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Joint Research Centre

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The Entrepreneurial University. Where do we stand in Romania?

JRC training workshop

Strengthening University-Industry-Government cooperation

Dr. Marina Ranga

18 November 2020

European Commission

Outline

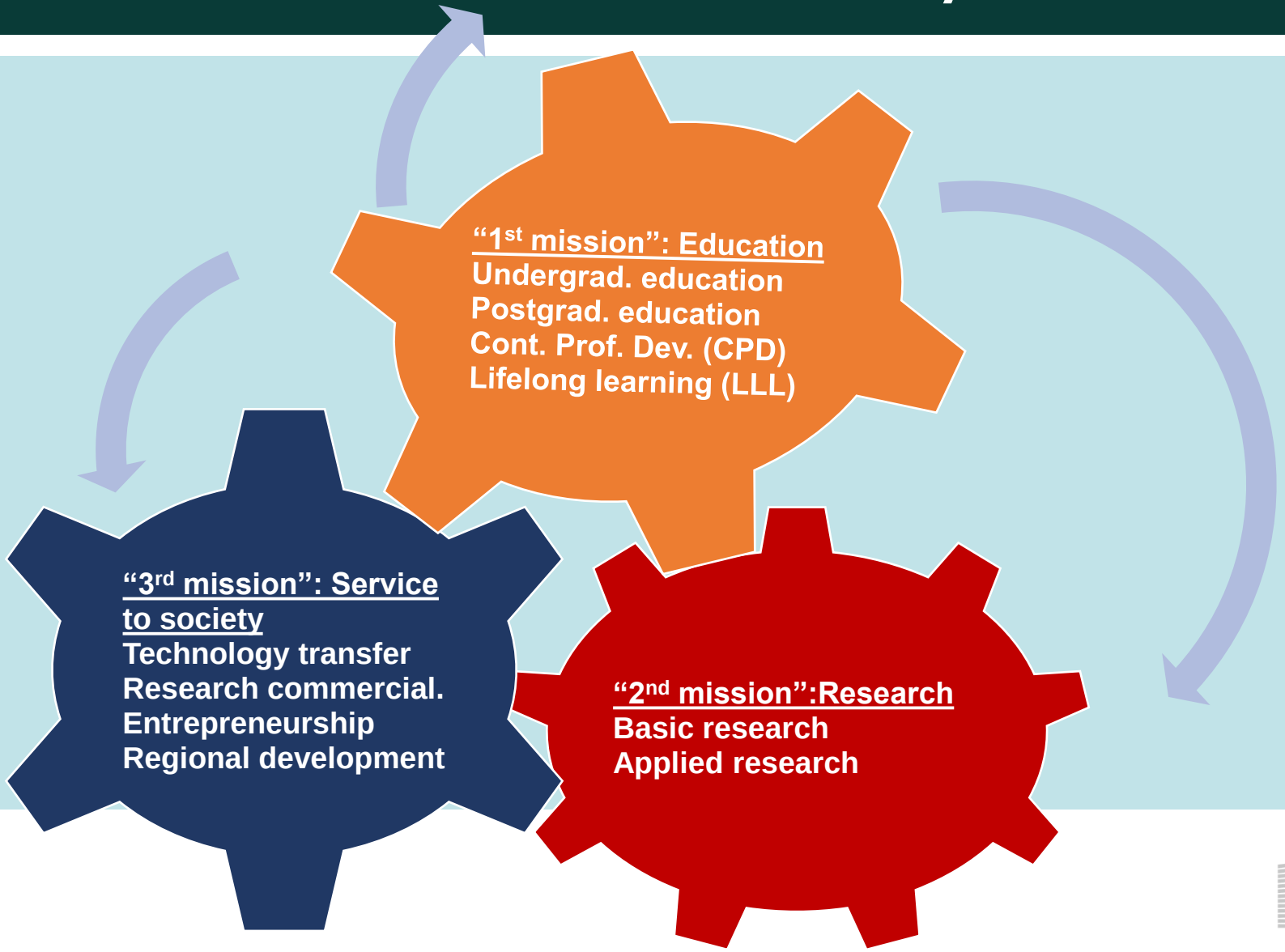
1. What is an Entrepreneurial University?
2. The three University missions – European vs. US universities
3. Key driver for the Entrepreneurial University: The Bayh-Dole Act (1980) – pros and cons
4. JRC studies on universities in NW and NE Romania
5. Steps towards an Entrepreneurial University

What is an Entrepreneurial University?

