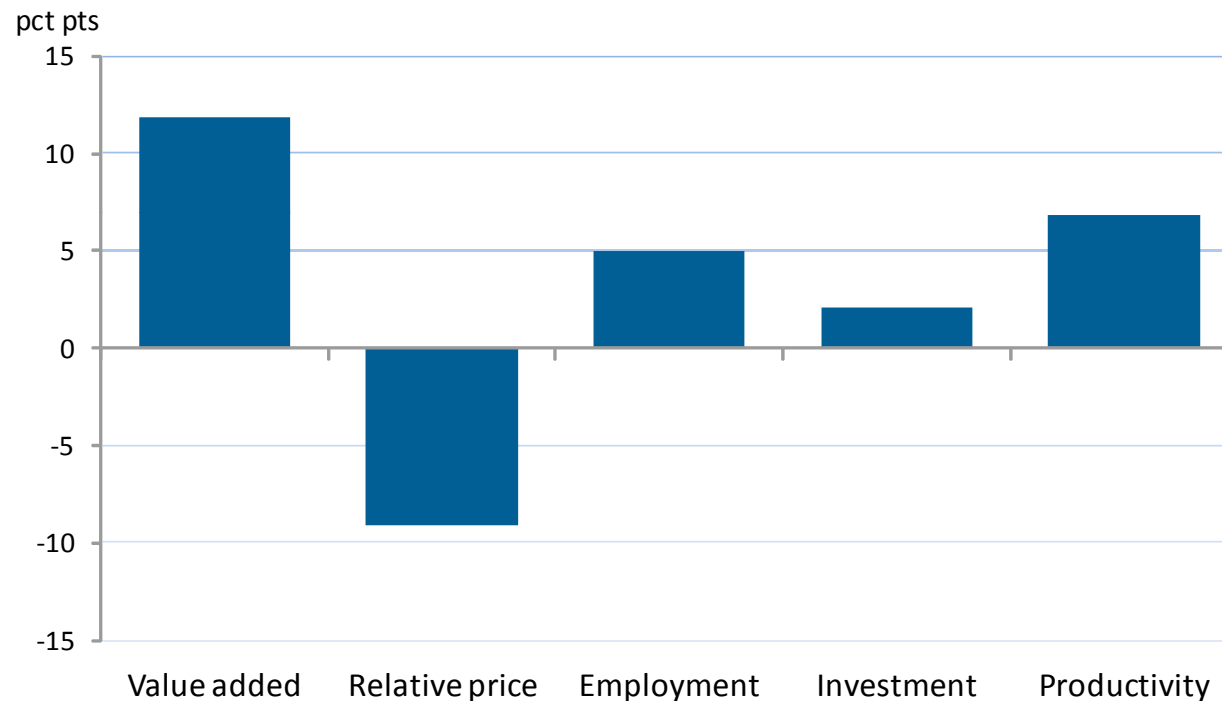
Overall Regulation in Service Industries



Descriptive Statistics

Reform vs. No-Reform Countries

post reform differences from non-reforming countries



Difference of average differences (in percentage points) of cumulative 5-year growth of "Reform" versus "No Reform" observations, over $[T-5; T]$ and $[T; T+5]$ respectively for the Pre-Reform and for the Post-Reform periods, where T is the year a major reform is observed in a particular country/sector. The "Reform" observations are country/sector observations which experienced a major reform in year T . The "No Reform" observations are observations for countries that did not experience any major reform in the sector considered over a 10-year window surrounding year T .

Data Set

▶ **Sample:**

▶ 32 OECD Countries

AUS, AUT, BEL, CAN, CHE, CHL, CZE, DEU, DNK, ESP, EST,
FIN, FRA, GBR, GRC, HUN, IRL, ISL, ITA, JPN, KOR, LUX, MEX,
NLD, NOR, NZL, POL, PRT, SVK, SVN, SWE & USA

▶ 5 sectors

▶ 1975-2012 highly unbalanced

▶ **Additional Constraints:**

▶ Minimum requirement of 3 years preceding reform

▶ Common sample of VA and Employment (and thus productivity)

Reform Definition

- ▶ **Shock**

- = Major reduction of Barriers to Entry

- = a cumulative drop in regulation score bigger than 2 sd over 3 year-period, dummy = 1 in 1st year of reform episode

- ▶ Allows phasing-in

- ▶ All shocks treated equal

- ▶ Robustness to alternative qualifications

- ▶ Creates 176 shocks

Methodology

▶ **Local Projection Method:** Jorda (2005, AER)

$$y_{c,s,t+j} - y_{c,s,t} = \lambda_0 + \lambda_{ct} + \lambda_{cs} (+ \lambda_{st}) \\ + \beta_j * reform_{c,s,t} + \sum_{k=1}^j \gamma_j * controls_{c,s,t+k} + \varepsilon_{cst}$$

▶ **Impulse Response Function**

- ▶ Simple estimation and appropriate inference
- ▶ Modest requirement on series length
- ▶ No identification needed
- ▶ Exogeneity of reforms initially assumed, later relaxed

