WORLD TRADE ORGANIZATION

World Trade Report 2020:

Government policies to promote innovation in the digital age

Starting point

- Resurgence of government policies/intervention in economy. Different phases overtime, variance across countries.
- For over a decade, countries adopted new kinds of policies, labeled “New industrial policies”, “Industry 4.0”, “digital development plans”, etc.
- Such government policies are reflecting a duality inherent to all policy phases, aiming to address difficult modernization of traditional industries and supporting the new economy
- However, clearly this time, there is a focus on technological upgrading, digitalization of production and innovation

Questions

- What has changed with the digital economy?
- What are the policy implications of such changes at the national level?
- What is the role of trade and the WTO?

Key findings

- What's changing with the digital economy?
  - Special features of digital economy lead to re-thinking of policy-making.
- What are the policy implications of such changes at the national level?
  - Today's digital-oriented policy toolkit includes new tools and adapt old ones, reflecting the unique characteristics of the digital economy. Hence policies focus on:

    (1) encouraging innovation and knowledge;

    (2) developing data policies and regulation;

    (3) supporting the development of enabling infrastructure and access to it; addressing winner-takes-all dynamics and employment concerns.
- What is the role of trade and the WTO?
  - Open trade policies conducive to innovation;
  - WTO rulebook and commitments contributed to innovation: ITA, standards, TRIPS, e-commerce, etc. Many national policies already covered in WTO rules.
  - Looking ahead: what reforms are needed?

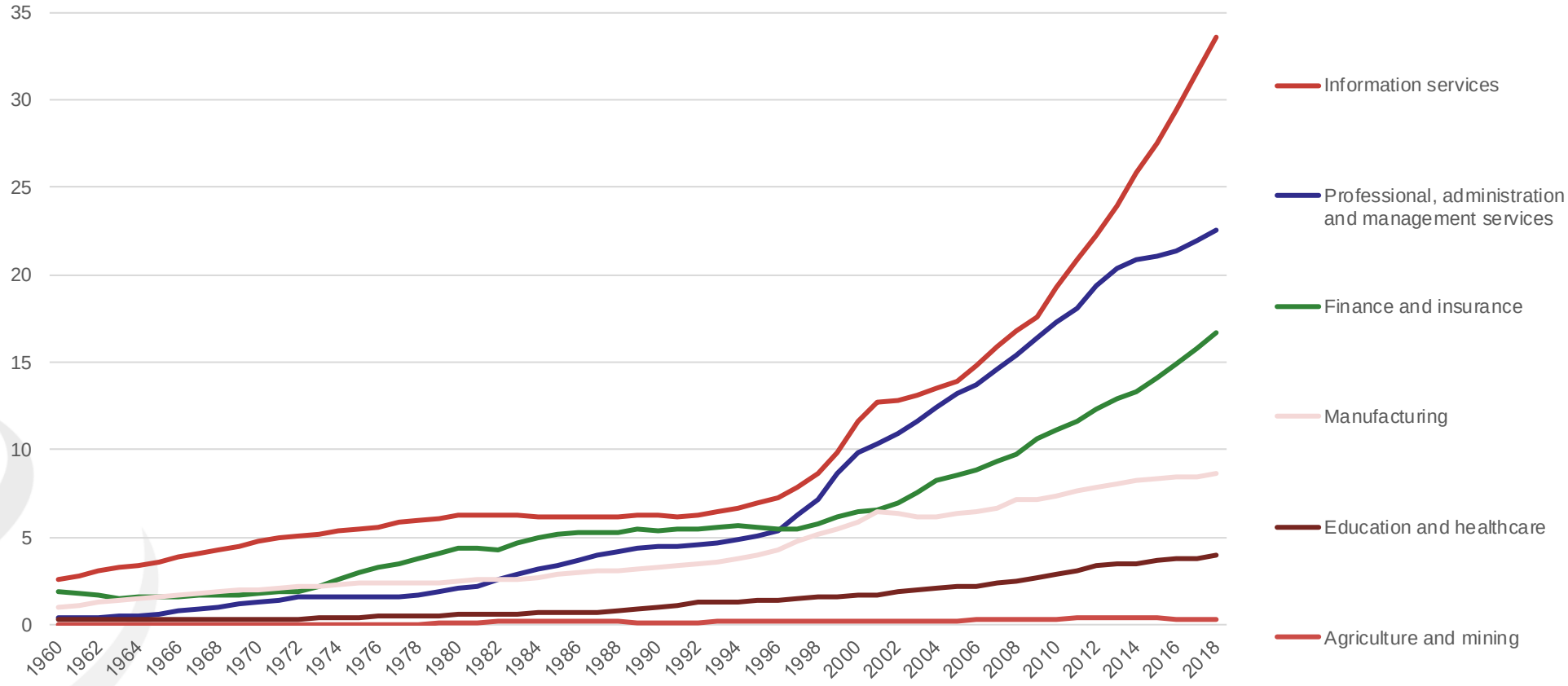
Questions

- What has changed with the digital economy?
- What are the policy implications of such changes at the national level?
- What is the role of trade and the WTO?

