European Commission

Manufacturing the future? The manufacturing sector as a possible driver of R&D, exports and productivity growth

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Motivation

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∞ Re-industrialisation in EU (Industrial Renaissance)

Revamp the emphasis on the role of manufacturing for competitiveness through sector dynamism (EC, 2014 & 2017)

Manufacturing sector important engine for: ① R&D investments; ② productivity growth, and ③ exporting (EPSC Strategic Note, 2015)

∞ Trumponomics?

Repatriation of manufacturing jobs? (nationalism + flexibility)

Despite the conjectures and the policy interest, scarce (no) cross-country evidence

Background

- Outsourcing and offshoring have threatened countries' economic security by the loss of capabilities (Pisano and Shih, 2009 2012; De Backer et al., 2015)

- Manufacturing sector advantages: local multipliers (Moretti, 2010) and 'industrial commons' (Pisano and Shih, 2009)
  - *"country's industrial commons - the collective R&D, engineering and manufacturing capabilities that sustain innovation."*

- Policy documents suggest that a large manufacturing sector has advantages:
  - *"3 reasons why the manufacturing sector remains important: source of productivity growth; engine for R&D and innovation; trade and internationalization" (EPSC 2015)*

- Policymakers have formulated targets in terms of the size of the manufacturing sector:
  - *"The EU goal of increasing the share of manufacturing to 20% of GDP by 2020"*

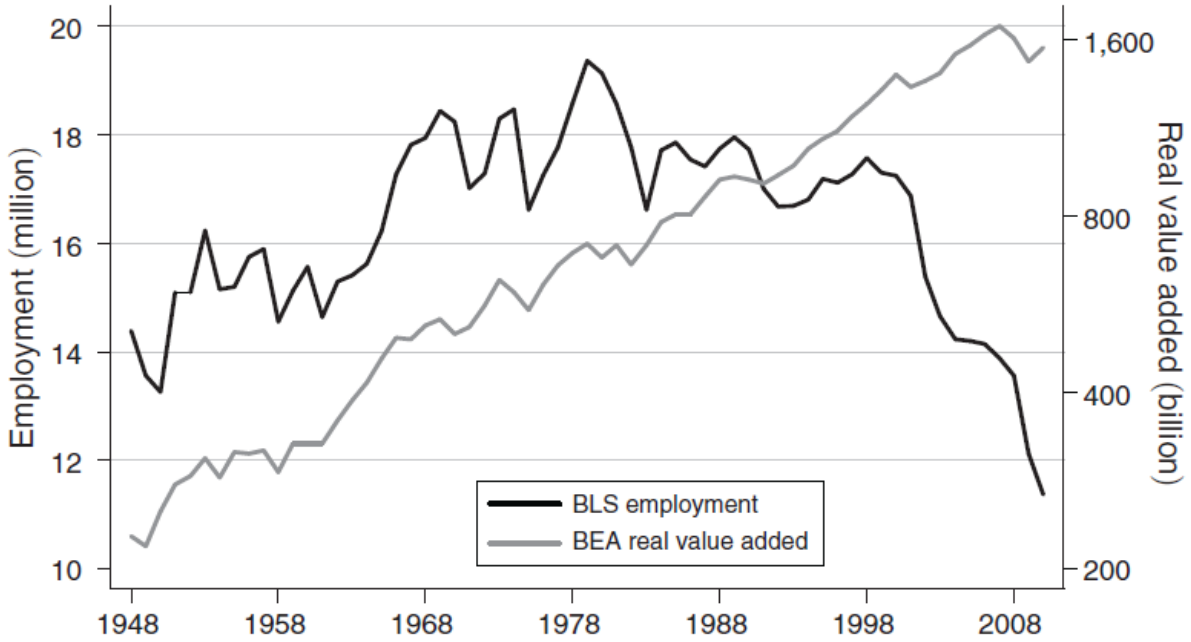

FIGURE 3. US MANUFACTURING EMPLOYMENT VERSUS VALUE ADDED

Note: Figure compares annual manufacturing employment as of March according to the US Bureau of Labor Statistics (1948–2010, series CEU3000000001) to real value added as measured by the Bureau of Economic Analysis (1948–2010).