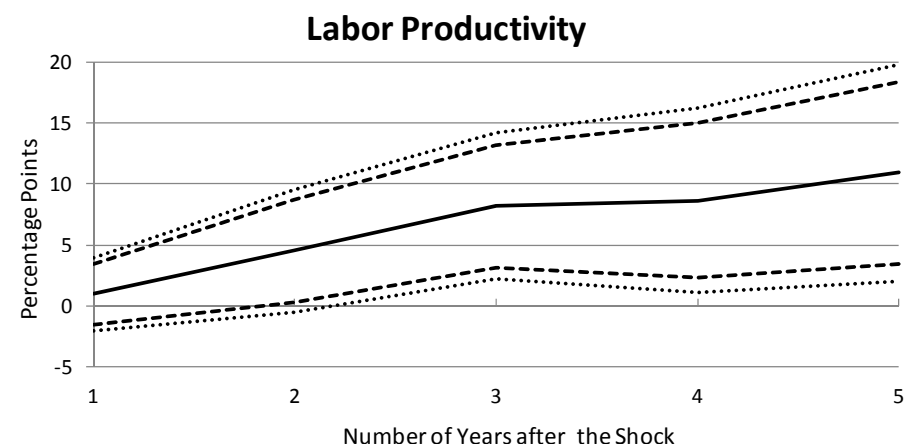
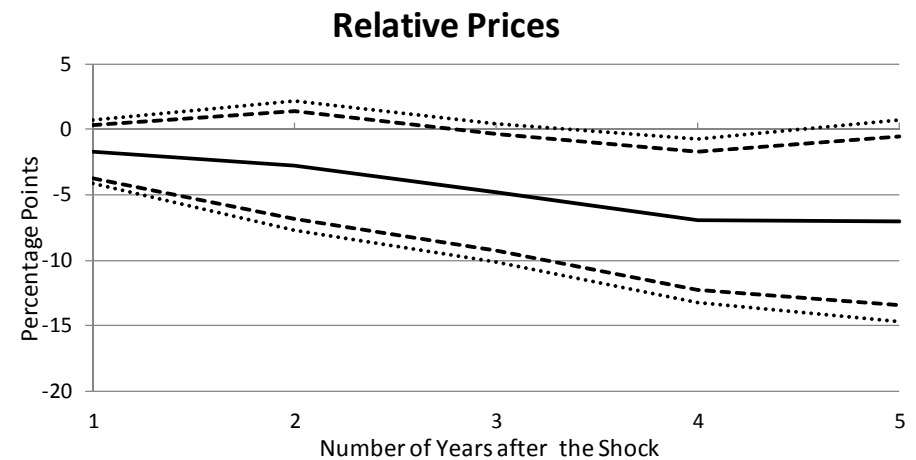
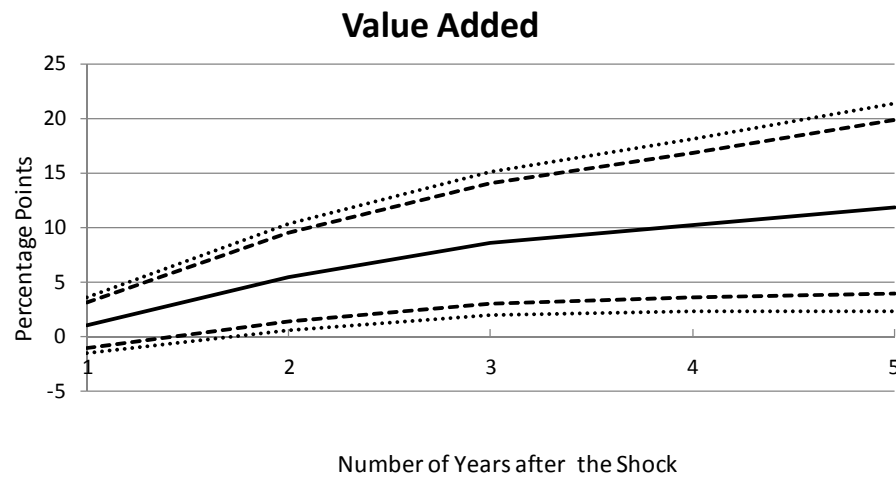
Baseline Results

Effect of Reform Shock on **Value-Added**

	(1)	(2)	(3)	(4)	(5)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5
ETCR Entry Dummy	1.06	5.48**	8.56**	10.21**	11.86**
	(1.29)	(2.48)	(3.34)	(4.01)	(4.84)
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Country-Ind. FE	Yes	Yes	Yes	Yes	Yes
Ind.-Year FE	No	No	No	No	No
N	2735	2620	2505	2390	2275

Standard errors in parentheses; starlevel: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Baseline Results