Special features of the digital economy

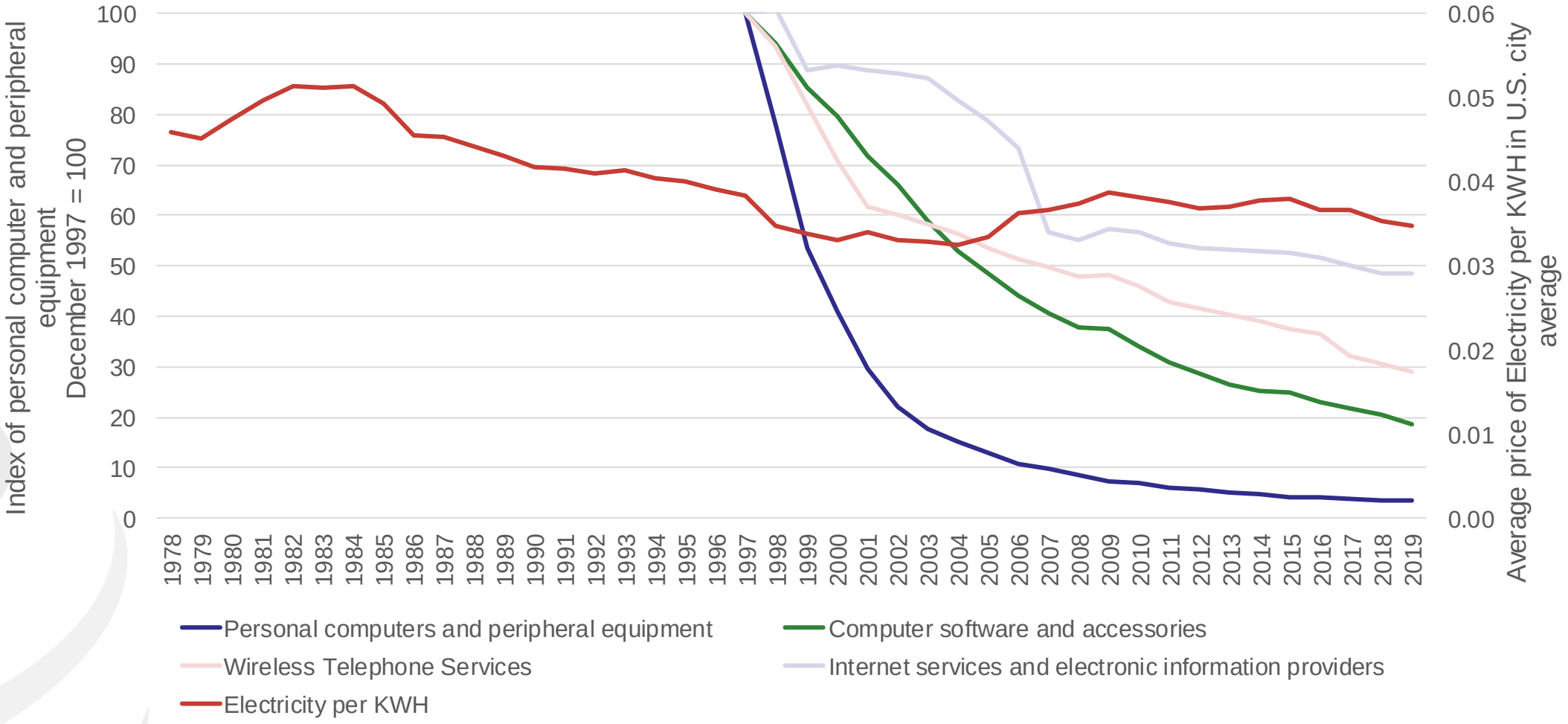
- Data as key inputs in the digital economy
- Digital technologies are general purpose technologies
- Goods and services are increasingly integrated
- Firms are more scalable in the digital economy
- Dramatic changes take place rapidly

Digital technologies spread rapidly to all sectors



Source: Authors' calculation based on data from the US Bureau of Economic Analysis.

The relative price of computers has declined drastically in the past decades



Source: Authors' calculation based on data from the US Bureau of Economic Analysis.

