Drivers of Productivity Dynamics

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Plan

1. Productivity and the Cycle in the US

2. Drivers of TFP growth in Spain

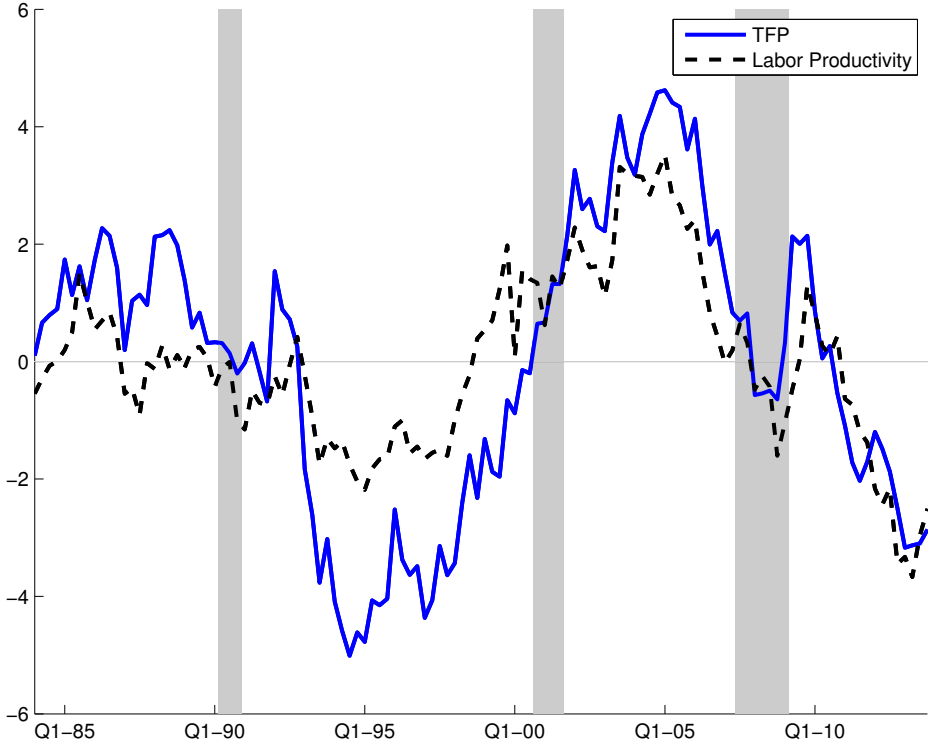
3. Policy implications

1. Productivity and the Cycle

- Productivity is the key driver of economic growth and increasing living standards.

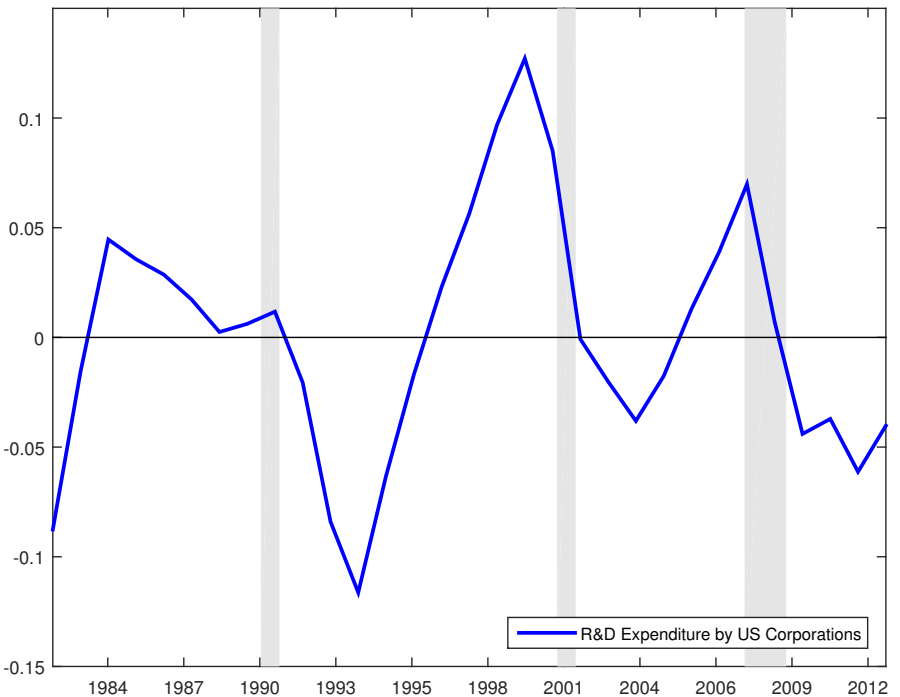
- What drove the evolution of TFP during the Great Recession?

