



НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ  
УНИВЕРСИТЕТ

Центр исследований производительности

# "МАКРОЭКОНОМИЧЕСКАЯ ТЕОРИЯ И ИЗМЕРЕНИЕ ПРОИЗВОДИТЕЛЬНОСТИ"

Револьд Михайлович Энтов



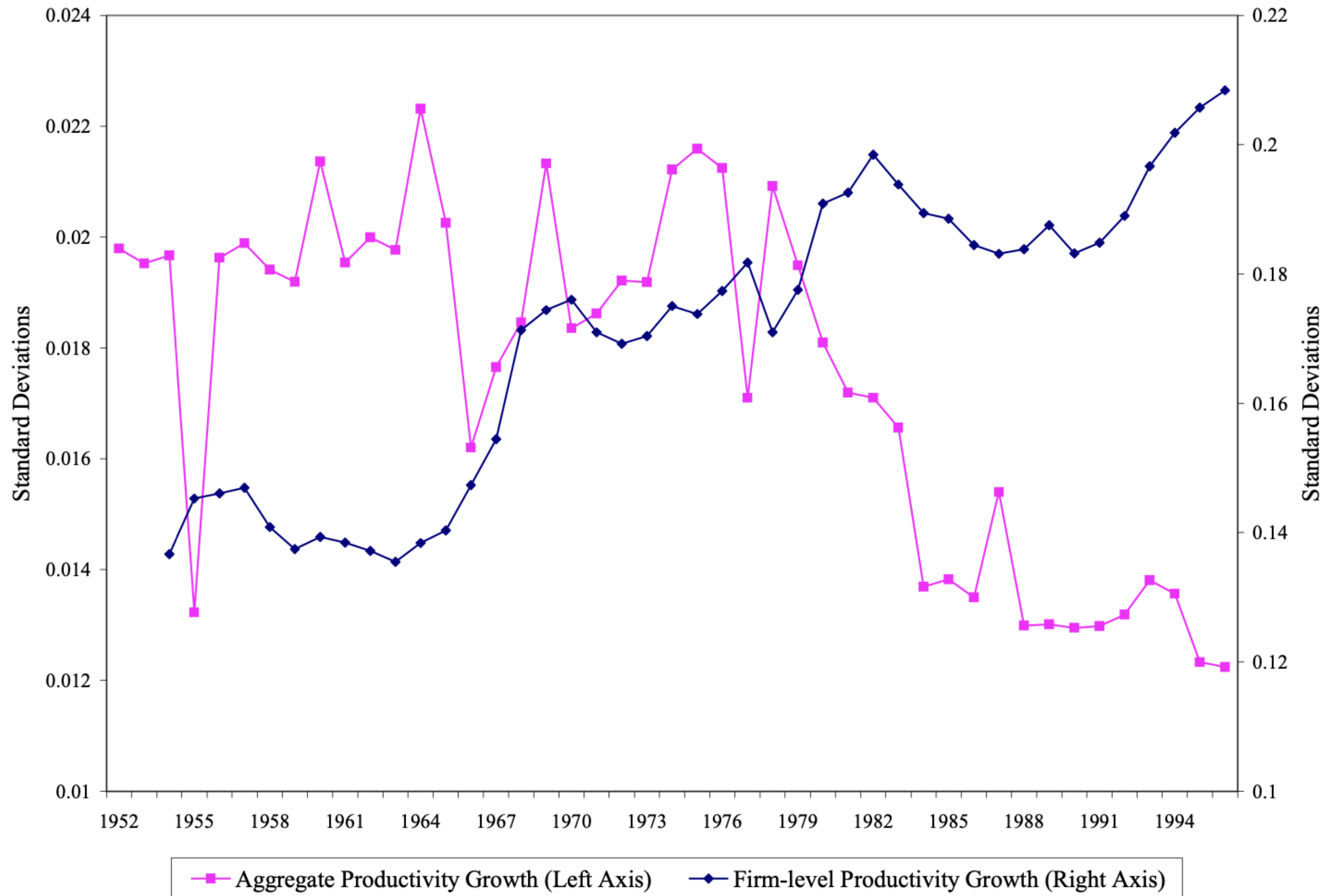
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## План лекции

1. Агрегирование в макроэкономических моделях
2. Производительность и проблема эффективной аллокации ресурсов
3. Компьютерная революция: новые модели экономического роста