Innovation in AI cover a wide range of fields

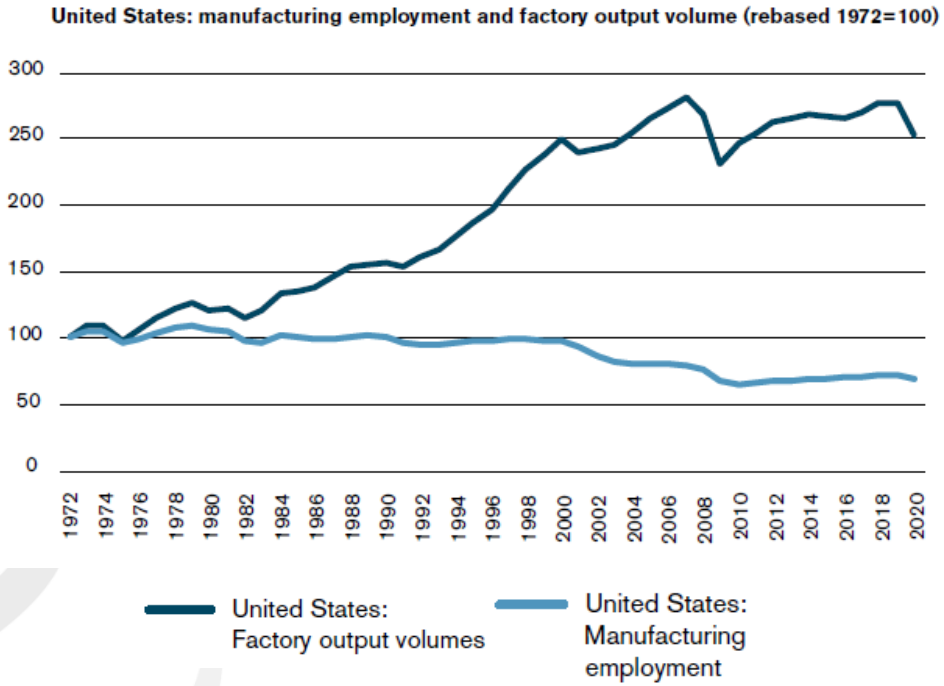
Top patent applicants by AI application field

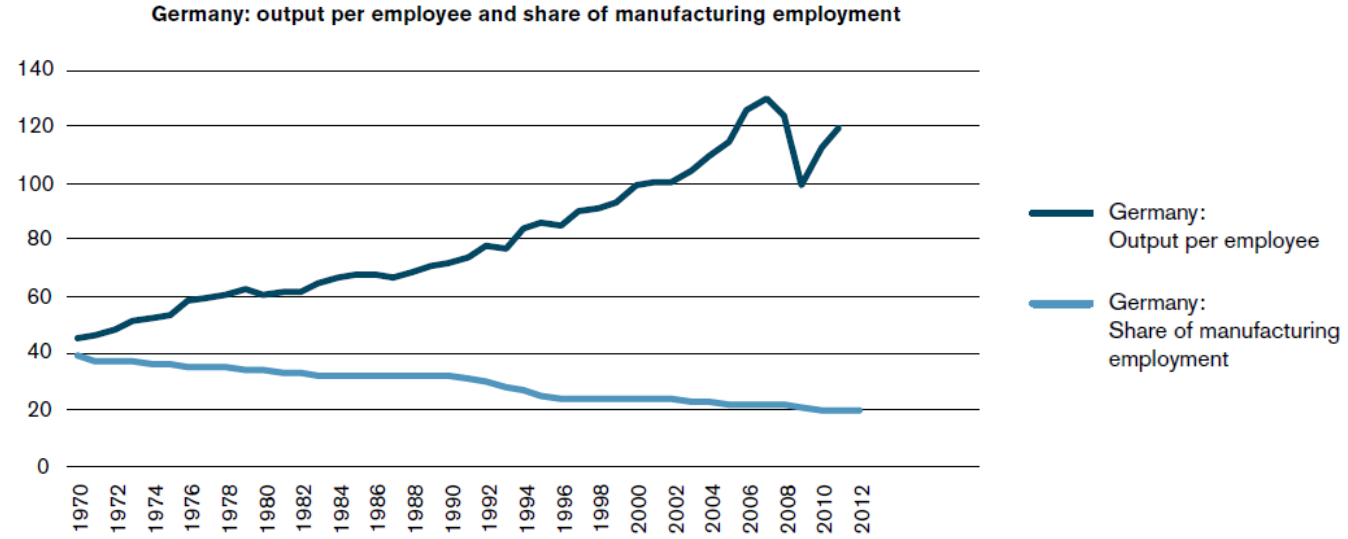
	Agriculture	Arts and humanities	Banking and finance	Business	Cartography	Computing in government	Document management and publishing	Education	Energy management	Entertainment	Industry and manufacturing	Law, social and behavioural sciences	Life and medical sciences	Military	Networks	Personal devices, computing and human-computer	Physical sciences and engineering	Security	Telecommunications	Transportation
IBM	17	150	93	935	184	81	1223	215	43	82	546	22	553	29	308	1050	112	486	759	424
Microsoft	17	209	42	780	218	96	944	151	22	236	192	9	319	25	332	1438	155	377	754	278
Samsung	29	176	17	183	42	44	265	73	140	62	131	5	595	64	135	922	165	446	755	538
Alphabet	4	163	29	463	361	38	521	67	18	55	61	6	119	13	241	709	53	206	593	333
Siemens	14	51	27	60	39	31	170	58	164	11	266	6	1127	16	58	268	323	293	458	415
Hitachi	18	98	65	168	23	37	270	90	141	13	199	2	447	18	61	306	256	297	338	735
Toyota	14	40	0	26	31	19	14	80	173	15	36	3	188	10	30	169	267	92	198	1987
Sony	13	267	10	194	67	32	196	106	34	314	46	5	372	14	88	495	85	299	538	209
SGCC	4	6	32	194	114	55	43	14	646	1	518	26	158	5	148	160	36	322	374	184
Panasonic	9	145	11	115	21	31	251	80	97	45	96	4	322	14	53	323	101	261	494	487
Toshiba	7	158	33	232	12	50	439	37	142	12	132	3	390	11	73	336	108	161	274	286
Bosch	39	9	8	14	21	3	17	25	155	10	58	1	129	4	13	137	230	184	185	1469
NEC	11	97	16	197	21	47	351	63	51	17	105	4	368	9	58	203	69	317	438	190
Fujitsu	12	73	47	173	8	34	326	66	25	22	110	3	401	8	54	200	55	351	253	299
LG Corporation	12	84	25	94	9	10	71	15	93	13	49	4	113	20	43	409	57	212	524	451
Canon	2	89	1	56	11	18	496	31	15	11	50	1	380	4	28	293	33	118	195	56
Mitsubishi	16	42	13	50	17	14	119	49	94	17	88	1	171	30	45	130	148	121	179	501
Ricoh	4	62	13	95	10	24	367	24	6	7	81	1	55	5	44	176	22	72	134	163
NTT	3	55	8	61	14	22	177	36	21	11	27	5	129	8	57	72	23	107	273	42
Sharp	5	74	3	21	7	16	203	35	7	8	28	0	92	7	14	153	33	54	142	88