- Considers new sources of funds, like patents, research under contracts and partnership with a private enterprise (Etzkowitz, 1983)
- Creates new business ventures by university professors, technicians or students (Chrisman et al, 1995)
- An entrepreneurial university can mean three things: the university itself, as an organization becomes entrepreneurial; the members of the university are turning themselves somehow into entrepreneurs; and the interaction of the university with the environment (Ropke, 1998)
- Is characterized by close university-business partnerships, greater faculty responsibility for accessing external sources of funding, and a managerial ethos in institutional governance, leadership and planning (Subotzky, 1999)
- An entrepreneurial university is based both on commercialization (custom-made further education courses, consultancy services and extension activities) and commoditization (patents, licensing or student-owned start-ups (Jacob et al 2003)

The Entrepreneurial University

Continuous interaction between the three university missions



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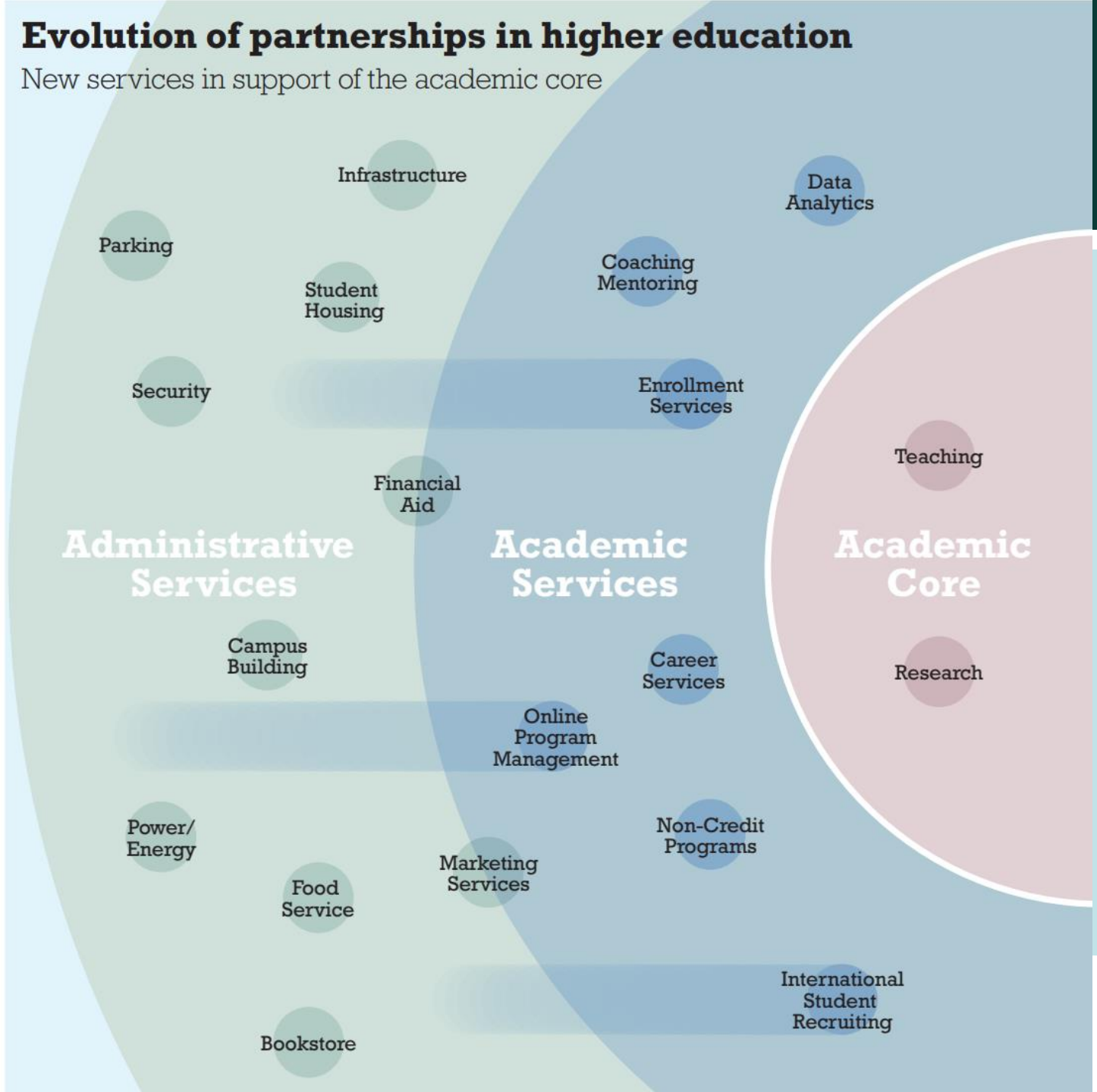
Typical "third mission" activities