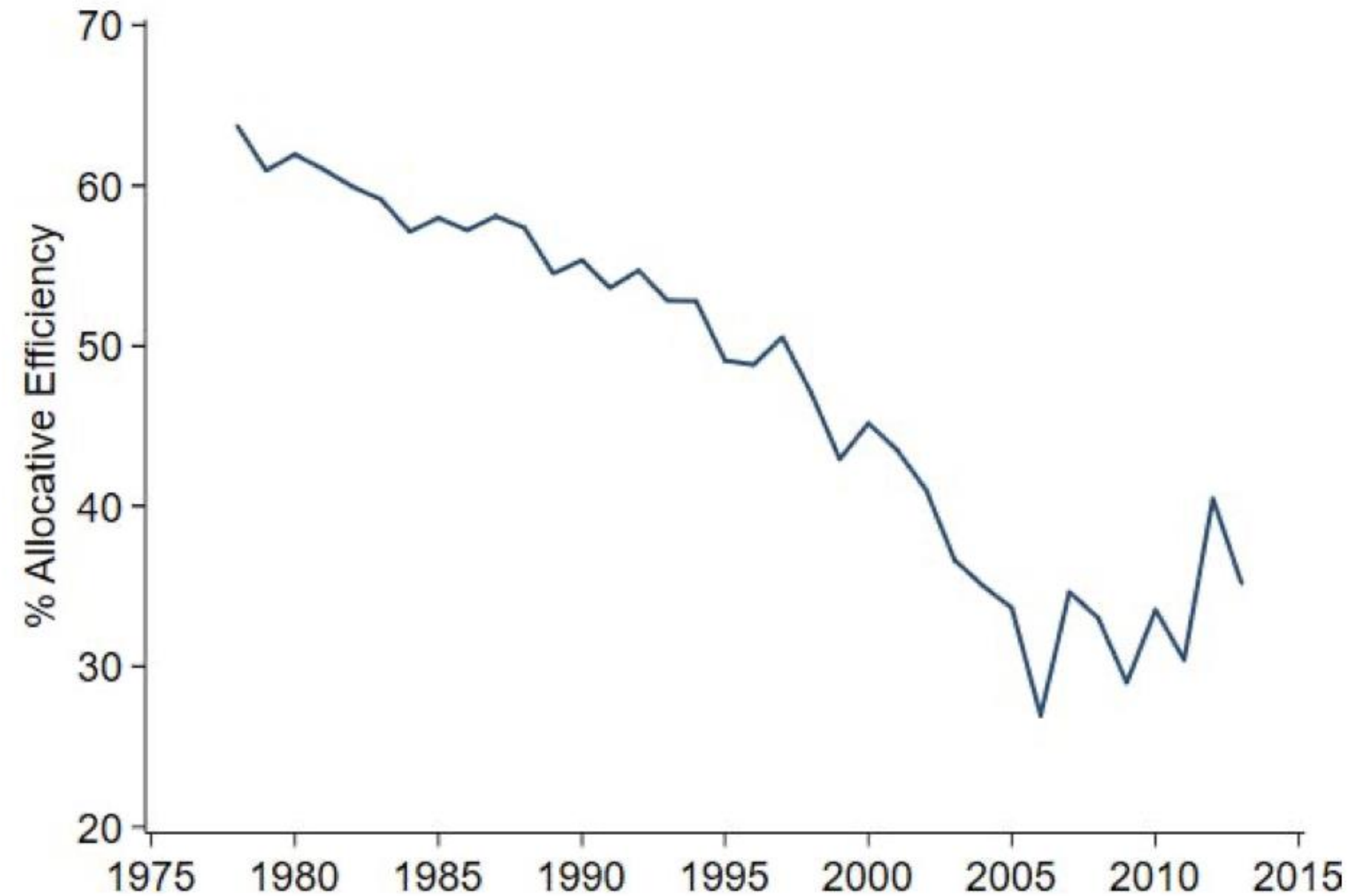
# Evolution of the Aggregate and Firm-level Volatility of productivity



Aggregate productivity growth comes from the BLS.  
Firm-level sales per worker obtained from COMPUSTAT