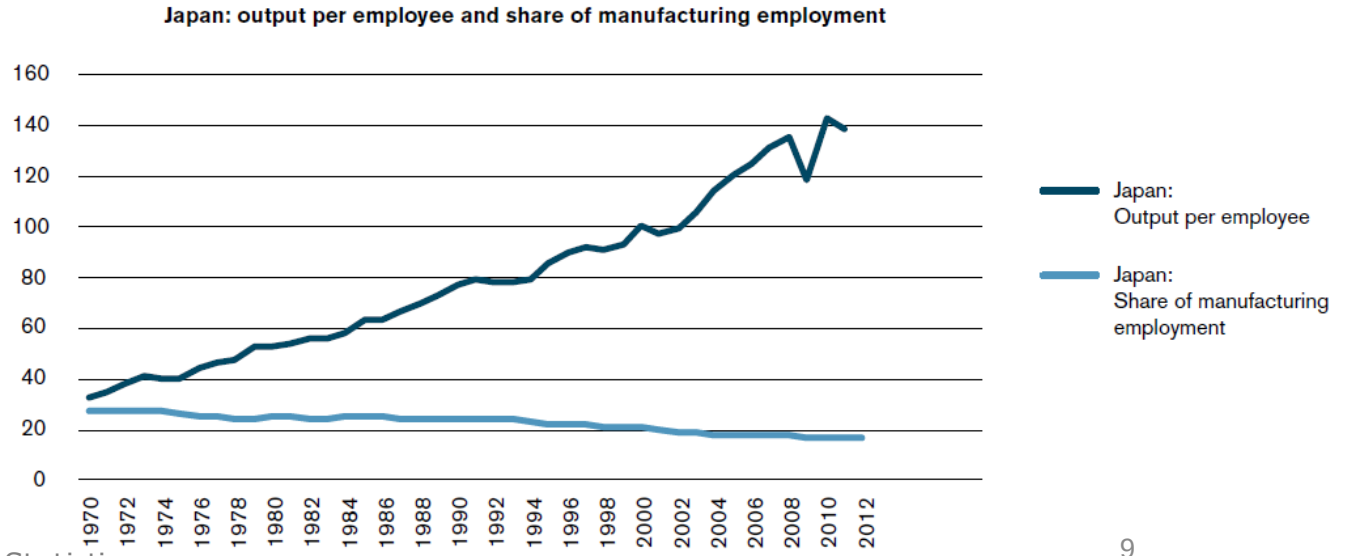
Source: World Intellectual Property Organization (WIPO)

Manufacturing employment declines while factory output continues to grow

Rebased 1972=100







Source: Author's calculation based on data from US Bureau of Labour Statistics

Questions

- What has changed with the digital economy?
- What are the policy implications of such changes at the national level?
- What is the role of trade and the WTO?