Consulting and joint research projects	Contract research, joint research projects, research consortia
Research commercialisation (patents, licenses)	• University TTOs, professional TT managers, patent attorneys
Spin-off formation by faculty and students	• Exploit (sell or license) the patent for a technology owned by a university or institute (e.g. Moderna) • Potentially disruptive technology • Located in a business incubator, accelerator, technology or science park • Advantages: exclusive licensing, use of university resources for technology development, access to seed capital, proximity to university, IPR, access to industrial sectors in the area, etc. • Can change the structure of the regional or local economy (jobs, taxes)
Business support (S&T parks, business incubators, accelerators, industrial parks, technology parks, Science City, etc.)	• Support to founders from the idea stage to more mature ventures, with wide range of services (general business advice, finance, technology and legal aspects, etc.)
Strategic partnerships and venture capital	• VC industry in Europe much les developed than in the US • Traditional business culture is risk-averse • VC mostly focused on the expansion stage, little on early-stage investments
Professional education for economy needs	Continuous professional education, lifelong learning
PPPs for development projects	• Traditionally in real-estate developments in and out campus - DBFO model (Design, Build, Finance and Operate) (UK), but recent expansion into academic services



PPPs expanded from the administrative to the academic side of the university

Administrative vs. academic partnerships

	Traditional P3s	Academic P3s
Growth Areas	Student housing, infrastructure	Online services, international pathways, non-credit programs
University offices leading efforts	CFO, Auxiliary	Provost, Dean
Leading Reasons for Partnerships		
Budget constraints	●	●
Fastest path to market	●	●
Higher quality of service	●	●
Impacts		
Students	●	●
Faculty	●	●
Brand	●	●

Marks and Sparkman (2019), The New Era of Public-Private Partnership in Higher Education

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How did the "missions" evolve?

Evolution of European and US universities

European universities

1st phase
11-12th c.-1809
Education

2nd phase
1809-1970s
Research

3rd phase
1970s-present
'Third mission'

"First academic revolution" ***"Second academic revolution"***

US universities

1st and 2nd phase
1862 Morrill Act
Land grant universities
Education and research
Incipient 'third mission'

3nd phase
1970s
Expansion of the 'third mission'

European universities

1st phase – The medieval university

Meeting of doctors at the **University of Paris** (14th-century manuscript)

- **European universities rising out of the teaching tradition of the Roman Catholic Church, focused on Philosophy, Theology, Law and Medicine**
  - 1088 - University of Bologna “the mother of European universities”, focus on **law** (students hired and paid for the teachers)
  - 1150 - University of Paris, focus on **theology** (founded by Pope Innocent III, teachers paid by church)
  - 1167 Oxford; 1209 Cambridge (predominantly paid by the crown and the state)
  - 1218 Salamanca; 1220 Montpellier; 1222 Padua, 1224 Naples; Toulouse, 1229; 1347 Krakow; 1365 Vienna; 1385 Heildelberg, 1475 Leuven

  Student communities (*universitates*) protected by the Church, that was in charge of their rights and education.
- **7 liberal arts: *Trivium* (grammar, rhetoric, logic) and *Quadrivium* (arithmetic, geometry, astronomy, music)**
- **3 Aristotelian philosophies: physics, metaphysics and moral philosophy added later**
- **Human rights and international law added to curricula, under external influences**, e.g. Renaissance (mid-14th c.), Enlightenment (18th c.), Protestant Reformation (1517), discovery of the New World (1492)

European universities

2nd phase – The research university

Humboldt University of Berlin

The German research university (Humboldtian) – model of large-scale modern university

- **1809** - **Wilhelm von Humboldt founded University of Berlin on a new theory → "take account of fundamental laws of science in all their thinking":**
  - Teaching based only scientific knowledge
  - Professionalization of research, equipped labs **– the 1st university research labs**
  - Student-centred university education, academic freedom
  - Academic prestige based on competition and specialization in scientific disciplines
  - **Unification of the education function ("chair") and the research function ("lab")**
  - Strategy against the predominant interest of government for vocational education
- **1891:** Bayer AG opens its own internal research lab – **the 1st industry R&D lab**
- **1870-1910: revitalization of technical schools** (*Technische Hochschulen*)→ mass education of technicians and engineers for industry (foundation of industry R&D)
- **1960: higher vocational schools** *(Fachhochschulen)* → further U-I cooperation
- Universities and HEIs seen mainly as a source of research staff.