Pierce, J. R., & Schott, P. K. (2016). The surprisingly swift decline of US manufacturing employment.

Why did the jobs go?

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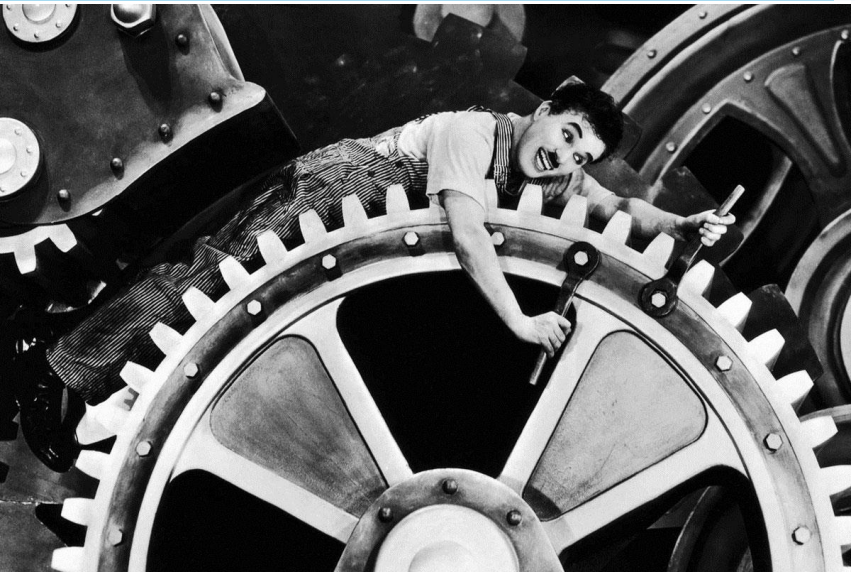

A dating website's survey shows that manufacturing jobs are not sexy

Five industries overall that are the least sexy:

1. Insurance
2. Manufacturing
3. Community service
4. Call centers and customer service
5. Consulting

http://mix1065fm.cbslocal.com/2013/04/24/the-sexiest-and-least-sexy-jobs-for-men-and-women/

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Empirics

Previous research focused mainly on individual countries (e.g. US: Pierce and Schott 2016; or Denmark: Bernard et al 2016)

The decrease in manufacturing employment has occurred alongside increasing productivity

- At the plant level, shifts toward less labor-intensive production and international exposure via input-output linkages contribute to the decline in employment.

- Employment decline: firm exit and reduced employment at surviving manufacturers. But a non-negligible part is due to firms switching from manufacturing to services (small, highly productive, import intensive firms)

Data

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- **Data sources:**
  - WBI → manufacturing VA as share of GDP
    + share of merchandise exports
  - OECD MSTI → BERD as share of GDP
  - Penn World Tables (Feenstra et al 2015) → TFP

We focus on manufacturing sectors (share of value added)