What does this mean for policies?

- Data key input: data availability (policies) matter; less capital intensive model (less upfront capital needed to build a new sector), more knowledge/IP/education intensive
- Digital: how to generate innovation (*new in country* or *new in the world*)
  - Large focus on R&D – more horizontal support
  - Use of tech hubs and attraction of talent; start-up and entrepreneurship
  - Software industry can develop cheaply on open source tech
  - Benefitting from "importing knowledge", remaining importance of FDI, immigration and integration in shifting supply chains (integration of digital processes in manufacturing)
- Digital economy requires a network/access to network (goods, standards, telecom infrastructure). Allows potentially all countries to develop a local app industry
- Flip side of digitalization of production (quick changes): need to retrain workers
- Scalability: companies can quickly become global; winner-takes-all effects (negative spill-overs)

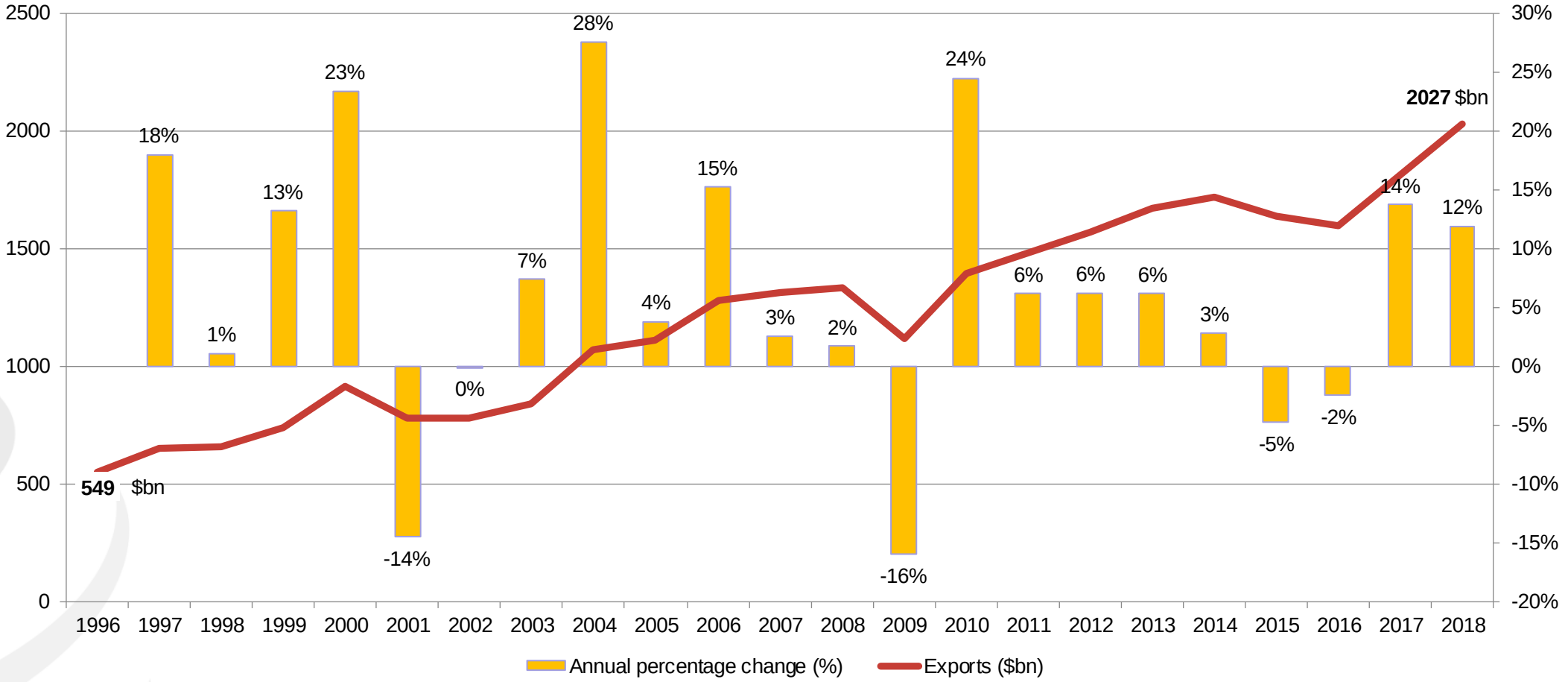
What do we find?