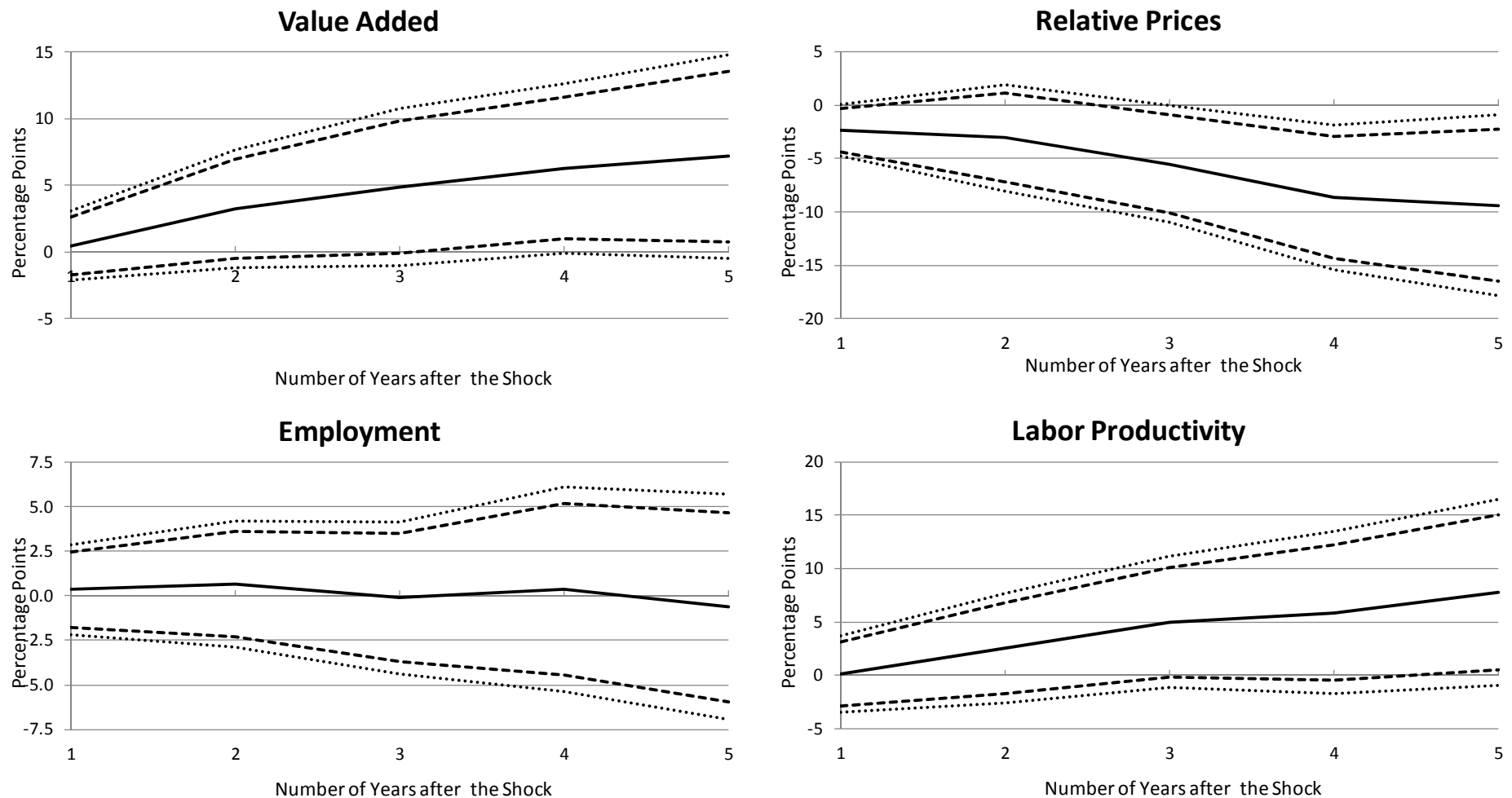
Baseline Results with Country-Industry and Country-Year FE. Cluster robust standard errors at country-industry level. Dotted lines indicate 90%- and 95% confidence intervals.

Including Industry-Year FE

Effect of Reform Shock on **Value-Added**

	(1)	(2)	(3)	(4)	(5)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5
ETCR Entry Dummy	0.48 (1.33)	3.23 (2.26)	4.89 (3.00)	6.28* (3.23)	7.17* (3.89)
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Country-Ind. FE	Yes	Yes	Yes	Yes	Yes
Ind.-Year FE	Yes	Yes	Yes	Yes	Yes
N	2735	2620	2505	2390	2275
Cluster robust standard errors in parentheses; starlevel: * p<0.10, ** p<0.05, *** p<0.01					