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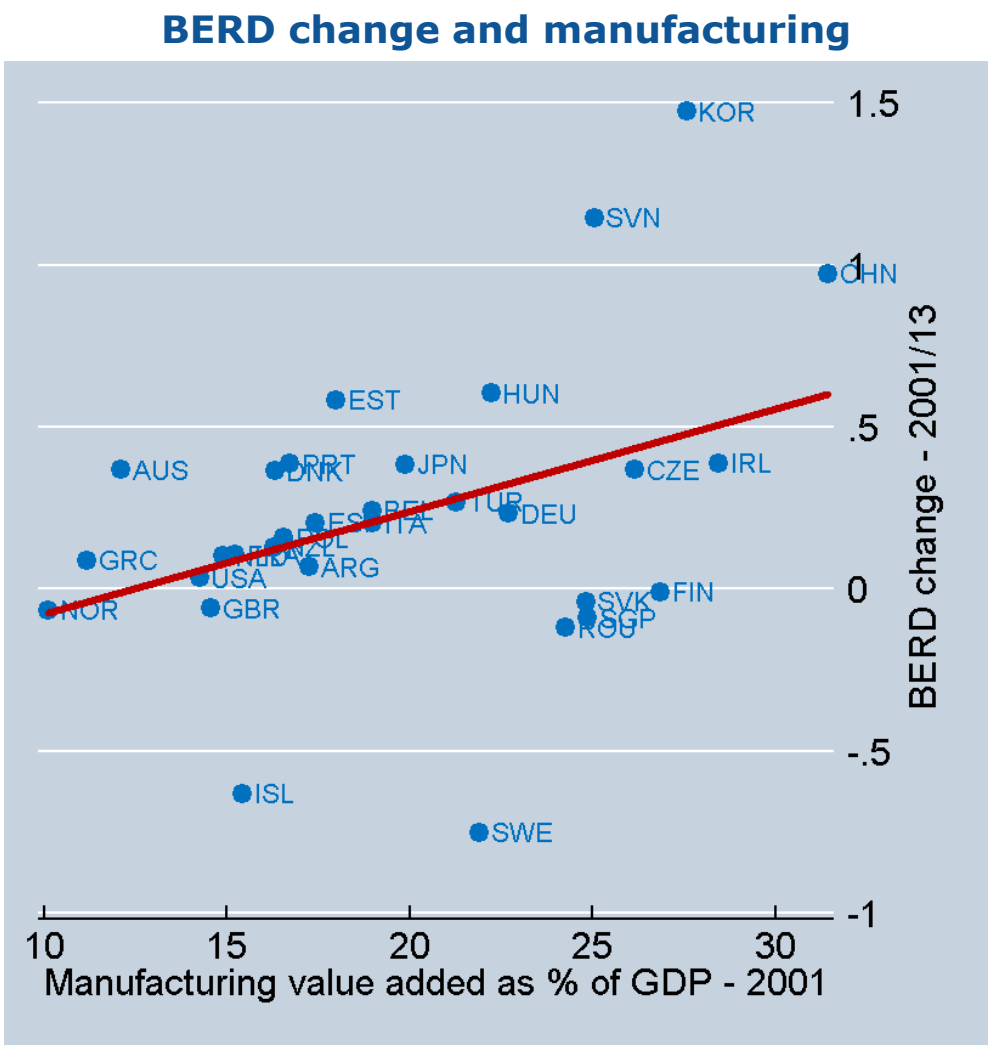
Methodology

- **Scatterplots & correlations, looking for univariate relationships**
- **Regressions to control for other influences:**
  - OLS: the 'workhorse'
  - Fixed effects: to control for unobserved heterogeneity
  - LSDVC: correct for lagged DV bias in a dynamic FE model
  - GMM: IVs to control for lagged DV bias, but problems related to availability and proliferation of instruments, and large SEs

