# Innovation Policies at the Digital Age

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BETTER POLICIES FOR BETTER LIVES

# What is digital innovation? AI?

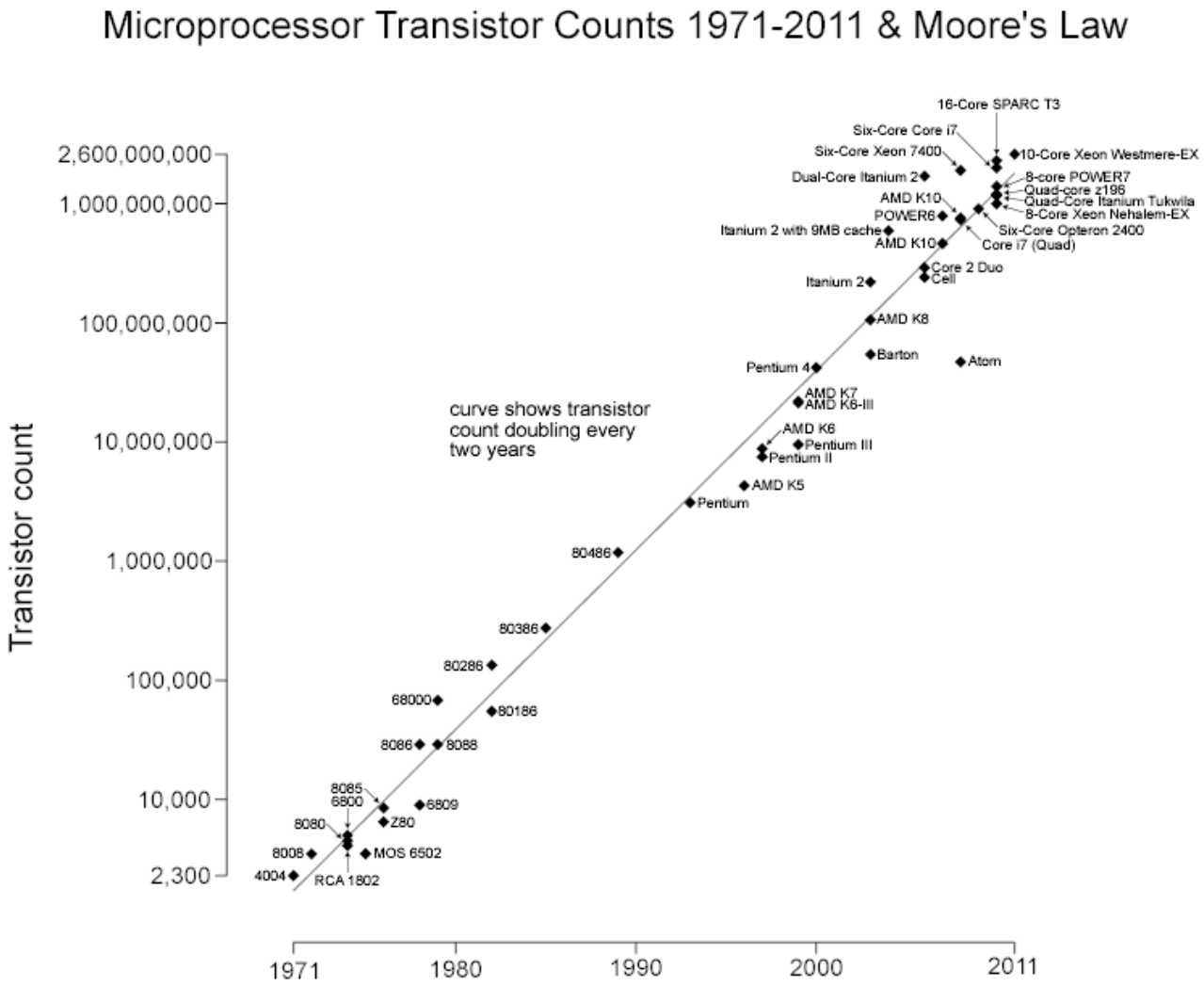
***Digital innovations*** *are new products and processes enabled by digital tools or embodied in data and software. Most if not all innovations now are at least partially digital.*

***Questions in this presentation****:*

1. *What is specific about digital innovation?*
2. *What does it mean for innovation policies?*

# Moore's Law

(source: wikimedia)



# Digitalisation is everywhere

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New technologies which underpin digital innovation:

- Artificial Intelligence
- Smart phones
- The Cloud
- Big Data analytics
- Internet of Things
- 3D Printing
- Block chain
- Virtual/augmented reality
- Etc.