Including Industry-Year FE

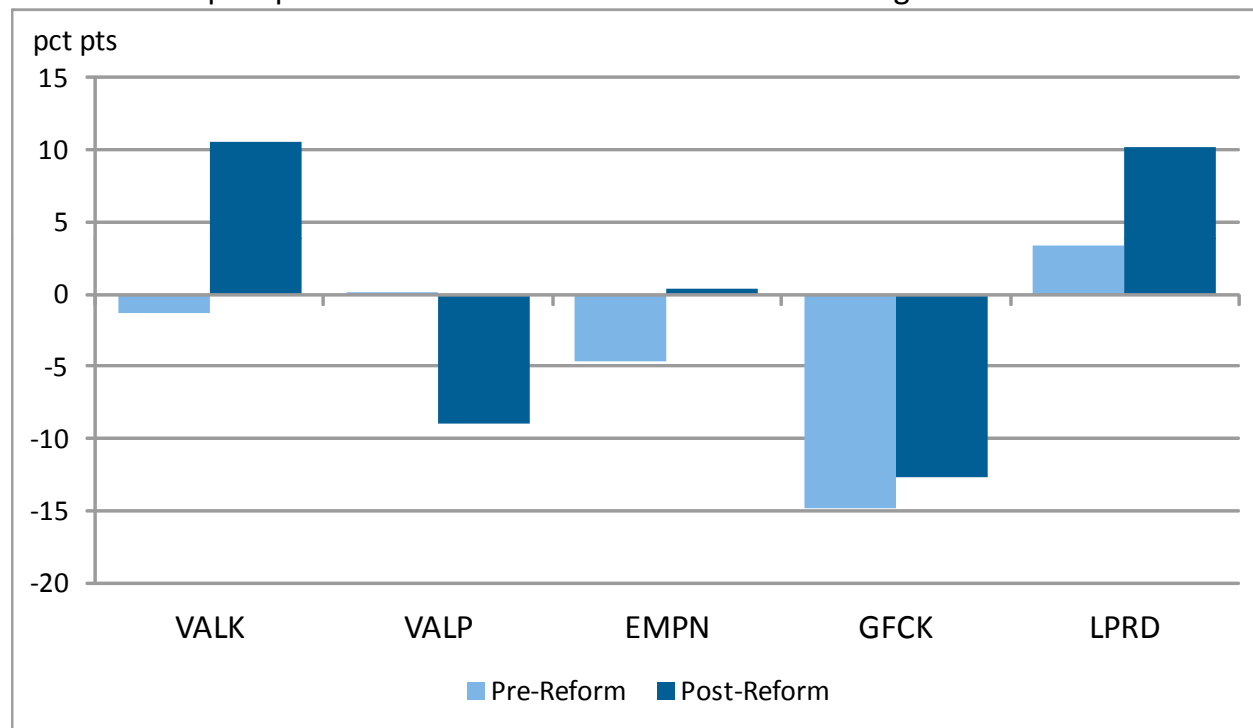


Baseline Results with Country-Industry, Country-Year and Industry-Year FE. Cluster robust standard errors at country industry level. Dotted lines indicate 90%- and 95% confidence intervals.

IV Estimation

Reform vs. No-Reform Countries

pre- post reform differences from non-reforming countries



Average differences (in percentage points) of cumulative 5-year growth of "Reform" versus "No Reform" observations, over $[T-5; T]$ and $[T; T+5]$ respectively for the Pre-Reform and for the Post-Reform periods, where T is the year a major reform is observed in a particular country/sector. The "Reform" observations are country/sector observations which experienced a major reform in year T . The "No Reform" observations are observations of the same sector in a different country as the "Reform" observations but which did not experience any major reform over a 10-year window surrounding year T .

IV Estimation

Instruments:

- ▶ External Pressure
The presence of a new competition-related EU-Directive
- ▶ Peer Pressure
The number of other countries having a reform in the same sector; in t in previous 3 years

Instruments vary by country-year and country-industry, but variation by industry-year is basically eliminated

First Stage:

$$\begin{aligned} reform_{c,s,t} = & \lambda_0 + \beta_1 * PP_{c,i,t} + \beta_2 * PP_{c,i,(t-3:t-1)} + \beta_3 * EUDsR_{c,i,t} \\ & + \sum_{k=1}^j \gamma_j * controls_{c,s,t+k} + \lambda_{ct} + \lambda_s + \varepsilon_{cst} \end{aligned}$$

Second Stage:

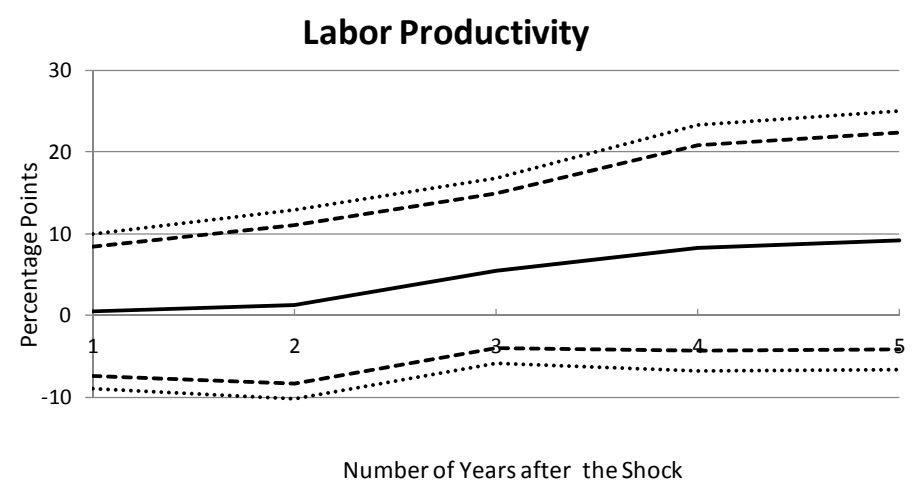
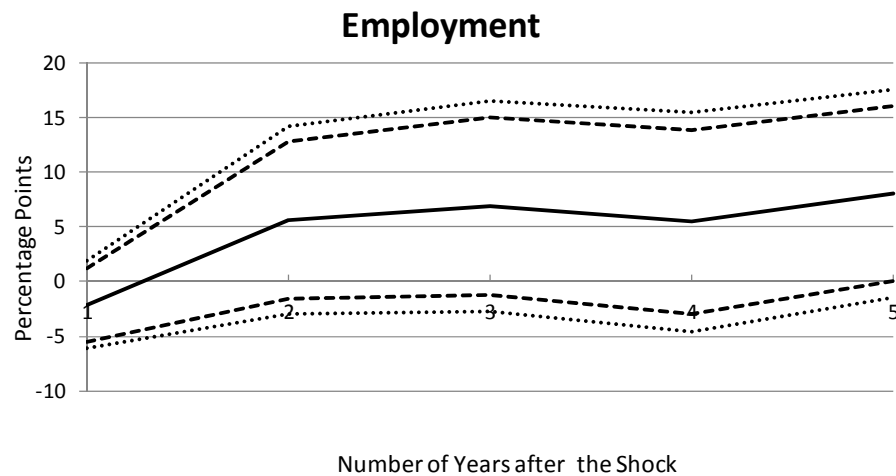
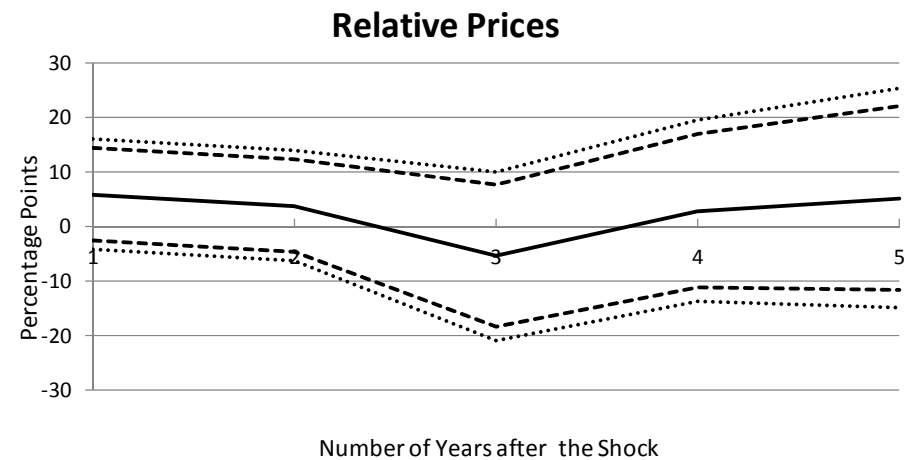
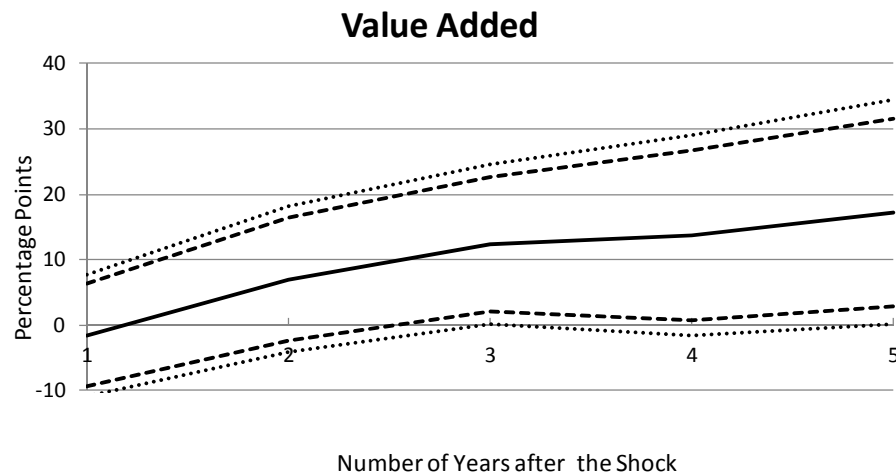
$$\begin{aligned} y_{c,s,t+j} - y_{c,s,t} = & \lambda_0 + \beta_j * \widehat{reform}_{c,s,t} + \sum_{k=1}^j \gamma_j * controls_{c,s,t+k} + \\ & + \lambda_{ct} + \lambda_s + \varepsilon_{cst} \end{aligned}$$

