Institutions, Policies and the European Paradox

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European Macroeconomics

October 24, 2022

Summary I

Introduction

- Main reference: Cimoli et al. (2009), ch. 2
- No example in history of a development process nested in an environment like institution-free tale's of textbook economics
- All historical experiences of sustained economic growth occurred in a rich set of institutions, shared behavioural norms and public policies
- Institutions and policies always matter in all process of technological learning, economic coordination, change

Market failures?

- When are public policies required for the textbook viewpoint? When there are market failures!
- Standard normative (welfare) theorems hold as yardstick in the underlining framework
- Yet, hardly any empirical setup looks like such a yardstick: the whole world can be seen as a market failure

Universal role of institutions I

- Non-market institutions (public agencies, trade unions, professional associations) are at the core of the very constitution of the whole socio-economic fabric
- They determine the governance structure where market exchanges are either socially non-desirable or simply ineffective
- At the same time, they shape economic behaviour of the agents involved
- Even if a *market form* rules, it is often embedded on a wider thread on non-market institutions
- Example: Pharmaceuticals

  → governments fund research through universities, public labs, post-education training programmes

Universal role of institutions II

- $\rightarrow$ public funds for procurement
- $\rightarrow$ regulation well beyond guarantees of property rights

- Even if "working", markets are imperfect mechanisms of selection

Generation, adaptation, exploitation of new technologies I

- The very properties of knowledge as information entail a market failure:
  - → pre-existing cognitive categories
  - → problem-solving heuristics
  - → tacitness
- All processes of generation of new technological knowledge involve a rich set of complementary actors (firms, communities, trade unions, etc.)
- Institutions and policies addressing technological learning have to do with the construction of national systems of production and innovation

Generation, adaptation, exploitation of new technologies II

- The dynamics of industrialisation rest upon structural transformations entailing a changing importance of different branches of economic activity as generators of both technological and organisational innovations
- In each epoch there appear to be technologies with such a wide domain of applications that country's prosperity depends on the ability to master them
- Structural hierarchies: the core technologies shape the overall absolute advantages/disadvantages of each country

Generation, adaptation, exploitation of new technologies III

- Self-sustained technological dynamics is hardly possible without a progressive construction of a manufacturing sector along the core technologies

Complementarities, incentive, coordination hurdles I

- What about coordination problems arising from the interactions between multiple heterogeneous agents?
- The fundamental coordination issue is the matching between decentralised behaviours and between distributed pieces of knowledge
- Different outcomes (in terms of industrialisation) crucially depend on the institutions at the top
- Gerschenkron (1962): "only when industrial development could commence on a large scale did the tension between the preindustrialization conditions and the benefits expected from industrialization become sufficiently strong to overcome the existing obstacles and to liberate the forces that made for industrial policies"

Complementarities, incentive, coordination hurdles II

- Nelson and Sampat (2001): institutions as social technologies mastering externalities and matching/mismatching patterns between innovative activities, underlying incentives structures, investments, skills, etc.

Institutional development of technological capabilities

- Active government support of catching-up, various forms of protection and subsidy were fundamental for the industrialisation of most countries
- Such policies "angered" companies in the leading countries, obviously
- In industries where international trade is considerable some kind of infant-industry protection is required
- During XIXth and XXth centuries, property rights regimes did not restrict seriously the ability to copy and adopt new technologies
- Conflicts usually emerge when catching-up companies enter the world market dominated by leader-economies firms.

Domains of policy interventions I

What are the different domains of policy interventions and how do they map into different policy measures and institutions?

Domains of policy intervention	Policy measures	Related institutions
(i) Opportunities of scientific and technological innovation	Science policies, graduate education, "frontier" technological projects	Research universities, public research centers, medical institutes, space and military agencies, etc.
(ii) Socially distributed learning and technological capabilities	Broader education and training policies	From primary education to polytechnics, to US-type "land-grant colleges", etc.
(iii) Targeted Industrial Support Measures, affecting e.g. types of firms, etc.—*in primis* the structure, ownership, modes of governance of business firms (e.g. domestic vs. foreign, family vs. publicly owned companies, etc.)	From the formation of state-owned firms to their privatization, from "national champions" policies to policies affecting MNCs investments; all the way to the legislation affecting corporate governance	State-owned holdings, public merchant banks, public "venture capitalist", public utilities

Figure: Examples

Domains of policy interventions II

- Policies and activities of institutional engineering affect together:
  - → technological and learning capabilities of organisations
  - → economic signals they face (profitability, opportunity costs)
  - → the ways agents interact with one another and with non-market institutions
- All developed countries present a high degree of intervention that, of course, differs in the modes and aims across them
- The successful case of Japan:
  - → protection against import and FDI;
  - → oligopolistic rivarly between Japanese companies;
  - → export orientation stimulating technological dynamism