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European universities

2nd phase – The research university

Oxford University

The British research university

• **1963**: **vocational technical schools in England** (approx. 70 years after Germany) → German advantage in technical and general vocational education

• **British universities' higher status of humanities and abstract intellectual disciplines (e.g. mathematics) that give social prestige, lower status of technical education**

• **Teaching and research capabilities in science and engineering less developed than in German technical universities and US universities**

• **Move of chemical engineers to US and Germany** (chemical engineering not introduced as a scientific discipline in English universities, university degrees in chemistry not accepted for a position in industry, only certificates from the Royal Society of Chemistry)

• **Germany's dominance over Britain in synthetic dye production (around 1850)**
• **Synthetic dyes industry → synthetic organic industry, modern pharma industry**
• Decline in Britain, growth in Germany and the USA

European universities

2nd phase – The research university

Napoleon I on his Imperial Throne

The French University (Napoleon's Imperial University)

The French Revolution (1789-1799)

- Education was for men to become involved in the affairs of state, while women's main job was to raise the family (Rousseau, Mirabeau)
- Educational reform: extreme centralization of educational policy, central schools, teacher training, instruction in French for political and nationalistic ends.

Napoleon's Imperial University (1808)

- Stronger centralized control of the educational system
- Religious education for girls, middle-class boys educated to be civil and military leaders
- Educated elite to run the country (scientists, architects, engineers) and the military, patriotism and loyalty to the state
- Remove education from the Church control of and place it under state control
- Very elitist and stratified education

European Universities

European Higher Education Area (EHEA)

http://www.ehea.info/

- Unique international collaboration on HE reflecting the **political will of 48 countries**
- Common set of **structural reforms and shared tools** to make HE systems more compatible, strengthen QA, increase staff & students' mobility, facilitate employability
- **Bologna Declaration (1999)** signed by 29 European countries → **Bologna Process**
- **Ministerial Conferences** every 2-3 years to assess progress, decide on the new steps
  - ❑ 1999, Bologna: enhancing the competitiveness of EHEA, increasing academic autonomy
  - ❑ 2001, Prague: LLL, QA system, national qualification framework, social dimension of education
  - ❑ 2003, Berlin: connection EHEA-ERA, promotion of QA
  - ❑ 2005, Bergen: partnerships between students, HEIs, academic staff and employers, 3-cycle framework of qualifications (BA, MSc, PhD), further enhancing of research, especially in the 3rd cycle
  - ❑ 2007, London: social dimension of education
  - ❑ 2009, Leuven/Louvain-la-Neuve: student-centred learning
  - ❑ **2010, Budapest-Vienna: Anniversary Ministerial Conference to launch of EHEA** → New phase of Bologna Process: consolidation and operationalisation of existing tools, reducing gaps
  - ❑ 2020, Rome (18-20 November)

European Universities

European Research Area (ERA)

- Single, borderless market for research, innovation and technology across the EU.
- Aligns countries' research policies and programmes, stimulates free circulation of researchers for:
  - ❑ better cross-border cooperation
  - ❑ building of critical mass
  - ❑ continent-wide competition
- ERA was launched in 2000 and a process to revitalise it began in 2018
- Strategic approach to innovation: Europe 2020 Strategy, Innovation Union Flagship Initiative
- Fully integrated European-level structures and programmes:
  - EU RTD Framework Programmes, H2020 Horizon Europe
  - European agencies, Intergovernmental research organisations (CERN, Euratom, ESA)
  - European Research Council, Joint Technology Initiatives, EIT
- **The new ERA for Research and Innovation:**
  - Strengthen mobility of researchers and the flow of knowledge
  - Incentivise investment in research and innovation
  - Promote gender equality and diversity in science
  - Enhance cooperation among universities, business and other research and innovation actors
  - **'Technological sovereignty"**