- Government support in innovation and the digital economy – mix of “known tools” and “new tools”
  - R&D support to promote innovation
  - Tariff liberalization supports digitalization and ICT sector expansion
  - New policy instruments to foster digital innovation (tech clusters, data policies, regulatory sandboxes)
- Investment policies are a central piece of government policies (investment incentives, investment facilitation)
- Industrial policy tools are still widely used to support traditional economic sectors (metals, chemicals…)

Government R&D funding key to promote innovation

Source: Author's calculation based on UNESCO data

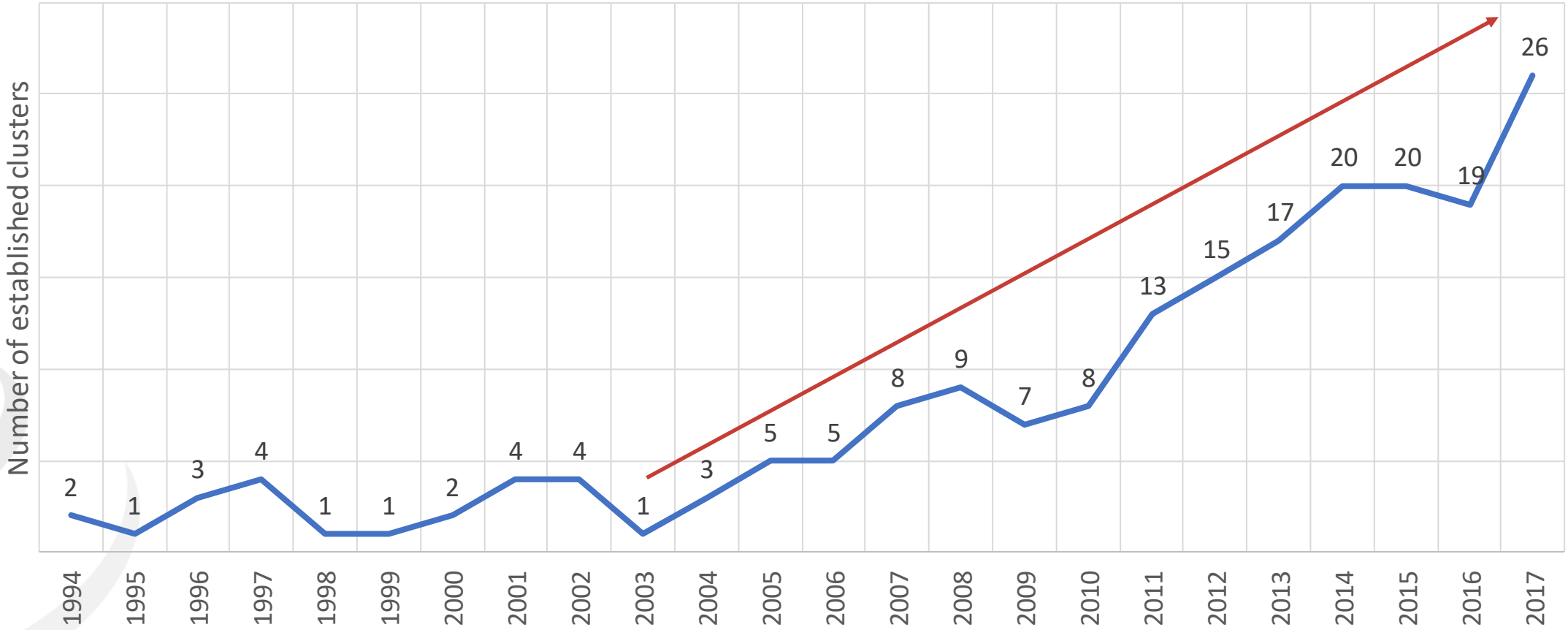
World exports of ITA products almost quadrupled



Source: WTO Secretariat based on UN Comtrade (reported data, complemented by mirror estimates).