*Broader and more efficient use of data processing technologies is the new driver of growth.*

# The general framework

## Changes in the micro foundations of the economy due to digital

- Zero marginal cost of handling data
- Lower fixed cost
- Fluidity

## Changes in innovation

- Innovation processes and products
- Market structures and dynamics
- Distribution of performance and rewards

## New policies required

- Access to data
- Innovation support
- Competition
- Entrepreneurship
- Education
- Place-based

# Lower costs and barriers

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# Lower costs and barriers

- Digitalisation is about making information handled by machines => technical change operates, with **productivity gains**
- **R&D and innovation** are intensive in information, hence benefit massively from digitalisation
- **Zero marginal cost, zero friction**

  **= « fluidity »**

# Zero Marginal Cost - Fluidity

Bits are much easier (less costly) to handle (parse, move, replicate, combine, diffuse) than other carriers of information (writings, humans etc.).

⇒ Zero cost of re-production (production beyond the “original”)

⇒ Zero cost of communication (circulation of data, information, knowledge, and value)

⇒ Zero friction: no barriers, versatility, agility

⇒ Lower search cost on markets (identifying products & suppliers; reaching customers)

# Changes in innovation

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# Changes in innovation

In what respects is digital innovation different from "traditional" innovation?

- Data as the main factor of innovation
- Servitisation
- More and faster innovation
- Innovation is more collaborative

# Data – the new oil of the digital economy

**Data is the raw material** of the digital economy: the major source of innovation and value creation.

- Industrial data (generated by normal activity);
- Customers' data: orients innovation efforts;
- In the lab: Simulation, digital twins;
- Artificial Intelligence requires a lot of data.

⇒ **Access to data** is a unique competitive factor

- Companies want to acquire data: purchase of databases (e.g. patients data), takeover of data-rich companies (e.g. LinkedIn)
- Companies in traditional industries invest in data collection
- Companies aim to keep their own data proprietary
- A market is emerging… painstakingly

# Changes in innovation

- Data as the main factor of innovation
- Servitisation
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# Servitisation

- Data and software are substituting to physical products, bringing new services.
- Customisation of products  as a service (allowed by software and data)
- Manufacturing firms are attracted by the “3 S”: sensors, software, service.
- Conversely service firms enter manufacturing (autonomous car, home appliances)
- A special category of service innovation: New business models, notably start-ups. E.g. renting replaces selling (the “sharing economy”).

# Changes in innovation

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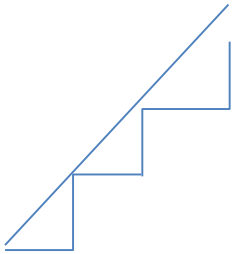
# Acceleration of innovation

- Decreasing cost of incremental innovations ;
- Digital products can reach *instantaneously* their entire market.
- product upgrade does not imply full devalorisation of past version (add-ons)

  => <u>increased number and frequency of innovations</u>
- Example: software upgrades (daily) vs novel cars (yearly)
- NOTA: This does not entail an acceleration in productivity: innovation can be more frequent but smaller.



# Changes in innovation

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# Market Structures and Dynamics

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# Business dynamics & market structures

Digitalisation has increased fluidity of markets, by reducing all sorts of frictions and barriers: within markets (segmentation), and around markets (entry barriers). Platforms are a major enabler of this fluidity.

Fluidity has two opposite effects on market structures:

- more entry on the one hand,
- winner take all on the other hand.

Actual market structures will result from the interaction of these two effects… and of competition policies.

# Business dynamics & market structures: more entry

**Digitalisation lowers entry barriers to markets:**

- Software production is less capital intensive than manufacturing
- Scale without mass allows rapid and limitless growth: the small can seize the market overnight (acceleration in creative destruction).
- The cloud reduces fixed costs, hence set up cost for new firms;
- Small firms have direct access to global markets thanks to reduced communication costs;
- Long tail (specialised niches) can be served thanks to reduced search costs;

=> More entry and higher growth of new companies

=> **More intense competition on markets**

# Business dynamics & market structures: winner take all

Digitalisation facilitates size and monopoly

Supply side forces:

- Scale economies: zero marginal cost, scale without mass
- Lower barriers to expansion (transportation costs etc.) => no more “local dominance”, only “global dominance”.

Demand side forces:

- Network effects
- The “attention economy” generates a Superstar effect (Rosen)

⇒ Consolidation of the position of a few large incumbents

⇒ **Winner take all market structures**

# Distribution of Performance and Rewards

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# The Distribution of Performance and Rewards

How are performance and rewards related to innovation distributed at the digital age – across businesses, across skill categories, across places?

Drivers of the distribution:

- **Data are fluid**, they will go where they can be best used.
- **Skills and competences are NOT fluid**, they won't circulate between individuals or places.
- **Data is complementary** to certain factors (collective and individual competences & skills): data will increase the most the productivity of certain individuals/skills, companies, place.
- Hence the **abundance of data** will benefit more certain entities than others.