Figure 1: Detrended Capacity Adjusted TFP and Labor Productivity



All series are log-linearly detrended. Labor productivity is GDP divided by hours worked (see Appendix A.1 for data sources). TFP is Utilization-Adjusted Total Factor Productivity (available at http://www.frbsf.org/economic-research/total-factor-productivity-tfp/; see Fernald (2012) for details).

Figure 2: R&D Expenditures by US Corporations, 1983-2013



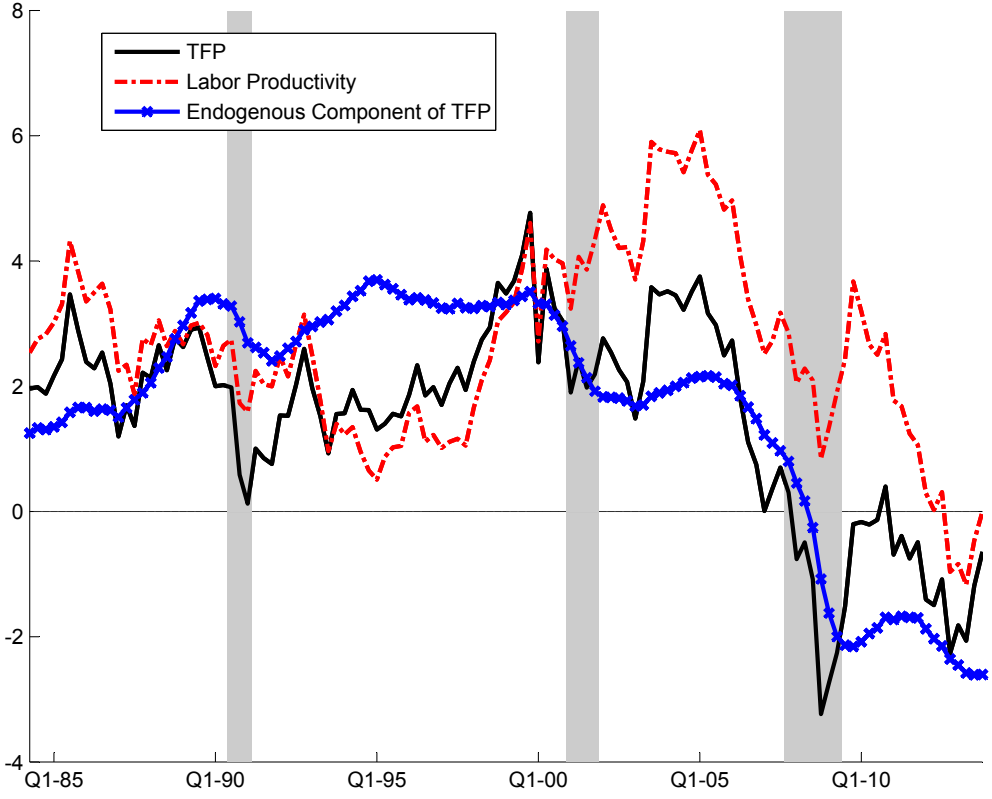
Log-linearly detrended data. Source: R&D Expenditure by US corporations (National Science Foundation). Data are deflated by the GDP deflator and divided by the civilian population older than 16 (see Appendix A.1 for data sources).