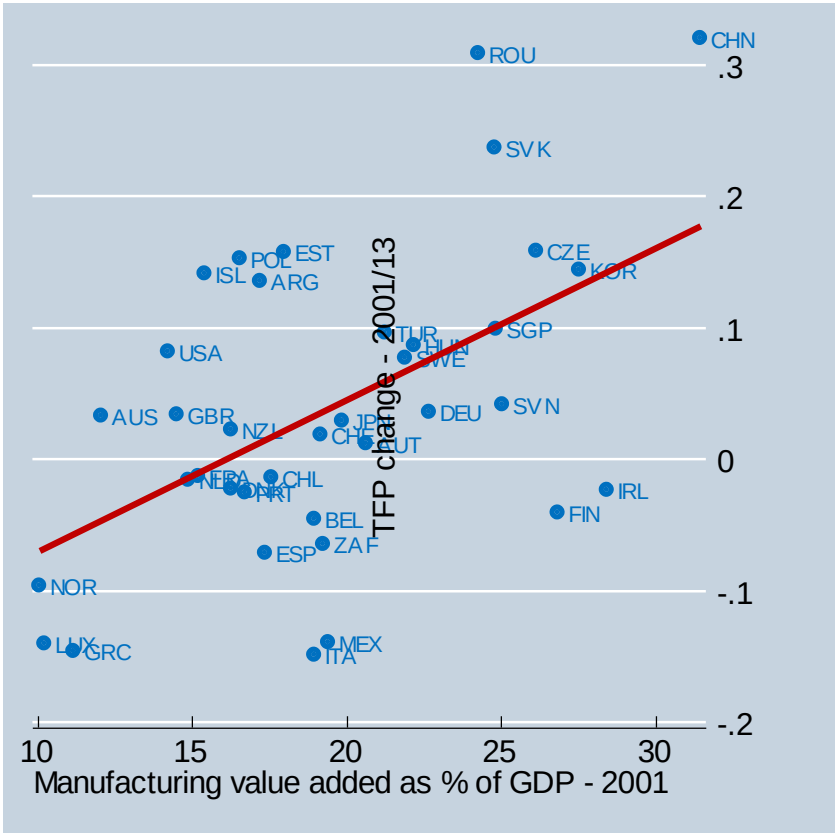
Scatterplots



y = -0.393 (s.e. 0.279) + 0.032x (s.e. 0.014)

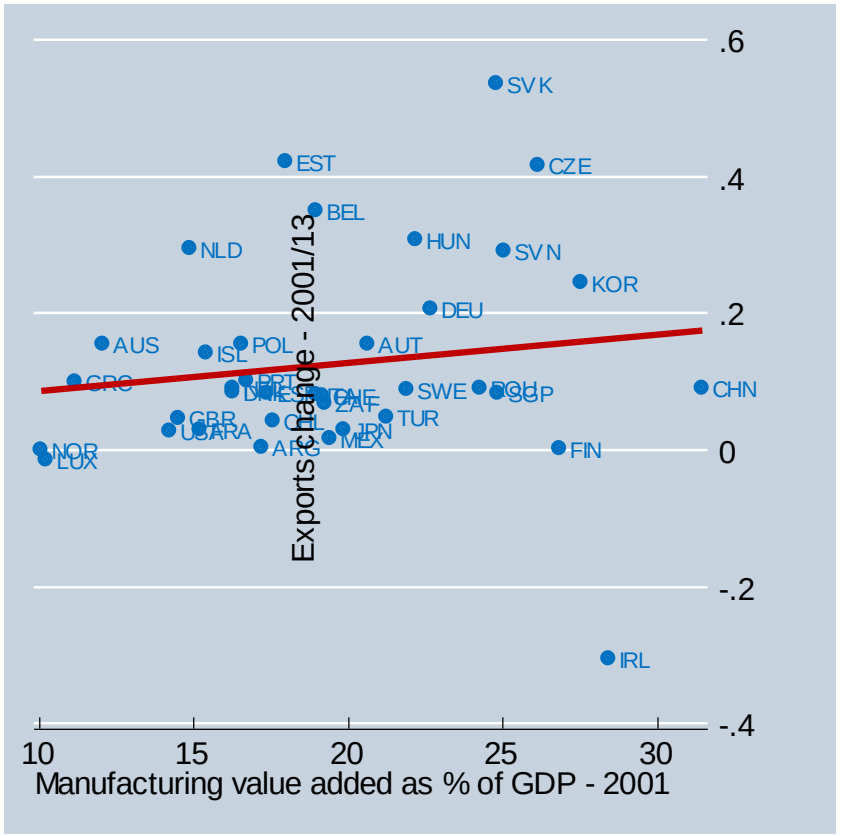
Positive correlation between the share of manufacturing value added at the beginning of the period and the change of BERD share during the period considered