## Allocative Efficiency in the U.S.

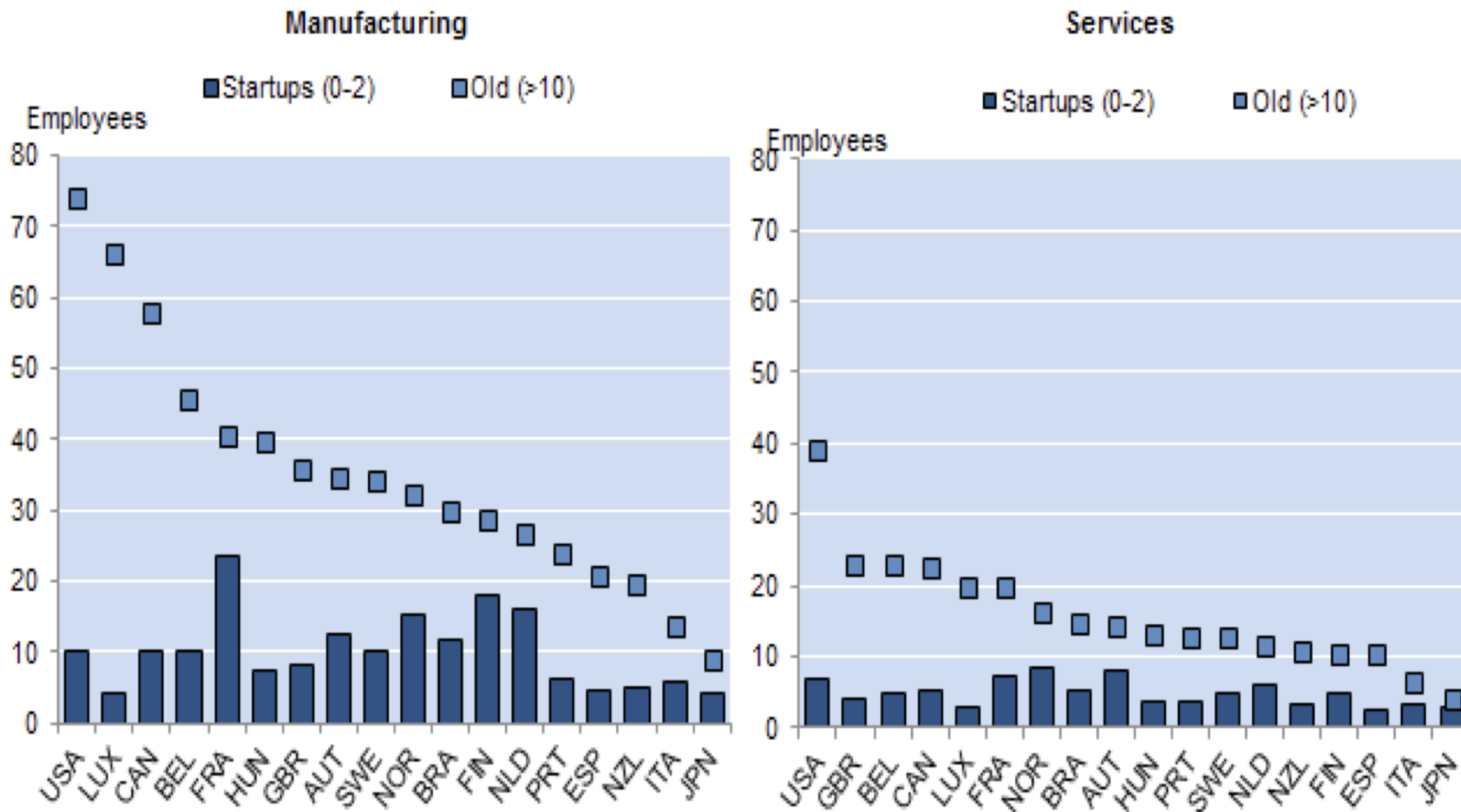


The figure shows the % allocative efficiency in U.S. manufacturing between 1978 and 2013.