Domains of policy interventions III

- The successful case of Korea:
  - → channelling the resources to *create* absolute and comparative advantages;
  - → large groups with strong learning capabilities selected best foreign technologies and re-adapted them to local conditions;
  - → penalties to rent-seeking behaviours
- The not very successful case of EU:
  - → R&D subsidy and other forms of financial transfers;
  - → generic calls for competition, networking, cohesion;
  - → European paradox

Historical regularities:

Domains of policy interventions IV

1. Centrality of public agencies in the generation and establishment of new technological paradigms
2. Incentives are not enough: affecting and directing technological change and technological capabilities is crucial with new technologies
3. Market discipline can be helpful just when it comes to price out of the market low-performing institutions
4. Policies generally face the need to balance measures aimed at capability building with mechanisms curbing inertia and rent-seeking
5. Endogenous market mechanisms tend to behave in a virtuous manner for those countries already at the frontier. By the way, free-trade agreements are usually advocated and exploited by leading economies

What lessons? I

- Globalisation went hand-in-hand with strong efforts to impose the Washington Consensus
- Trade liberalisation was key part of such a process
- Free-trade may create competition but not automatically since it is neither sufficient nor necessary to create a competitive and innovative economy
- Greater integration with profound differences in initial conditions, institutions, technological capabilities may lead to virtuous or vicious circles, *even more so today than in the past*
- Possible solutions as appropriate policy packages:
  - → public education systems through research centers;
  - → supporting national incumbent firms;

What lessons? II

→ new governance that combines knowledge accumulation and its exploitation with interests of profits-motivated agents;

→ increasing knowledge access and sharing the benefits from technology-driven economic growth

What is the European Paradox?

- Main reference: Dosi et al. (2006)
- Such a paradox refers to the conjecture that EU countries play a leading global role in top-level scientific output, but lag behind in the ability to convert this strength into wealth-generating innovations
- We will show that data do not support such claim and suggested policies by EU institutions are based on rather questionable assumptions
- There is ample evidence of widespread European corporate weaknesses across scientific and technological fields

Persistent stylised facts I

- A good deal of knowledge is, and is likely to continue to be, rather sticky, organisation- and people-embodied, and often also partially clustered
- *Useful* academic research is *good* academic research
- Government funding of basic research is responsible, mainly in the US, for most major scientific advances
- Business-financed university research is very low everywhere and lower in US than in Europe
- The expansion of US university patenting has resulted in a rapid decline of the patent quality and value

Persistent stylised facts II

- New appropriation regimes for public research tend to corrupt the ethos of researchers and to twist their research agenda
- Only very rarely has a critique of the Open Science System and the public funding of basic research come from corporate users
- Anticommons tradegy: excessive fragmentation of IPRs slow downs R&D because all owners can block each other

Any Paradox in the data? I

- The *central point* is the claim that EU scientific performance is *excellent* compared with that of its principal competitors, while Europe's major weakness lies in its difficulties in transforming the results of research into innovations and competitive advantage
- Suggested by European Commission with two pieces of evidence:
  - → higher number of EU publications per euro spent on non-BERD;
  - → lower number of patents per euro spent on BERD than US or Japan

Any Paradox in the data? II

Table 1
Publications and citations weighted by population and university researchers

	Publications / Population	=	Publications / Researchers	x	Researchers / Population
UK	5.84		6.99		0.84
Germany	3.88		4.77		0.81
France	3.96		4.09		0.97
Italy	2.58		5.83		0.44
US	**4.64**		**6.80**		**0.68**
EU15	**3.60**		**4.30**		**0.84**
	Citations / Population	=	**Citations / Researchers**	x	**Researchers / Population**
UK	42.60		51.00		0.84
Germany	26.82		32.98		0.81
France	25.81		26.68		0.97
Italy	16.89		38.25		0.44
US	**39.75**		**58.33**		**0.68**
EU15	**23.03**		**27.52**		**0.84**
	Top1%publications / Population	=	**Top1%publications / Researchers**	x	**Researchers / Population**
UK	0.08		0.10		0.84
Germany	0.05		0.06		0.81
France	0.04		0.05		0.97
Italy	0.03		0.06		0.44
US	**0.09**		**0.13**		**0.68**
EU15	**0.04**		**0.04**		**0.84**

US-EU differences in education

- Today universities seem to occupy a more significant position as basic research performers within the US than in other industrialised countries
- US universities have consistently absorbed larger shares of the relevant cohorts of population than European ones
- EU HERD is allocated more to engineering, social sciencies and humanities than US. By contrast, US effort is concentrated more on medical and natural sciences
- US firms benefit from public research through conferences, publications and PHD mobility, not a lot from patents
- University-industry links in US are as much important as in EU