Table 1: Cyclicality of the Speed of Technology Diffusion

	I	II	III	IV
$\widehat{y}_t$	3.73	3.7	3.64	4.12
	(3.59)	(2.81)	(3.94)	(3.17)
$\widehat{y}_t$ * US		0.07		-0.74
		(0.04)		(0.53)
lag_{it}	-0.057	-0.057		
	(5.22)	(4.76)		
lag_{it}^2	0.001	0.001		
	(2.52)	(2.12)		
$ln(lag_{it})$			-0.29	-0.29
			(6.68)	(6.65)
R2 (within)	0.11	0.11	0.13	0.13
N technologies	26	26	26	26
N observations	327	327	327	327

Notes: (1) dependent variable is the speed of diffusion of 26 technologies, (2) all regressions include technology specific fixed effects. (3) t-statistics in parenthesis, (4) $\widehat{y}_t$ denotes the cycle of GDP per capita in the country and represents the high and medium term components of output fluctuations, (5)$\widehat{y}_t$*US is the medium term cycle of GDP per capita times a US dummy, (6) lag represents the years since the technology first started to diffuse.

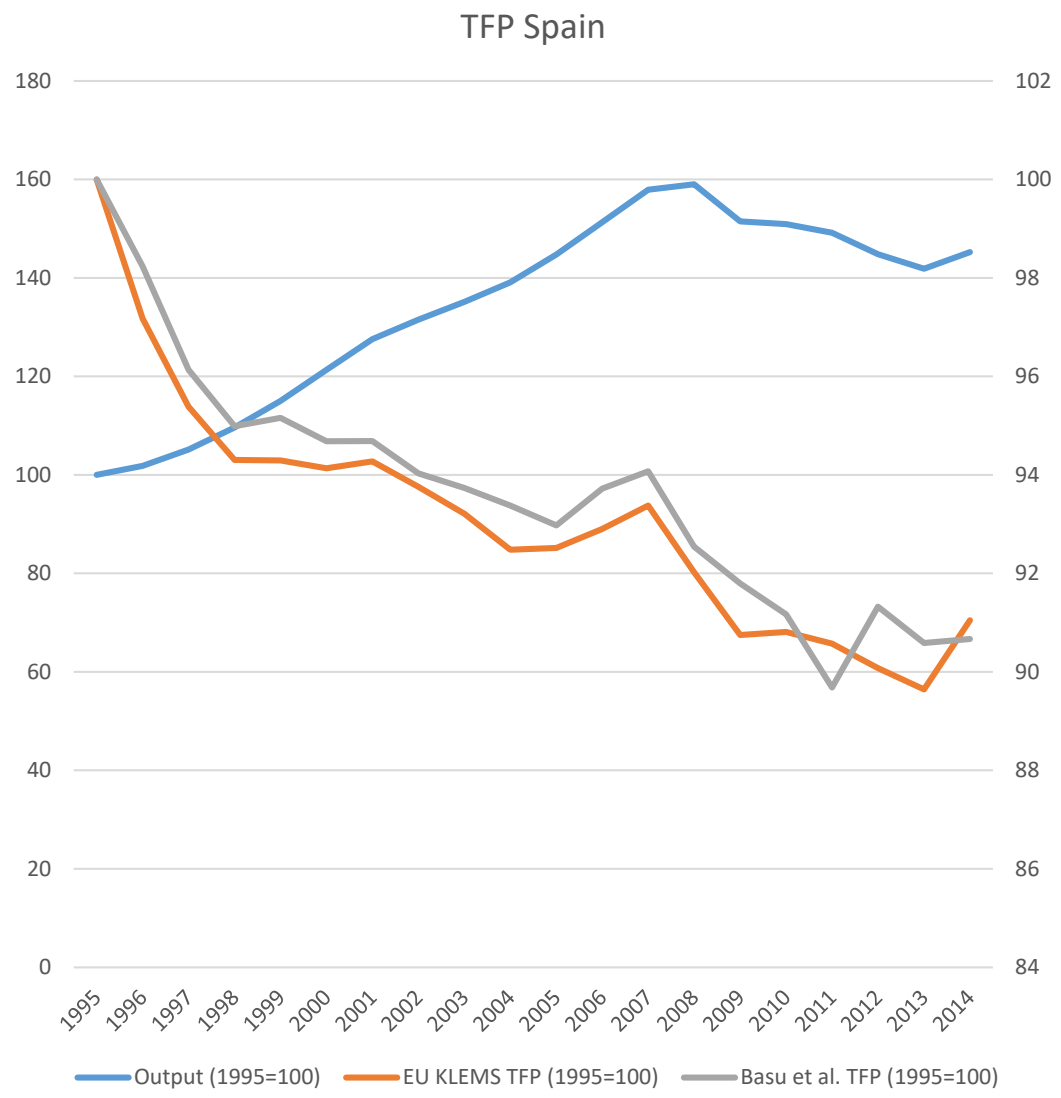
Figure 6: Endogenous TFP, TFP and Labor Productivity