# The strength of market selection and post-entry growth varies across countries.

## Post-entry growth – average size of young and old firms

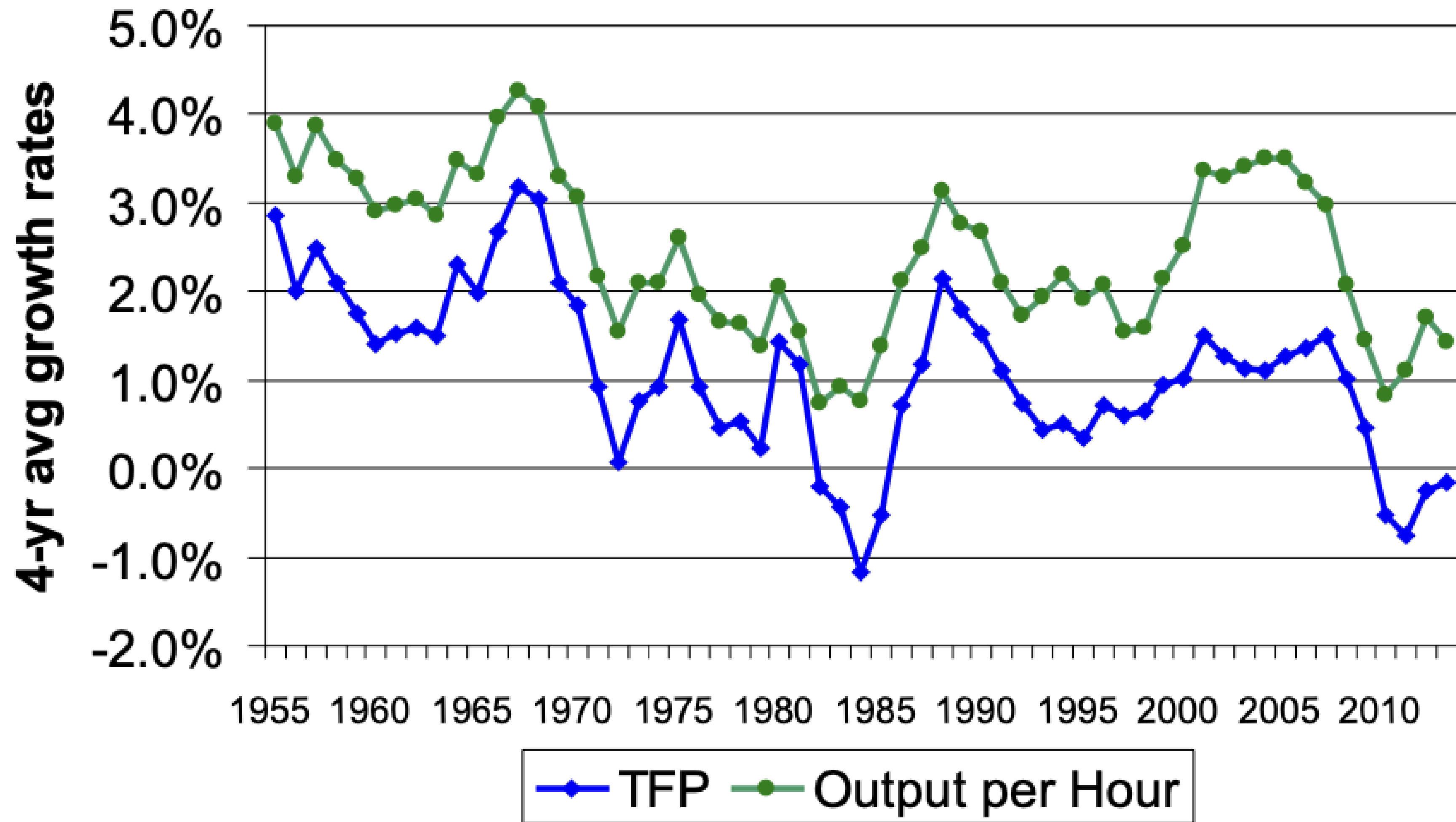


Panel reports the average size of start-up firms (from 0 to 2 years old) and firms more than 10 years old.

Source: Criscuolo, C., P. Gal and C. Menon (2014), "The Dynamics of Employment Growth: New Evidence from 18 Countries", OECD Science, Technology and Industry Policy Papers, No. 14.



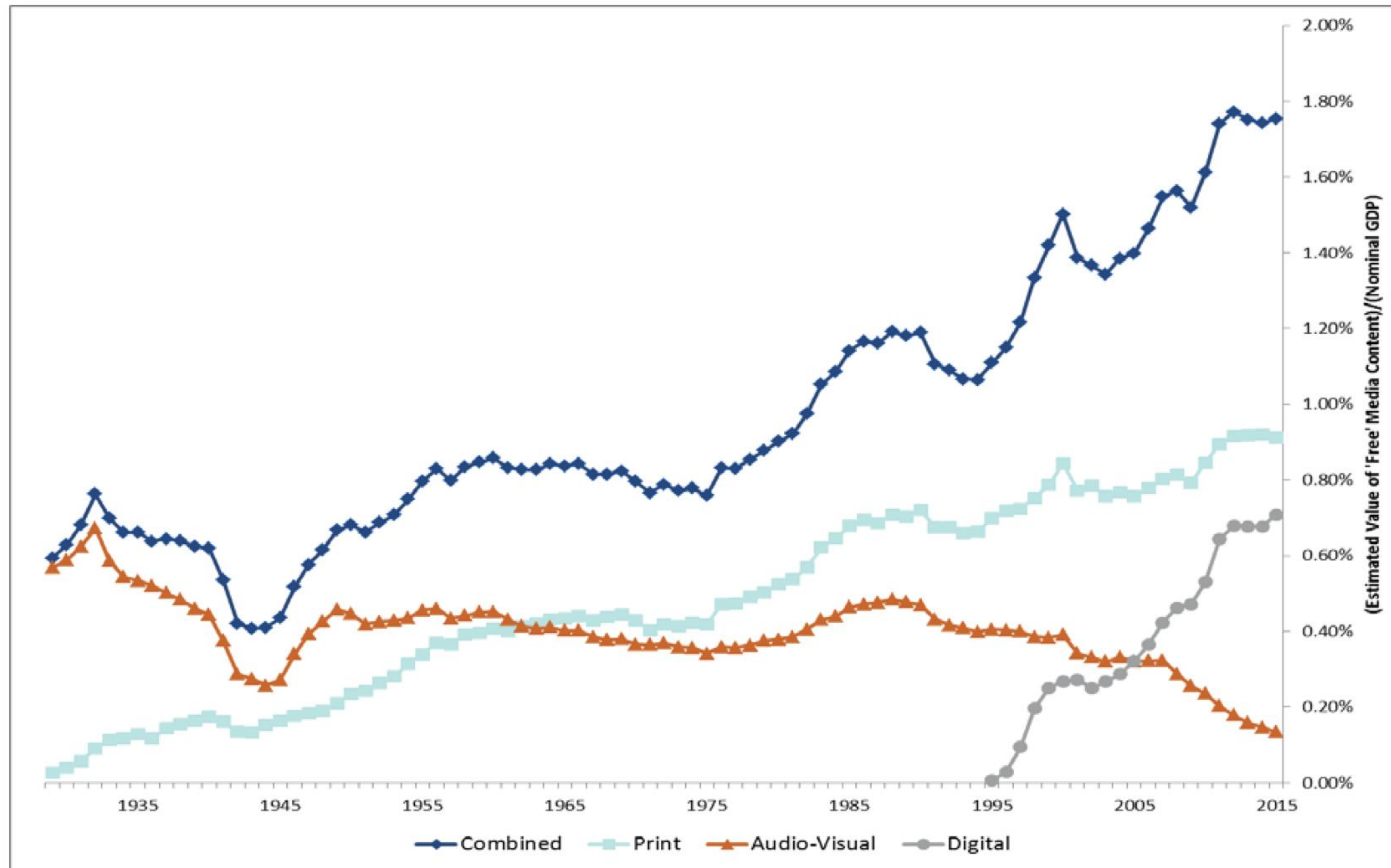
# Growth in Output per Hour and TFP U.S. NFB, 1955-2011