TFP change and manufacturing



y = -0.186 (s.e. 0.064) + 0.012x (s.e. 0.003)

Export change and manufacturing



y = -0.004 (s.e. 0.005) + ***0.044x (s.e. 0.045)***

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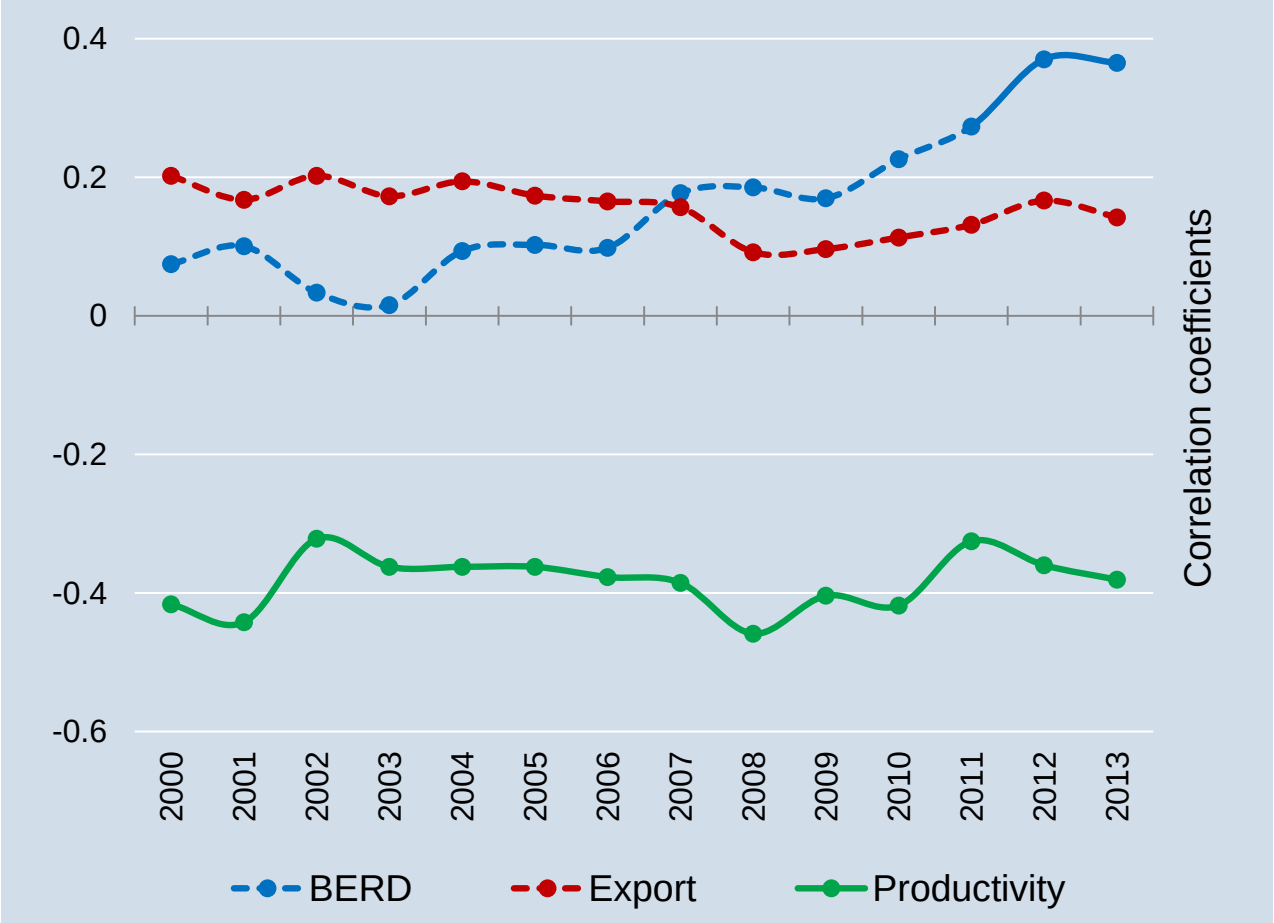
Correlations with manufacturing