Labor productivity is GDP divided by hours worked (see Appendix A.1 for data sources). Smoothed shocks from model estimated using data as described in Section 4.2 and Appendix A.1.

2. What about Spain?

- Accelerated decline in TFP growth during the GR
- But significant pre-recession downward trend in TFP
- Not driven by compositional change
- All sectors (other than Finance) underperform vs. EU and USA



How to expand production in times of high demand?

- Option 1: **Increase capacity**
    - Adding less productive resources into production, increasing marginal cost
    - Results in decline in TFP (though value added and profits may increase)
- Option 2: **Improve productive technology**
    - Adopting new productive processes to reduce production costs / produce more sophisticated goods and services
    - Results in higher TFP

Which of these two avenues was followed by Spanish firms during 1995-2008 expansion?

	1970	1995	2007	2008	2015
I/Y	0.287	0.238	0.345	0.318	0.217
Decomposition of Investment					
Residential St	0.31	0.27	0.38	0.36	0.23
Other Construction	0.27	0.38	0.30	0.31	0.28
Machines	0.23	0.14	0.11	0.12	0.17
Software	0.00	0.03	0.03	0.04	0.07
Communications	0.04	0.03	0.03	0.03	0.04
IT	0.02	0.03	0.02	0.02	0.02
RD	0.02	0.04	0.03	0.04	0.06
Structures	0.58	0.65	0.68	0.67	0.50

Why?

$$\frac{\lambda'}{R} * \frac{\Delta\pi^A}{R-1} = 1$$

$\Delta\pi^A$= Increase in profits by marginally enhancing the technology

λ'= marginal impact of investing 1 euro in tech enhancement activities on technology.

Why is λ' so small?/ what does it mean outside the model?

1. Lack of technological knowledge in companies
2. Insufficient/inefficient use of human capital in production
3. Lack of mechanisms to allocate efficiently knowledge in the economy

1. Lack of technological knowledge in companies

Most companies do not have the know-how to

- understand their technological needs
- find the solutions
- implement them

2. Insufficient/inefficient use of human capital in production

- Spain produced many and very good college graduates, but often lack practical training/experience
- As a result, companies use them in low-end positions where their skills are not very relevant
- This results in **high mismatch between skills and jobs** (one of the highest in the EU)

How to fix it?

- **Facilitate practical training for Vocational training and college students in companies.**

3. Lack of mechanisms to allocate efficiently knowledge in the economy

- Lack of market for technological knowledge
- Often mismatch in technological knowledge between those that need it and those that have it (e.g. technical departments in universities)
- Companies do not know who can help resolve their **specific technological** problems

How to fix it?

- **Government should create institutions to solve these matching/contractual frictions**

Conclusions

- Effective economic policies require

  1. accurate diagnosis of the sources of the frictions/market failures that may rationalize an intervention

  2. **creative solutions** to these problems

- We know less than we should about the drivers of technology upgrading in Spain
- Two policy prescriptions from what we know:
  1. Provide practical expertise to students to speed up their raise within organizations
  2. Bridge the gap between those that have technological knowledge and companies that need it