Source: Charles R. Hulten and Leonard I. Nakamura (2019). "Expanded GDP for welfare measurement in the 21st century" NBER Working Paper No. 26578, National Bureau of Economic Research, Inc.



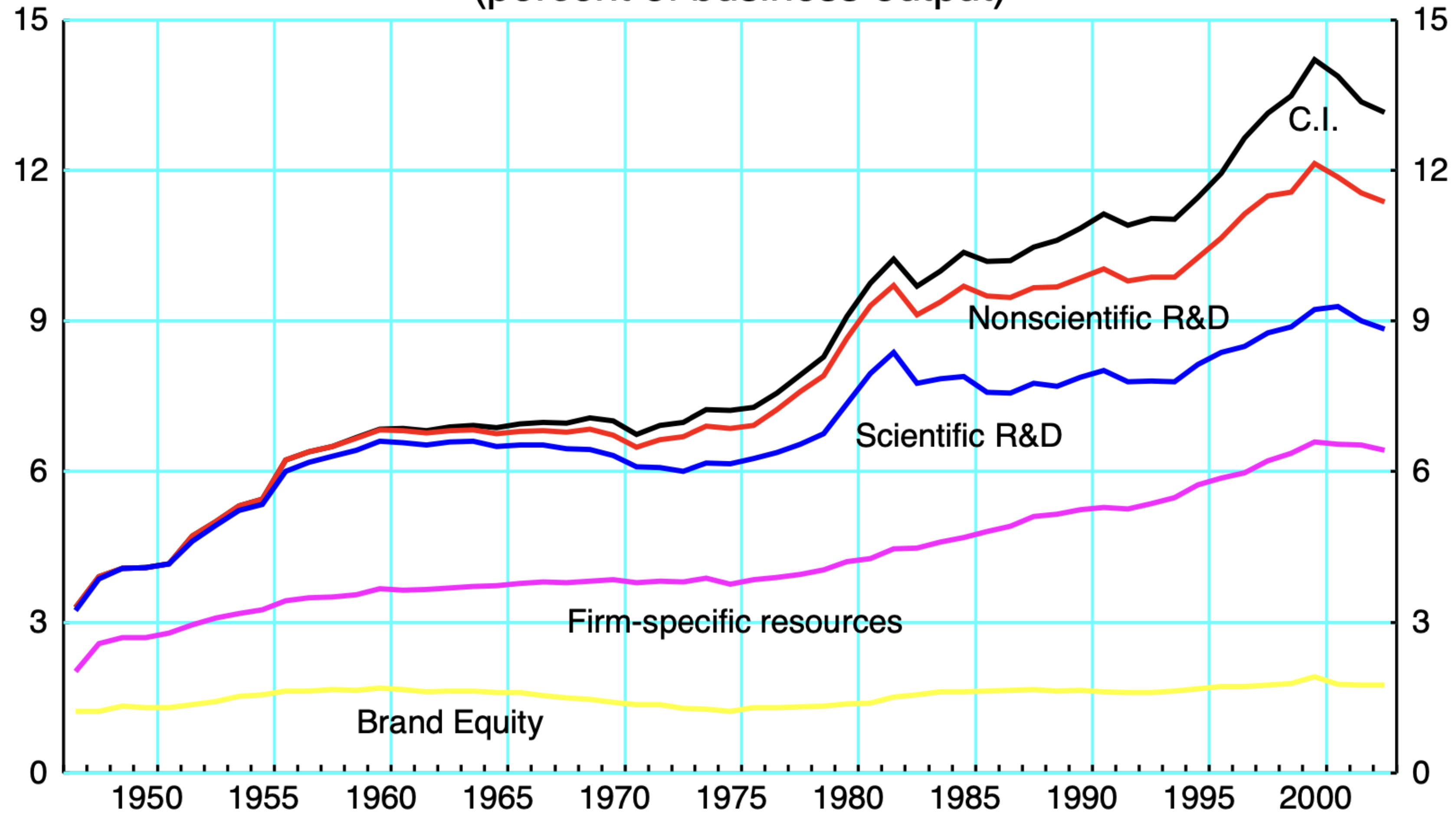
# Consumer Media Content as a Share of GDP, %



Source: Leonard Nakamura, Jon Samuels, and Rachel Soloveichik. "Measuring the "Free" Digital Economy Within the GDP and Productivity Accounts". Federal reserve bank of Minneapolis. System Working Paper 18-03, January 2018