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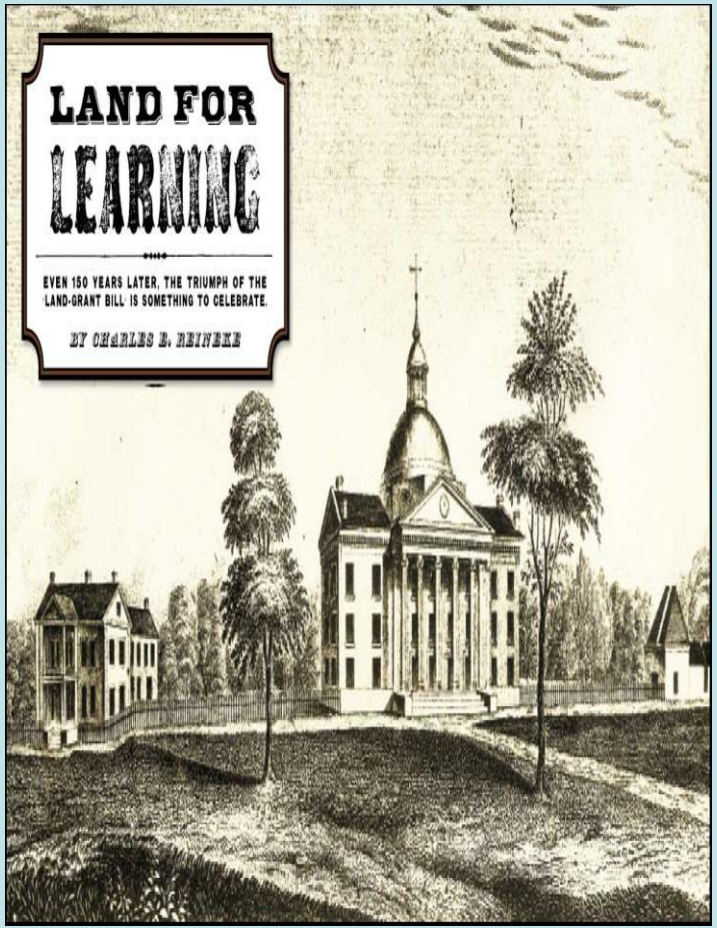
The American university
1st and 2nd phase



- **The American university developed to serve the practical needs of the local community (not from the Catholic Church)**
- **The Morrill Act (1862) granted land to universities as financial support →** universities sell the land and gain resources for university campuses
- **Land grant universities' applied research orientation from inception** (vocational education, research projects for local industry and agriculture)
- **Universities grew together with industries, no centralised university system controlled by the government, 'third mission' embedded in the university mission of service to society**
- **Before WWII**: very low public support to R&D (government-funded R&D in the 1930's at 12-20% of total R&D investments, industry-funded R&D 60-70%)
- **After WWII**: significant government support for R&D in **mission-oriented national research labs** (defence, energy, space, health, and agriculture), universities and corporate research centres

The American university

3rd phase: The Entrepreneurial University

Stanford University

<u>From the 1970s: economic and political changes (exogenous factors)</u>

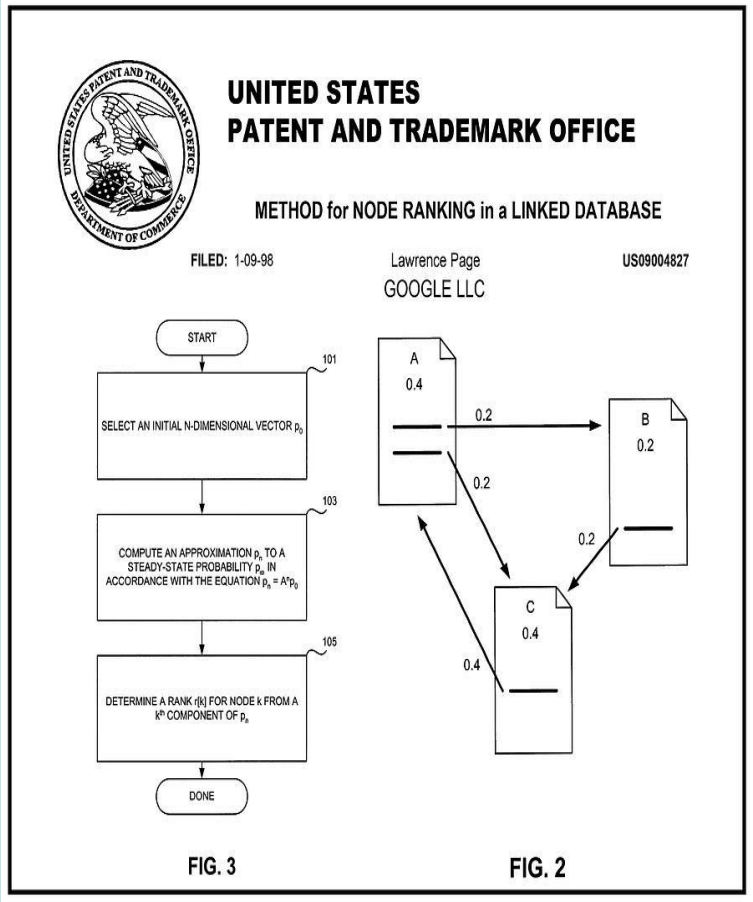
- **Economic slowdown in the US and Europe** (1973 oil crisis, US loss of manufacturing industries to competitors abroad, after losses only internally).