Increasingly, tech clusters are used as an innovation policy

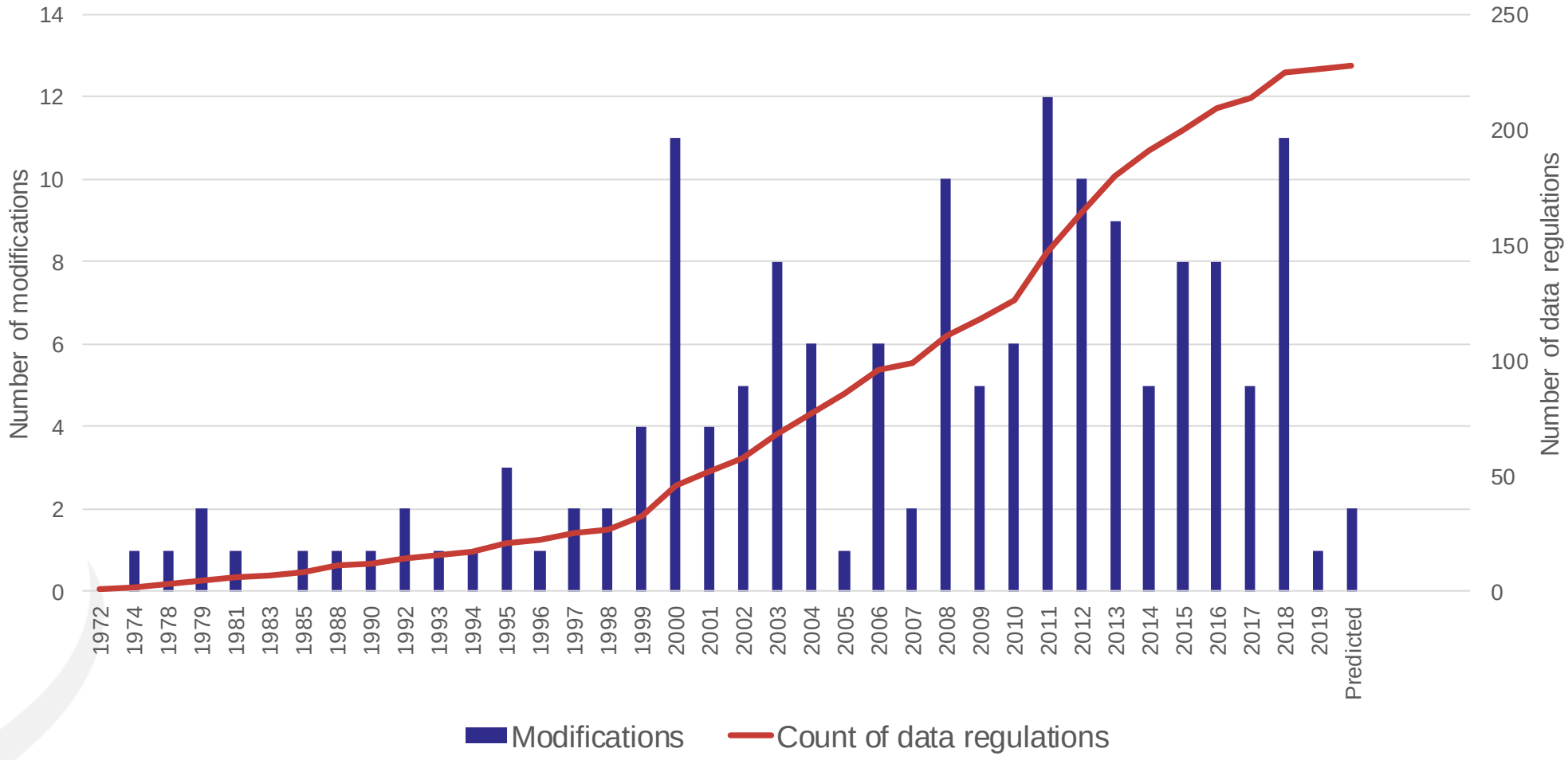
Number of clusters established in 27 economies' innovation policies



Source: European Commission and OECD (2019)