# Intangible Investments (percent of business output)



Note: C.I. = Computerized information





# Average annual change in labour productivity in the market sector and contribution of tangible and intangible capital deepening, labour quality and MFP growth, 1995-2006

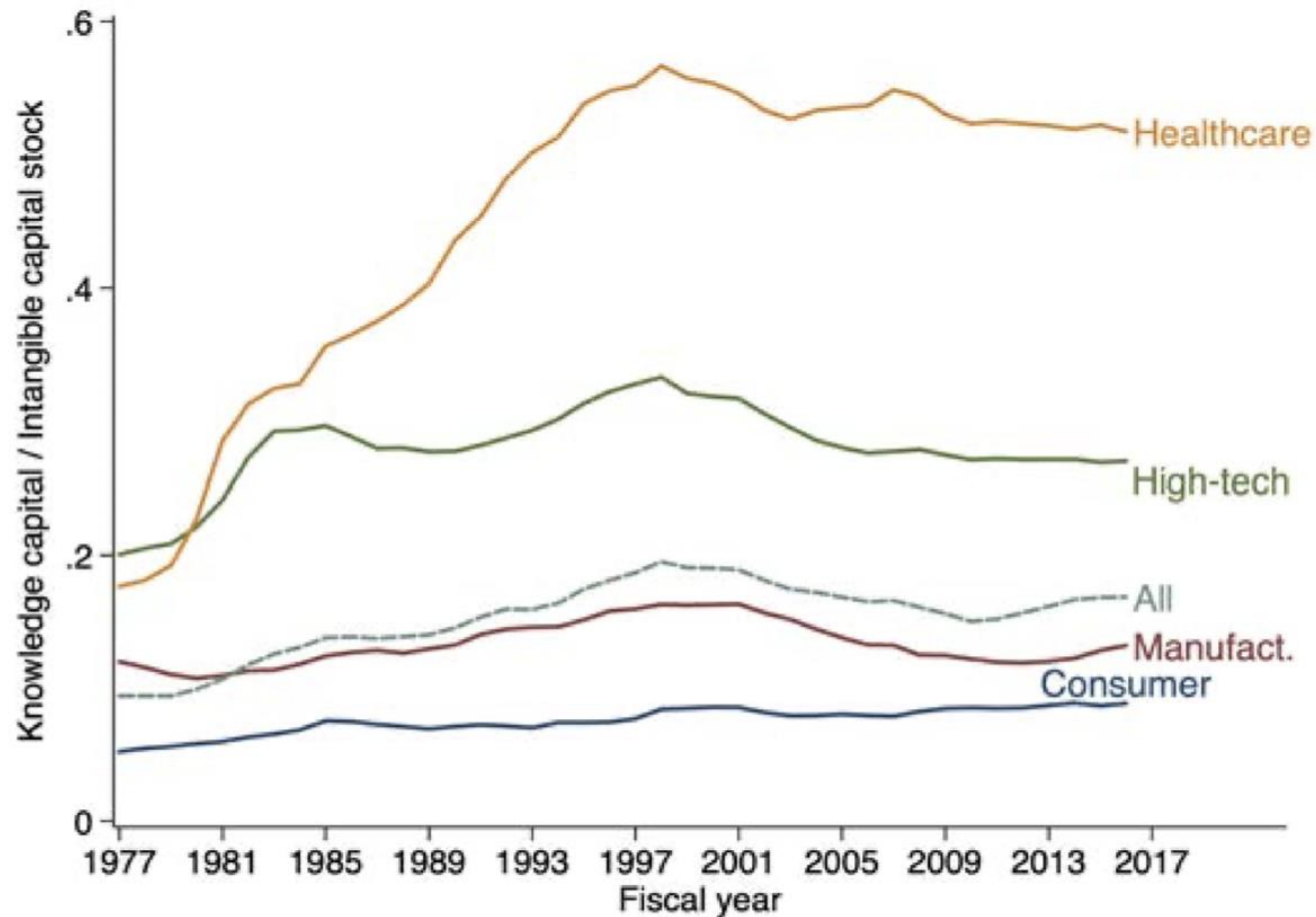
	Germany 95-06	France 95-06	Italy 95-06	Spain 95-06	Austria 95-06	Denmark 95-06	<b>Average 95-06</b>	Czech Rep 97-06	Slovakia 00-06	Greece 95-06	UK 95-06	USA 95-06
<i>Excluding Intangible Capital (percent)</i>												
Labour productivity growth	1.61	1.83	0.26	0.36	1.99	1.54	<b>1.18</b>	4.50	6.30	3.21	2.90	2.75
Contributions												
ICT cap. deep. (ex. software)	0.23	0.14	0.12	0.21	0.29	0.50	<b>0.20</b>	0.38	} 2.85	0.46	0.74	0.47
Non-ICT cap deep.	0.57	0.37	0.31	0.56	-0.03	0.28	<b>0.39</b>	1.76		1.52	0.36	0.30
Labour quality	-0.16	0.44	0.24	0.68	0.24	0.19	<b>0.23</b>	0.34	0.49	0.73	0.26	0.20
MFP	0.98	0.88	-0.41	-1.10	1.49	0.57	<b>0.37</b>	2.02	2.97	0.51	1.54	1.78
<i>Including Intangible Capital (percent)</i>												
Labour productivity growth	1.79	2.00	0.29	0.47	2.36	2.11	<b>1.32</b>	4.60	6.17	3.27	3.06	2.96
Contributions												
ICT-capital deepening	0.20	0.12	0.11	0.19	0.26	0.44	<b>0.17</b>	0.35	} 2.72	0.45	0.63	0.40
Non-ICT-cap deepening	0.48	0.31	0.29	0.49	-0.02	0.24	<b>0.34</b>	1.62		1.48	0.28	0.24
Intangible-cap. deepening	0.38	0.48	0.12	0.12	0.55	0.72	<b>0.30</b>	0.68	0.21	0.24	0.69	0.83
Computerized information	0.07	0.15	0.03	0.05	0.13	0.29	<b>0.08</b>	0.06	0.04	0.06	0.16	0.18
Innovative property	0.23	0.18	0.05	0.15	0.29	0.27	<b>0.16</b>	0.35	0.07	0.11	0.17	0.35
Economic competency	0.07	0.15	0.04	-0.08	0.13	0.17	<b>0.06</b>	0.27	0.10	0.07	0.36	0.29
Labour quality	-0.15	0.40	0.22	0.64	0.22	0.17	<b>0.21</b>	0.31	0.46	0.71	0.22	0.18
MFP	0.88	0.69	-0.45	-0.96	1.35	0.53	<b>0.29</b>	1.64	2.78	0.40	1.23	1.33