=> *the distribution of performance & rewards is becoming more skewed*

# The Distribution of Performance and Rewards

These forces pushing towards more inequality operate at all levels: between individuals, companies, places

- Companies (rising differential in market performance)
- Individual Skills (rising wage differential)
- Places (rising differential between cities, between urban and rural areas – the world is spiky)

# New Policy Requirements

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# Updating Innovation Policies

The new context and features of innovation call for an update of the targets, mechanisms and instruments of innovation policies.

Many of the issues raised are really new, and learning is needed before strong policy measures are taken

=> *Need for policy experiments and evaluation*

# New Targets for Innovation Policies

| Policy issue | Policy instruments |
|---|---|
| Data is the main source of innovation | Data access policies<br>Markets for knowledge |
| Servitisation | Support to innovation in services |
| Acceleration in innovation | Improving the reactivity and versatility of instruments |
| Entrepreneurship | Entrepreneurship policies<br>Data access<br>Competition |
| Winner take all | Data access<br>Competition |
| Ecosystems | Support to cooperation<br>Public research policies, knowledge transfer |
| Skewed distribution of performance and rewards across skill categories | Education and training<br>Fiscal policies |
| Places | Smart specialisation |
| Conversion of SMEs to digital | Support to digitalisation |

# Data Access – The Policy Agenda

Data have many properties of a public good => need to develop an open data policy agenda:

⇒ Policy objective: Ensure the broadest access to data and knowledge (incentivising sharing, favouring reuse, favouring competition)…

… while respecting constraints in relation with:

- The diversity of data (issues differ across data categories)
- Ethics (privacy etc.) and
- Economics (incentives to produce and disseminate the data).

(and recognising the existence of diverging national interests possibly leading to the protection of certain data).

# Data and Knowledge Markets

Markets normally improve access to resources.

The development of knowledge markets has been viewed positively by economists, but overall they remain very thin…

Why? issues relate notably to specificity of data, informational and appropriability difficulties.

<u>Data and knowledge markets might take off:</u>

- Generalised use of data make markets deeper.
- The Internet (platforms) and AI might help tackle the informational/access issue.
- Blockchain (an Internet-based public ledger) might help strengthen appropriation.

# Servitisation

- Innovation policies have been conceived for manufacturing types of innovations
- Service type innovation (e.g. new business models) relies little on R&D => passes through the net of policy support (e.g. R&D tax incentives)
- But service innovation requires a deep understanding of digital technologies, which is not yet widespread, especially among SMEs in traditional industries => diffusion, advice and training policies.

# Acceleration of Innovation

The research agenda in advanced domains is shifting very quickly and impossible to predict; if public programs are too rigid, then businesses will rather avoid participating (as it generates a risk of being locked in an outdated technology).

=> Government needs become more flexible, reactive, while keeping (prudential) rules of engagement.

Possible ways:

- Digitalisation of government's own operations – in order to monitor policy targets and take decisions more quickly.
- DARPA-type model (autonomy, agility)
- Accelerated procedures for providing funds (e.g. "French Tech").
- Non targeted support

# Competition Policies

Competition is changing, what should anti-trust authorities do?

- Need a new, specific doctrine for markets for digital products (noting that ALL products are increasing digital).
- Central question: data ownership & control (access), as data is an essential facility and a source of market power.
- Specific attention should be devoted to takeovers (acquisition of potential, emerging competitors by dominant players).
- Competition takes place at global level: need a common approach across jurisdictions (still progress to do)

# Challenges for the Patent System

The patent system has been designed for a physical world.

Examples of new challenges include:

- AI can create patentable inventions

⇒ Who should own them?

⇒ Could AI be the new “person skilled in the art”?

- 3D Printing makes manufacturing at home easier, hence favouring counterfeiting

=> Will the manufacturing industry experience the same fate as the music industry?

# Supporting SMEs in the Digital Transition

**Technology adoption is lower among SMEs:**
**Enterprises using cloud computing services by employment size class, 2014**

As a percentage of enterprises in each employment size class


*Source*: OECD Science, Technology and Industry Scoreboard 2015.

# Supporting SMEs in the Digital Transition

- Transitioning to digital requires resources (capital, skills) and is risky => SMEs do hesitate
- Companies which don't adapt to digitalisation will fail and disappear. In certain cases it might be appropriate to let market selection operate and let go companies who fail to adapt: but this can be costly, as cleansing means that valuable assets will simply vanish – the social cost of creative destruction

Policies:

- Provide various types of support to SMEs in their transition to digitalisation, e.g. technology demonstrators, expert advice or financial support (e.g. loan guarantees)

⇒ "Nouvelle France Industrielle" (France), « Smart Industry » (NL)

# Thank you

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