R&D inputs and output in EU I

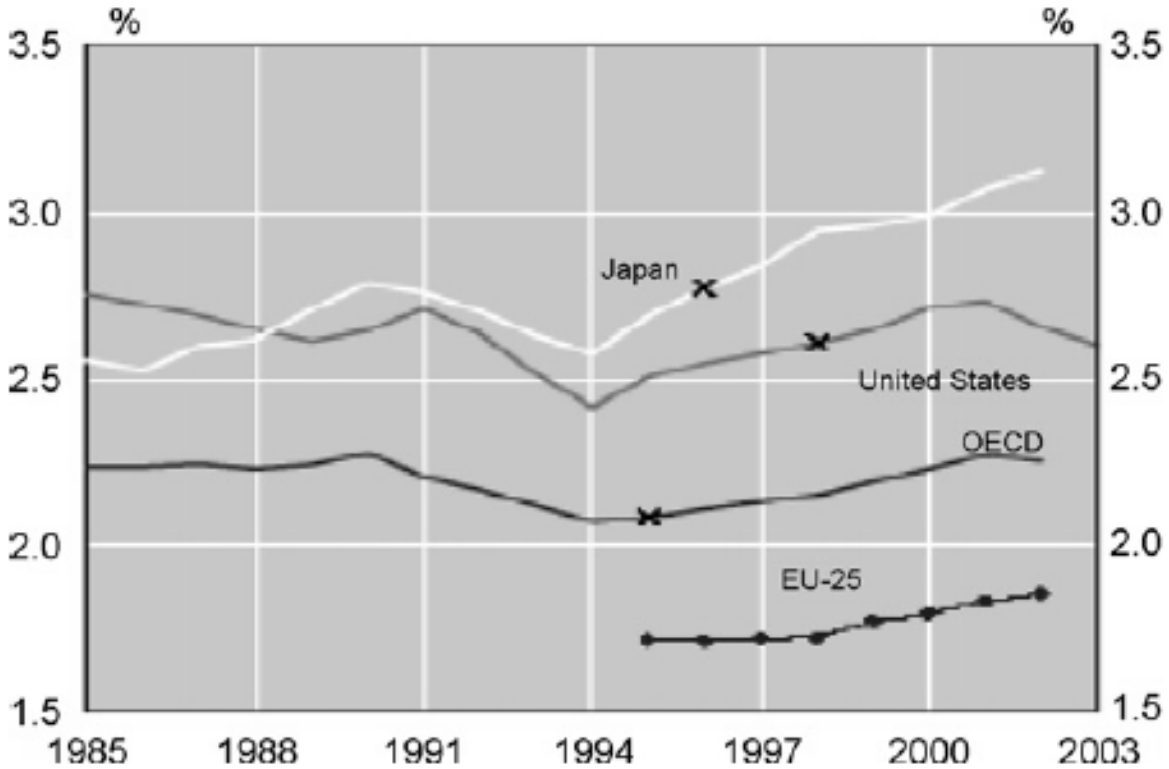


Fig. 2. Gross domestic expenditure on R&D as a percentage of GDP.
Source. OECD (2004a).

R&D inputs and output in EU II

Table 3
Government-financed GERD as a percentage of GDP

	1998	1999	2000	2001
Finland	0.87	0.94	0.89	0.87
France	0.81	0.80	0.84	0.82
Germany	0.81	0.78	0.78	0.79
Italy	0.51	–	–	–
Spain	0.35	0.36	0.36	0.38
Sweden	–	0.89	–	0.90
United Kingdom	0.55	0.55	0.53	0.53
EU-15	0.65	0.65	0.65	0.66
EU-25	0.63	0.63	0.63	0.63
US	0.79	0.76	0.71	0.76

Note. Italian percentage refers to 1996. *Source*. OECD (2004a).

R&D inputs and output in EU III

Table 4
Breakdown of government-funded R&D (2001): BERD and non-BERD

	Government financed BERD	On GDP (%)	Government financed non-BERD	On GDP (%)
EU-15	9,369	0.10	53,352	0.56
EU-25	9,868	0.09	55,073	0.52
US	18,849	0.19	57,533	0.57

Note. Our calculations are based on OECD (2004a). Gross expenditures are expressed in 2000 dollars (millions)—i.e. based on constant prices and purchasing power parities (PPP).

R&D inputs and output in EU IV

Table 5
Breakdown of industry-financed GERD as a percentage of GDP

	1998	1999	2000	2001
Finland	1.84	2.16	2.39	2.41
France	1.16	1.18	1.14	1.21
Germany	1.44	1.59	1.65	1.65
Italy	0.43	–	–	–
Spain	0.44	0.43	0.47	0.45
Sweden	–	2.47	–	3.07
United Kingdom	0.86	0.91	0.91	0.88
EU-15	0.98	1.04	1.06	1.08
EU-25	0.93	0.98	1.00	1.02
US	1.70	1.77	1.88	1.84

Note. Italian percentage refers to 1996. *Source*. European Commission (2004).