\*Employment, value added, and the stock of tangible capital for all countries from 1997 to 2005 from EUKLEMS, version March 2008

Source: Bart van Ark, Janet X. Hao, Carol Corrado & Charles Hulten. "Measuring intangible capital and its contribution to economic growth in Europe" In EIB Papers, volume 14, p. 62-93, 2009



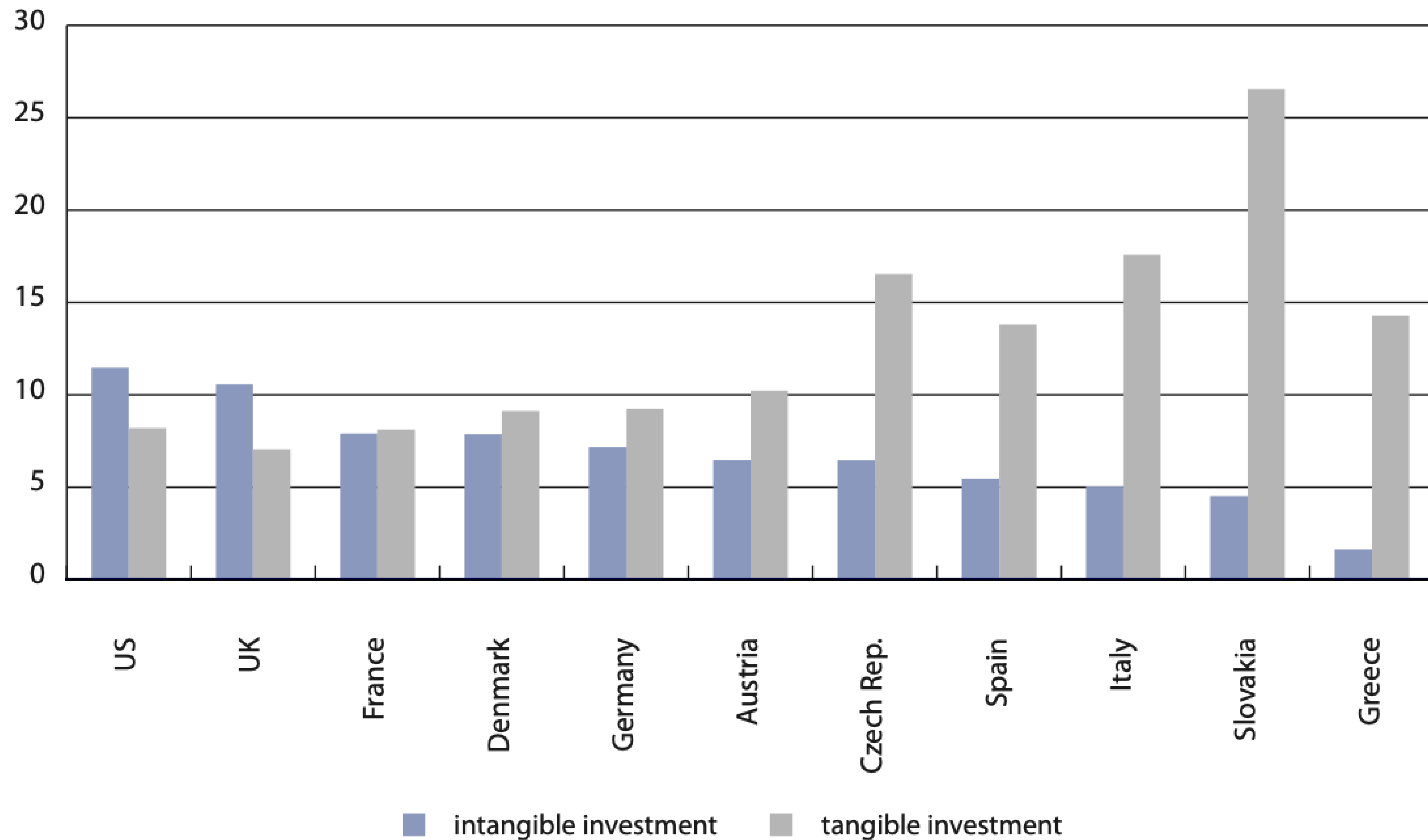
# Knowledge capital as a fraction of total intangible capital