IV Results

Effect of Reform Shock on **Value-Added**

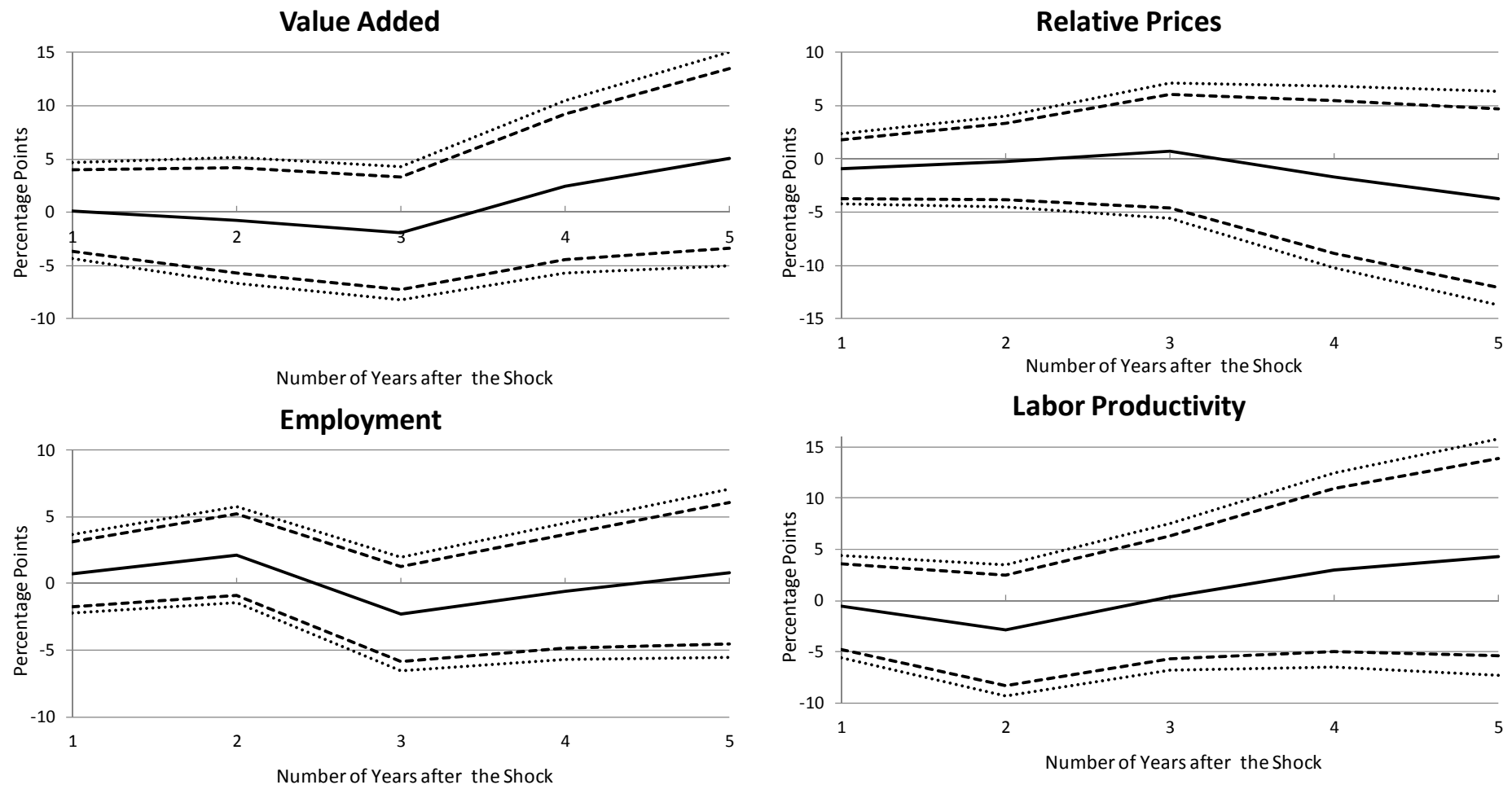
	(1)	(2)	(3)	(4)	(5)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5
ETCR Entry Dummy	-1.55 (4.76)	7.03 (5.67)	12.35** (6.21)	13.73* (7.84)	17.22** (8.75)
N	2577	2472	2367	2262	2157
Hansen J	4.16	3.84	2.51	2.70	2.69
Hansen P	0.12	0.15	0.29	0.26	0.26
1st Stage F	28.67	27.55	27.66	27.98	27.71
Cluster robust standard errors in parentheses; starlevel: * p<0.10, ** p<0.05, *** p<0.01					

IV Results



IV Results with Country-Industry and Country-Year FE. Cluster robust standard errors at country industry level. Dotted lines indicate 90%- and 95% confidence intervals.

Barriers to Entry vs. Public Ownership: Baseline



Baseline Results with Country-Industry and Country-Year FE. Cluster robust standard errors at country-industry level. Dotted lines indicate 90%- and 95% confidence intervals.

Conclusion

▶ Results:

- ▶ Gradual but persistent effect on value-added and productivity
- ▶ Negative (but temporary?) effect on relative prices
- ▶ No effect on employment and investment: incumbents vs. new entrants?
- ▶ No comparable effect of a reduction in public ownership

▶ Relevance:

- ▶ Benefits take time to materialize
- ▶ No evidence of a short-term cost

▶ Further steps:

- ▶ Instrumentation
- ▶ Importance of the cycle
- ▶ Related questions: exports, profits, wages
- ▶ Reform Database: actual legislative change vs. indicator based identification

Additional Results

Baseline Tables

Effect of Reform Shock on **Inflation** (relative to aggregate deflator)