Data regulations are widely used

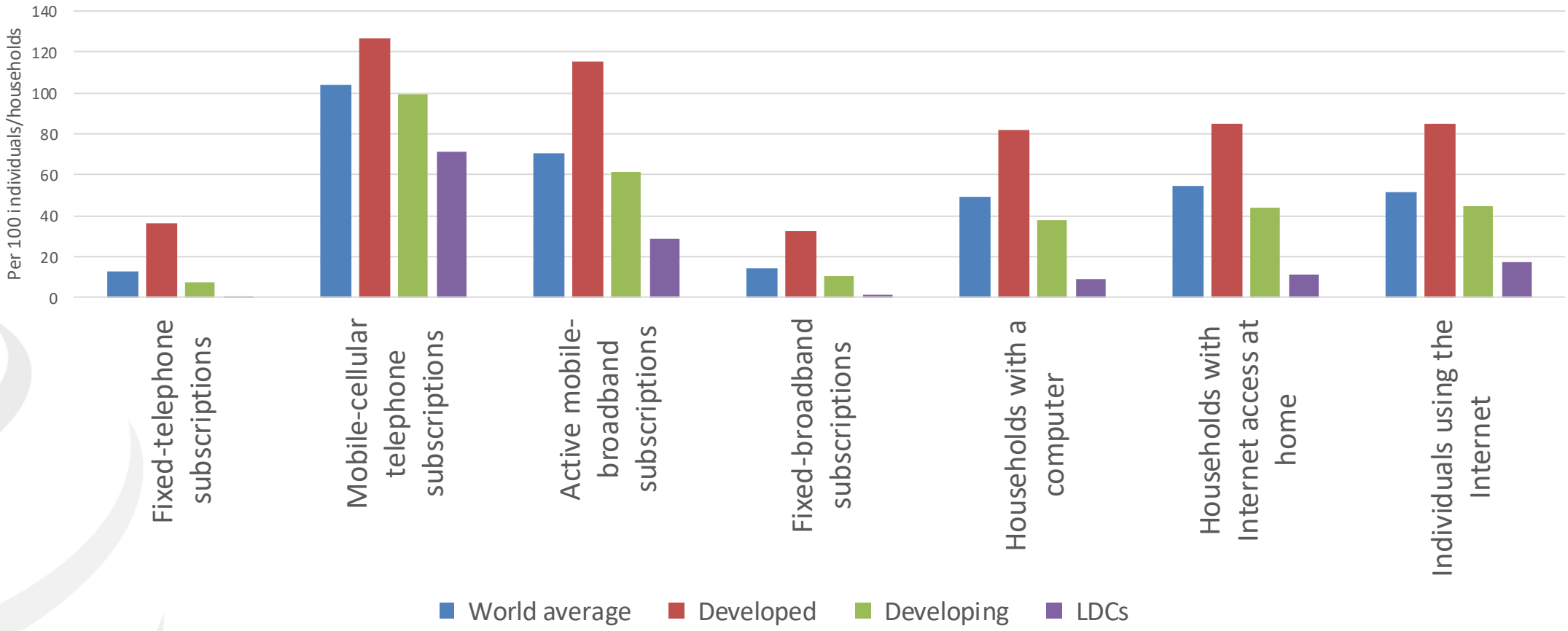
Data laws and regulations affecting cross-border data flows, 1972-2019



Source: Casalini and López-González (2019)

LDCs are behind in access to digital infrastructure

Indicators of ICT access per 100 inhabitants, 2018



Source: Author's calculation based on data from International Telecommunications Union (ITU).

Questions

- What has changed with the digital economy?
- What are the policy implications of such changes at the national level?
- What is the role of trade and the WTO?

Rationales for government policy

- Why government innovation policy? Market failures in innovation activity, especially in the digital sector
  - Public good aspect of technology and data
  - Economy-wide benefits of general purpose technologies
  - Financial frictions
  - Coordination failures
  - Network externalities, technology lock-in
  - Winner-takes-all dynamics

Link between rationales for innovation policy and types of innovation policy

WORLD TRADE ORGANIZATION

The public good nature of knowledge, financial frictions, coordination failures and positive externalities lead to under-provision of innovation relative to socially optimal levels.	Innovation policies that enlarge market size, increase the productivity of R&D, and ensure the appropriability of research investments reduce the gap between the social and private returns to innovation, increasing innovation investment.
Network externalities can provide incentives for firms that have managed to capture large shares of the market (the "winners") to engage in anti-competitive behaviour, and to lock-in their technology.	Policies that ensure that markets are contestable, and policies that regulate the abuse of dominant position, address these issues.

Innovation policy tools

- **Open trade policies** contribute to innovation through improved access to foreign markets and increased competition
- Governments have a role to play in **funding innovation**
- The importance of **intellectual property rights (IPR) regulation** is bound to increase in the digital age
- Education and open immigration help enhance **human capital**
- **Policies to increase competition** benefit innovation
- Other complementary policies include **telecommunication infrastructure, technology clusters**, etc

Cross-border effects of innovation policy

- Domestic innovation policies can have international effects
  - Knowledge spillovers and technology diffusion
  - Strategic government policy
  - Inter-industry linkages
  - Competition for scarce resources
  - Supply and demand effects
- International cooperation key to limiting negative spillovers and maximising positive spillovers

International cooperation: where does the WTO fit?

- Cooperation in the multilateral trading system contributed to the expansion of digital sectors
  - Tariff elimination and reduction in some sectoral agreements
  - Technical standards
  - Government procurement
  - Trade in services
  - Trade-related aspects of intellectual property
  - Subsidies
  - TRIMS
  - Aid for Trade
- Cooperation at the bilateral, plurilateral and regional level
- Other forms of international cooperation (other international organizations)

Do we need more cooperation on innovation policies in the digital age?

- The rising importance of data leads to increasing demands for new international rules on data transfer, data localization, consumer protection and national security.
- More liberalization of digital trade would contribute to digital innovation:
  - Open up and stimulate competition in digital service sectors (mode 4, telecom and internet services)
  - Facilitate investment in broadband infrastructure
- Do we need more flexibility in R&D subsidies?
- International dialogue and cooperation on competition policies

WORLD TRADE ORGANIZATION

Thank you!