Results

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Dependent: BERD as a share of GDP

	OLS	FE	BE	LSDVC	GMM	GMM	GMM
BERD/GDP	0.994***	0.885***	1.009***	0.885***	1.003***	0.866***	0.868***
	(0.011)	(0.061)	(0.012)	(0.072)	(0.009)	(0.071)	(0.062)
Manuf/GDP	0.004***	0.006	0.003**	0.007	0.004***	0.014***	0.010***
	(0.001)	(0.006)	(0.001)	(0.007)	(0.001)	(0.004)	(0.003)
Log GDP	0.002	-0.161	-0.002	-0.185		0.023*	0.018*
	(0.004)	(0.230)	(0.004)	(0.351)		(0.012)	(0.010)
Log GDP/capita	0.008	0.274	-0.017	0.301		0.123**	
	(0.010)	(0.253)	(0.018)	(0.374)		(0.050)	
Export share	-0.046	0.233	-0.122	0.170		-0.002	-0.073
	(0.099)	(0.273)	(0.147)	(0.508)		(0.343)	(0.253)
Human capital							0.130**
							(0.061)
TFP							0.368**
							(0.166)
Constant	-0.086	1.199	0.056		-0.047**	-0.906***	-1.018***
	(0.070)	(2.231)	(0.119)		(0.018)	(0.319)	(0.339)

All variables are lagged

Overall, significant effect of manufacturing

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Results for different test

Dependent: Productivity

	OLS	FE	BE	LSDVC	GMM	GMM	GMM
TFP	0.859***	0.895***	0.840***	0.952***	0.737***	0.738***	0.696***
	(0.022)	(0.035)	(0.021)	(0.063)	(0.043)	(0.059)	(0.066)
Manuf/GDP	-0.000	0.001	-0.000	0.001	-0.000	0.000	0.001
	(0.000)	(0.001)	(0.000)	(0.002)	(0.001)	(0.002)	(0.001)
Log GDP	-0.001**	0.024	-0.001	0.055		-0.004	-0.002
	(0.001)	(0.040)	(0.001)	(0.134)		(0.004)	(0.005)
Log GDP/capita	-0.009***	-0.050	-0.006**	-0.090		-0.005	
	(0.003)	(0.044)	(0.003)	(0.141)		(0.025)	
BERD/GDP	0.003**	0.005	0.002	0.006		0.005	-0.002
	(0.001)	(0.007)	(0.002)	(0.023)		(0.018)	(0.015)
Export share							0.013
							(0.046)
Human capital							0.001
							(0.016)
Constant	0.186***	-0.067	0.193***		0.268***	0.315***	0.310***
	(0.022)	(0.414)	(0.026)		(0.048)	(0.107)	(0.093)

Overall, no significant effect of manufacturing

GMM specification tests not satisfied

Dependent: Exporting share

	OLS	FE	BE	LSDVC	GMM	GMM	GMM
Export share	0.986***	0.702***	1.012***	0.702***	1.031***	1.200***	0.859***
	(0.014)	(0.094)	(0.010)	(0.065)	(0.016)	(0.126)	(0.079)
Manuf/GDP	0.000	-0.001	0.000	-0.001	-0.001	-0.009**	0.003*
	(0.001)	(0.001)	(0.001)	(0.034)	(0.001)	(0.004)	(0.002)
Log GDP	-0.005***	-0.168	-0.002	-0.139		0.011	-0.020**
	(0.001)	(0.105)	(0.002)	(2.348)		(0.013)	(0.009)
Log GDP/capita	-0.005	0.196	-0.010	0.165		-0.098**	
	(0.011)	(0.123)	(0.008)	(2.415)		(0.044)	
BERD/GDP	0.001	0.006	0.001	0.005		0.039	0.024
	(0.005)	(0.020)	(0.005)	(0.423)		(0.027)	(0.027)
Human capital							0.016
							(0.024)
TFP							0.188
							(0.122)
Constant	0.090**	1.714*	0.060*		0.006	0.213	0.018
	(0.036)	(1.008)	(0.035)		(0.014)	(0.147)	(0.169)