	(1)	(2)	(3)	(4)	(5)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5
ETCR Entry Dummy	-1.69 (1.24)	-2.77 (2.50)	-4.83* (2.70)	-6.97** (3.20)	-7.00* (3.91)
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Country-Ind. FE	Yes	Yes	Yes	Yes	Yes
Ind.-Year FE	No	No	No	No	No
N	3019	2904	2789	2674	2559

Standard errors in parentheses; starlevel: * p<0.10, ** p<0.05, *** p<0.01

Effect of Reform Shock on **Employment**

	(1)	(2)	(3)	(4)	(5)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5
ETCR Entry Dummy	0.09 (0.95)	0.96 (1.60)	0.36 (2.04)	1.55 (2.70)	0.95 (3.10)
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Country-Ind. FE	Yes	Yes	Yes	Yes	Yes
Ind.-Year FE	No	No	No	No	No
N	2735	2620	2505	2390	2275

Standard errors in parentheses; starlevel: * p<0.10, ** p<0.05, *** p<0.01

Effect of Reform Shock on **Gross Fixed Capital Formation**

	(1)	(2)	(3)	(4)	(5)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5
ETCR Entry Dummy	-2.36 (7.25)	-4.64 (11.28)	-8.31 (12.47)	-11.63 (13.29)	-5.89 (13.04)
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Country-Ind. FE	Yes	Yes	Yes	Yes	Yes
Ind.-Year FE	No	No	No	No	No
N	1830	1753	1676	1598	1522

Standard errors in parentheses; starlevel: * p<0.10, ** p<0.05, *** p<0.01

Effect of Reform Shock on **Labor Productivity**

	(1)	(2)	(3)	(4)	(5)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5
ETCR Entry Dummy	0.97 (1.52)	4.52* (2.56)	8.20*** (3.06)	8.66** (3.85)	10.92** (4.52)
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Country-Ind. FE	Yes	Yes	Yes	Yes	Yes
Ind.-Year FE	No	No	No	No	No
N	2735	2620	2505	2390	2275

Standard errors in parentheses; starlevel: * p<0.10, ** p<0.05, *** p<0.01

Long-Run Effects - Baseline

Effect of Reform Shock on **Value-Added**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5	shock t+6	shock t+7	shock t+8	shock t+9	shock t+10
ETCR Entry Dummy	1.06 (1.29)	5.48** (2.48)	8.56** (3.34)	10.21** (4.01)	11.86** (4.84)	15.12** (5.79)	14.30** (6.33)	10.57 (6.63)	10.54 (7.60)	11.32 (9.09)
Country-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country-Ind. FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ind.-Year FE	No	No	No	No	No	No	No	No	No	No
N	2735	2620	2505	2390	2275	2160	2047	1932	1819	1709

Standard errors in parentheses; starlevel: * p<0.10, ** p<0.05, *** p<0.01

Including Industry-Year FE

Effect of Reform Shock on **Inflation** (relative to aggregate deflator)

	(1)	(2)	(3)	(4)	(5)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5
ETCR Entry Dummy	-2.34*	-3.06	-5.51*	-8.63**	-9.38**
	(1.23)	(2.53)	(2.79)	(3.46)	(4.31)
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Country-Ind. FE	Yes	Yes	Yes	Yes	Yes
Ind.-Year FE	Yes	Yes	Yes	Yes	Yes
N	3019	2904	2789	2674	2559

Cluster robust standard errors in parentheses; starlevel: * p<0.10, ** p<0.05, *** p<0.01

Effect of Reform Shock on **Employment**

	(1)	(2)	(3)	(4)	(5)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5
ETCR Entry Dummy	0.35	0.67	-0.10	0.39	-0.62
	(1.29)	(1.81)	(2.18)	(2.93)	(3.23)
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Country-Ind. FE	Yes	Yes	Yes	Yes	Yes
Ind.-Year FE	Yes	Yes	Yes	Yes	Yes
N	2735	2620	2505	2390	2275

Cluster robust standard errors in parentheses; starlevel: * p<0.10, ** p<0.05, *** p<0.01

Effect of Reform Shock on **Gross Fixed Capital Formation**

	(1)	(2)	(3)	(4)	(5)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5
ETCR Entry Dummy	1.44	-1.87	-7.54	-15.06	-12.06
	(8.44)	(12.03)	(12.84)	(12.34)	(11.98)
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Country-Ind. FE	Yes	Yes	Yes	Yes	Yes
Ind.-Year FE	Yes	Yes	Yes	Yes	Yes
N	1830	1753	1676	1598	1522

Cluster robust standard errors in parentheses; starlevel: * p<0.10, ** p<0.05, *** p<0.01

Effect of Reform Shock on **Labor Productivity**

	(1)	(2)	(3)	(4)	(5)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5
ETCR Entry Dummy	0.13	2.56	4.99	5.89	7.79*
	(1.82)	(2.60)	(3.14)	(3.87)	(4.44)
Country-Year FE	Yes	Yes	Yes	Yes	Yes
Country-Ind. FE	Yes	Yes	Yes	Yes	Yes
Ind.-Year FE	Yes	Yes	Yes	Yes	Yes
N	2735	2620	2505	2390	2275