- **Policy shift from a non-interventionist to an interventionist role of US government in the 1990s:**
  - Open industrial policy of Clinton administration: reconversion of military capacities, including R&D, to civilian purposes
  - *NIST Advanced Technology Program* for early-stage research in industry
  - *Technology Innovation Program* for critical high-risk national problems
  - *Small Business Industrial Research (SBIR)* and *Small Business Technology Transfer (STTR)* for technology start-ups
  - DARPA's *Technology Reinvestment Program for* dual-use technology development projects
  - Creation of U-I-G networks

- **Policy shift from research to innovation as driver** of national competitiveness

The American university

3rd phase: The Entrepreneurial University (cont.)



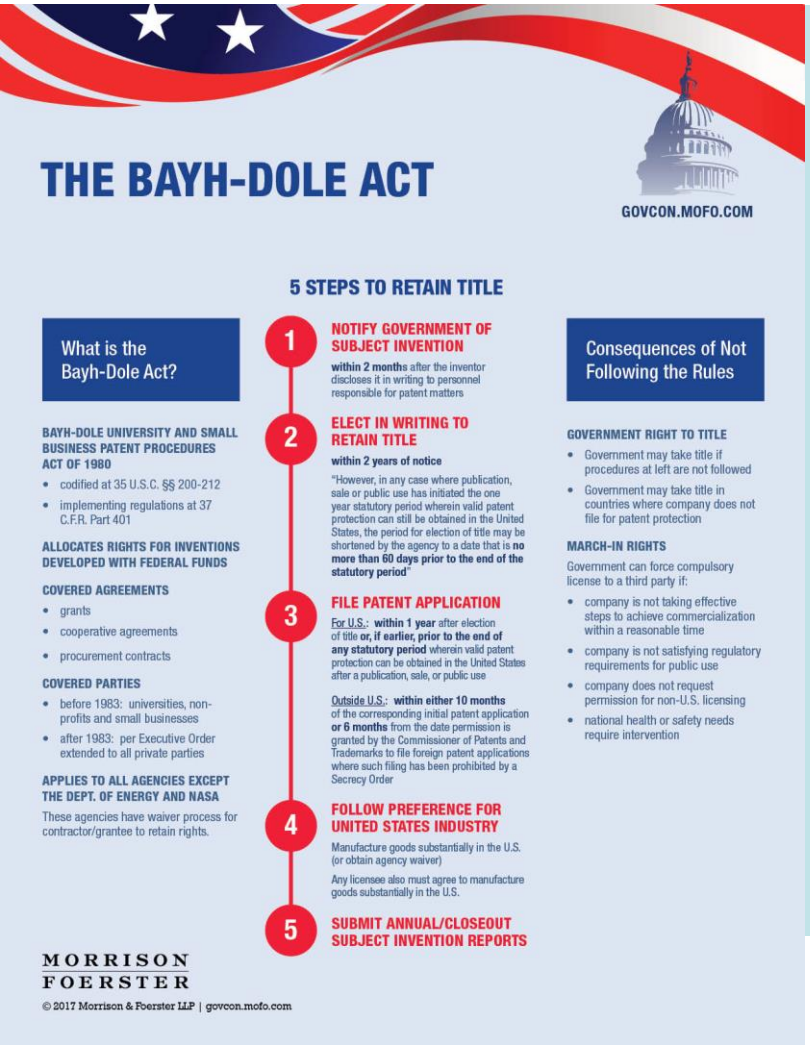
1970-80s: Internal changes in universities (endogenous factors)