Overall, no significant effect of manufacturing

GMM specification tests not satisfied

Counterfactual calculations

What if manufacturing share can be increased to reach a 3% R&D target? ...

Country	GERD (%)	GAP to 3%	Manufacturing (%)	Change manufacturing to reach 3% R&D target	Hypothetical manufacturing share
Romania	0.39	2.61	23.0	+15.86	39
Chile	0.39	2.61	11.9	+15.83	28
Argentina	0.61	2.39	15.9	+14.49	30
Greece	0.81	2.19	9.6	+13.27	23
Slovak Republic	0.83	2.17	20.3	+13.18	33
Poland	0.87	2.13	17.9	+12.92	31
Turkey	0.94	2.06	17.3	+12.47	30
Russian Federation	1.13	1.87	7.0	+11.33	18
Spain	1.26	1.74	13.1	+10.55	24
Luxembourg	1.30	1.70	5.1	+10.31	15
Italy	1.31	1.69	15.4	+10.27	26
Portugal	1.33	1.67	13.1	+10.16	23
Hungary	1.40	1.60	22.6	+9.73	32
Ireland	1.54	1.46	20.4	+8.88	29
Norway	1.65	1.35	7.4	+8.18	16
United Kingdom	1.66	1.34	10.8	+8.11	19
Canada	1.69	1.31	11.1*	+7.95	19
Estonia	1.71	1.29	15.6	+7.80	23
Czech Republic	1.91	1.09	24.9	+6.62	32
Netherlands	1.96	1.04	11.8	+6.32	18
Singapore	2.00	1.00	18.8	+6.07	25
China	2.01	0.99	30.1	+5.98	36
France	2.24	0.76	11.3	+4.59	16
Belgium	2.43	0.57	14.0	+3.45	17
Slovenia	2.60	0.40	22.5	+2.40	25
United States	2.74	0.26	12.4	+1.56	14
Germany	2.83	0.17	22.6	+1.05	24
Austria	2.96	0.04	18.5	+0.22	19
Denmark	3.06	-0.06	13.5	-0.35	13
Finland	3.29	-0.29	16.9	-1.74	15
Sweden	3.31	-0.31	16.8	-1.86	15
Japan	3.48	-0.48	18.6	-2.92	16
Korea	4.15	-1.15	31.0	-6.97	24

** 2012 is the last available year*

Conclusions

- Despite the policy interest, there is a lack of cross-country evidence. We provide some first evidence (not yet casual links)
- Manufacturing share positively associated to BERD…results less significant for exporting and TFP growth
- A large manufacturing sector may play a role for innovation-led growth in developed economies
- However, this role may depend on the specific industrial structure of a country
- Yes, policymakers should focus on new high-tech sectors, but also encourage technological upgrade in existing ones

Stats for the BERD – Manufacturing regression

	OLS	FE	BE	LSDVC	GMM	GMM	GMM
Observations	441	441	441	441	441	441	441
R-squared	0.985	0.796	0.998				
Wald chi2(2)				0.000	0.000	0.000	0.000
Arellano-Bond for (pval AR2)				0.530	0.556	0.561	0.580
Sargan overid. (pval)				0.814	0.949	0.916	0.900
Hansen t overid. (pval)				0.581	0.749	0.624	0.698
Number of instruments				29	29	29	29