Standard errors in parentheses; starlevel: * p<0.10, ** p<0.05, *** p<0.01

IV Results

Effect of Reform Shock on **Inflation** (relative to aggregate deflator)

	(1)	(2)	(3)	(4)	(5)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5
ETCR Entry Dummy	5.96 (5.18)	3.77 (5.16)	-5.38 (7.92)	2.94 (8.52)	5.26 (10.25)
N	2831	2726	2621	2516	2411
Hansen J	2.72	1.32	0.90	1.58	2.60
Hansen P	0.26	0.52	0.64	0.45	0.27
1st Stage F	30.72	29.59	29.17	30.06	29.78

Cluster robust standard errors in parentheses; starlevel: * p<0.10, ** p<0.05, *** p<0.01

Effect of Reform Shock on **Employment**

	(1)	(2)	(3)	(4)	(5)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5
ETCR Entry Dummy	-2.12 (2.05)	5.64 (4.41)	6.91 (4.93)	5.46 (5.11)	8.04* (4.87)
N	2577	2472	2367	2262	2157
Hansen J	5.66	1.22	0.25	1.17	1.27
Hansen P	0.06	0.54	0.88	0.56	0.53
1st Stage F	28.67	27.55	27.66	27.98	27.71

Cluster robust standard errors in parentheses; starlevel: * p<0.10, ** p<0.05, *** p<0.01

Effect of Reform Shock on **Gross Fixed Capital Formation**

	(1)	(2)	(3)	(4)	(5)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5
ETCR Entry Dummy	-4.15 (16.23)	13.29 (21.62)	35.49 (22.41)	29.48 (23.73)	54.42** (24.61)
N	1697	1628	1559	1489	1421
Hansen J	4.81	3.97	4.66	11.67	12.41
Hansen P	0.09	0.14	0.10	0.00	0.00
1st Stage F	17.92	17.74	17.22	17.15	16.28

Cluster robust standard errors in parentheses; starlevel: * p<0.10, ** p<0.05, *** p<0.01

Effect of Reform Shock on **Labor Productivity**

	(1)	(2)	(3)	(4)	(5)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5
ETCR Entry Dummy	0.57 (4.80)	1.39 (5.85)	5.45 (5.76)	8.28 (7.66)	9.18 (8.04)
N	2577	2472	2367	2262	2157
Hansen J	1.83	4.49	2.96	1.40	1.44
Hansen P	0.40	0.11	0.23	0.50	0.49
1st Stage F	28.67	27.55	27.66	27.98	27.71

Cluster robust standard errors in parentheses; starlevel: * p<0.10, ** p<0.05, *** p<0.01

IV Results – EU Sample

Effect of Reform Shock on **Value-Added**

	(1)	(2)	(3)	(4)	(5)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5
ETCR Entry Dummy	-0.93 (6.51)	8.82 (7.65)	14.91* (8.12)	13.69 (8.58)	20.34** (10.07)
N	1374	1300	1226	1152	1078
Hansen J	3.16	1.29	0.48	0.57	0.17
Hansen P	0.21	0.52	0.79	0.75	0.92
1st Stage F	22.93	22.76	21.91	21.85	21.80

Cluster robust standard errors in parentheses; starlevel: * p<0.10, ** p<0.05, *** p<0.01

Effect of Reform Shock on **Employment**

	(1)	(2)	(3)	(4)	(5)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5
ETCR Entry Dummy	-2.70 (1.82)	1.85 (4.32)	2.37 (5.67)	1.98 (5.76)	3.71 (5.83)
N	1374	1300	1226	1152	1078
Hansen J	4.93	2.34	2.95	4.72	4.53
Hansen P	0.08	0.31	0.23	0.09	0.10
1st Stage F	22.93	22.76	21.91	21.85	21.80

Cluster robust standard errors in parentheses; starlevel: * p<0.10, ** p<0.05, *** p<0.01

Effect of Reform Shock on **Inflation** (relative to aggregate deflator)

	(1)	(2)	(3)	(4)	(5)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5
ETCR Entry Dummy	6.94 (7.32)	3.10 (6.90)	-14.88 (11.53)	2.34 (12.05)	0.46 (13.01)
N	1437	1363	1289	1215	1141
Hansen J	3.23	2.52	0.29	0.94	1.53
Hansen P	0.20	0.28	0.87	0.62	0.47
1st Stage F	23.96	24.05	23.25	23.48	23.32

Cluster robust standard errors in parentheses; starlevel: * p<0.10, ** p<0.05, *** p<0.01

Effect of Reform Shock on **Labor Productivity**

	(1)	(2)	(3)	(4)	(5)
	shock t+1	shock t+2	shock t+3	shock t+4	shock t+5
ETCR Entry Dummy	1.78 (5.97)	6.97 (5.89)	12.54** (6.21)	11.72 (7.19)	16.63** (8.33)
N	1374	1300	1226	1152	1078
Hansen J	1.39	0.22	0.24	1.15	0.81
Hansen P	0.50	0.89	0.89	0.56	0.67
1st Stage F	22.93	22.76	21.91	21.85	21.80

Cluster robust standard errors in parentheses; starlevel: * p<0.10, ** p<0.05, *** p<0.01