Source: Michael Ewens, Ryan H. Peters, and Sean Wang (2019). "Measuring intangible capital with market prices" NBER Working Paper No. 25960, National Bureau of Economic Research, Inc.



# Intangible and tangible investment in the market sector (percent of GDP), 2006



Note: GDP is conventionally measured (including software and mineral exploration but excluding other intangibles).



# The links between financial development, intangible intensity and productivity

Dep variable: Labour Productivity Growth	(1)	(2)	(3)	(4)	(5)	(6)
FinDEV variable:	Market cap (initial)	Domestic credit (initial)	IMF Global Fin Index	IMF Global Fin Index	IMF Global Fin Index	IMF Global Fin Index
Initial Labour Productivity	-0.025*** (0.000)	-0.025*** (0.000)	-0.021*** (0.000)	-0.022*** (0.000)	-0.024*** (0.000)	-0.021*** (0.000)
Change Capital Stock	0.060* (0.099)	0.060* (0.098)	0.079 (0.125)	0.079 (0.125)	0.069 (0.114)	0.079 (0.125)
FinDEV * IntangIntens	0.465*** (0.007)	0.383*** (0.002)	0.076** (0.012)		0.096* (0.077)	
FinDEV * IntangIntens (knowledge)				0.088*** (0.003)		
FinDEV * IntangIntens (organisation)				0.077 (0.113)		
GDP growth * IntangIntens					-0.004 (0.436)	
Inflation * IntangIntens					0.000 (0.775)	
Labour regulation * IntangIntens					-0.008 (0.141)	
FinDEV * IntangIntens						0.048 (0.253)
FinDEV * IntangIntens * dFinDEP §						0.088** (0.012)
FinDEV * dFinDEP						-0.016 (0.564)
Observations	10,090	10,090	7,221	7,221	6,372	7,221
R-squared	0.139	0.139	0.143	0.143	0.147	0.143
Country-Year FE	YES	YES	YES	YES	YES	YES
Sector FE	YES	YES	YES	YES	YES	YES

*Note:* The dependent variable is the labour productivity growth. IntangIntens is intangible asset intensity.

All regressions include sector and country-year fixed effects. Standard errors are clustered at the industry level and pvalues are presented in parenthesis. \*, \*\*, \*\*\* denote statistical significance at the 10%, 5% and 1% levels.

Source: Lilas Demmou, Irina Stefanescu and Axelle Arquie (2019). "Productivity growth and finance: the role of intangible assets- a sector level analysis." OECD Working papers WKP(2019)16, No 1547.



# Firm-Value Decomposition Across Decades

	1970s	1980s	1990s	2000s	2010s
All firms (in %)					
$\bar{\mu}^P$ : Physical	43.15	37.99	28.11	23.93	22.65
$\bar{\mu}^L$ : Labor	23.07	18.73	23.01	24.35	24.53
$\bar{\mu}^K$ : Knowledge	24.90	33.53	39.89	43.53	44.72
$\bar{\mu}^B$ : Brand	8.88	9.75	8.99	8.19	8.10
Low skill (in %)					
$\bar{\mu}^P$ : Physical	48.03	47.15	37.41	34.88	35.89
$\bar{\mu}^L$ : Labor	14.83	11.17	14.41	16.67	15.22
$\bar{\mu}^K$ : Knowledge	17.40	18.80	19.26	23.04	21.97
$\bar{\mu}^B$ : Brand	19.74	22.88	28.92	25.42	26.92
High skill (in %)					
$\bar{\mu}^P$ : Physical	43.87	37.22	27.57	23.65	21.71
$\bar{\mu}^L$ : Labor	21.17	17.68	21.21	22.29	22.73
$\bar{\mu}^K$ : Knowledge	28.35	38.03	45.43	48.64	50.34
$\bar{\mu}^B$ : Brand	6.60	7.06	5.79	5.43	5.22

This table shows the average aggregate input-shares ( $\mu$ ) across different decades. The sample consists of firm-level annual data from 1975 to 2016



# The accelerated shift to intangible assets

## 2020 was record breaking for record compromises





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