R&D inputs and output in EU V

Table 8
Breakdown of shares of patents filed with EPO for different fields

	Electricity	Instruments	Chemistry	Processes	Mechanics	All fields
EU-15	36.3	36.5	37.5	50	54.1	42.6
US	35.2	39.7	39.9	27.1	22.1	33.1

	Telecom	IT	Semiconductor	Pharmaceutics	Biotech	Materials
EU-15	37.9	26.9	29.2	35.7	28.3	55.1
US	35.7	49.3	36.2	43.5	51.3	19

Source. European Commission (2003).

To sum-up:

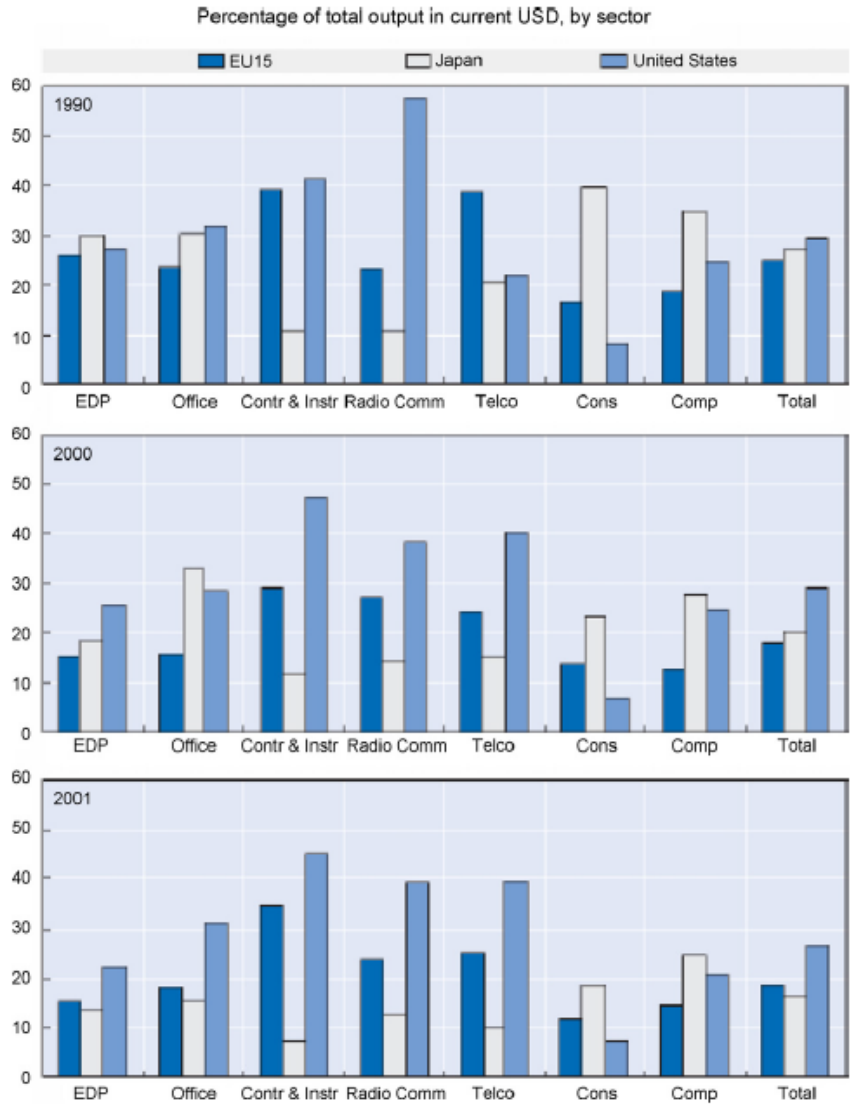
- Evidence suggests a European lag in terms of both lower search investments and lower innovative output
- Weakness in technological fields considered as the engine of the knowledge economy
- EU is strong in mechanical technologies and new materials

Structural weaknesses of European firms I

Irrespectively of industry-university links

- Commitment of European firms to research and international patenting
- Weak participation in core international oligopolies
- Potential corporate recipients in Europe are generally smaller, weaker and slower in seizing novel technological opportunities than US counterparts

Structural weaknesses of European firms II



So, what can be done?

- Increase support for high quality basic science through agile institutions
- Fully acknowledge the differences within the higher education system between research-cum-graduate teaching universities and other forms of tertiary education
- Push back the boundaries between public or open research and appropriable research
- Develop large-scale, technologically daring missions justifiable in terms of their intrinsic social and political value and able to match in terms of size and ambition the US programs
- Re-discover the use of industrial policies as a device to foster a stronger, more innovative, European industry