- Rise in venture capital
- **1980 Bayh-Dole Act** (universities, small businesses and non-profit to elect title and retain revenue from patenting research achieved with federal funding
- **Stevenson-Wydler Technology Innovation Act (1980) -1st technology transfer law in the US** required federal labs to set apart a part of the lab budget for TT to non-federal entities and actively engage in TT
- Rise in the pool and the mobility of scientists and engineers
- **Technological breakthroughs** in computing (microprocessor), biotechnology (genetic engineering), nanotechnology.
- **University TTOs, patent attorneys, professional TT managers**
- **Increased patenting and licensing, incubators, science parks, university spin-outs, equity investment in start-ups**
- **Academic entrepreneurship as a base for regional renewal**

Stanford's multi-billion patent (filed Jan 1998)
Google's *Page Rank* by Stanford alumnus Larry Page
Stanford got $1.8 M shares Google stock for long-term license

The American university

3rd phase: The Entrepreneurial University (cont.)



THE BAYH-DOLE ACT

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5 STEPS TO RETAIN TITLE

What is the Bayh-Dole Act?

BAYH-DOLE UNIVERSITY AND SMALL BUSINESS PATENT PROCEDURES ACT OF 1980

- codified at 35 U.S.C. §§ 200-212
- implementing regulations at 37 C.F.R. Part 401

ALLOCATES RIGHTS FOR INVENTIONS DEVELOPED WITH FEDERAL FUNDS

COVERED AGREEMENTS

- grants
- cooperative agreements
- procurement contracts

COVERED PARTIES

- before 1983: universities, non-profits and small businesses
- after 1983: per Executive Order extended to all private parties

APPLIES TO ALL AGENCIES EXCEPT THE DEPT. OF ENERGY AND NASA

These agencies have waiver process for contractor/grantee to retain rights.

1 NOTIFY GOVERNMENT OF SUBJECT INVENTION

within 2 months after the inventor discloses it in writing to personnel responsible for patent matters

2 ELECT IN WRITING TO RETAIN TITLE

within 2 years of notice

"However, in any case where publication, sale or public use has initiated the one year statutory period wherein valid patent protection can still be obtained in the United States, the period for election of title may be shortened by the agency to a date that is **no more than 60 days prior to the end of the statutory period**"

3 FILE PATENT APPLICATION

For U.S.: **within 1 year** after election of title **or, if earlier, prior to the end of any statutory period** wherein valid patent protection can be obtained in the United States after a publication, sale, or public use

Outside U.S.: **within either 10 months** of the corresponding initial patent application **or 6 months** from the date permission is granted by the Commissioner of Patents and Trademarks to file foreign patent applications where such filing has been prohibited by a Secrecy Order

4 FOLLOW PREFERENCE FOR UNITED STATES INDUSTRY

Manufacture goods substantially in the U.S. (or obtain agency waiver)

Any licensee also must agree to manufacture goods substantially in the U.S.

5 SUBMIT ANNUAL/CLOSEOUT SUBJECT INVENTION REPORTS

Consequences of Not Following the Rules

GOVERNMENT RIGHT TO TITLE

- Government may take title if procedures at left are not followed
- Government may take title in countries where company does not file for patent protection

MARCH-IN RIGHTS

Government can force compulsory license to a third party if:

- company is not taking effective steps to achieve commercialization within a reasonable time
- company is not satisfying regulatory requirements for public use
- company does not request permission for non-U.S. licensing
- national health or safety needs require intervention

MORRISON FOERSTER

The Bayh-Dole Act (1980)

- Prior to 1980, the federal government retained the licenses to all patents granted to universities using federal money to support their research, granted non-exclusive licenses to anyone who wished to produce the inventions
- $75 bn/year in government-funded R&D, approx. 28,000 patents held by federal government, but less than 5% of them licensed to industry for products
- Companies reluctant to invest, as they did not have exclusive rights to sell → no returns to taxpayers' money
- **The Bayh-Dole Act allowed universities, small businesses and non-profit to own patents to technologies made in whole or in part with federal funding and become directly involved in research commercialisation**
- Includes contracts, grants, cooperative agreements

How does Bayh-Dole Act work?

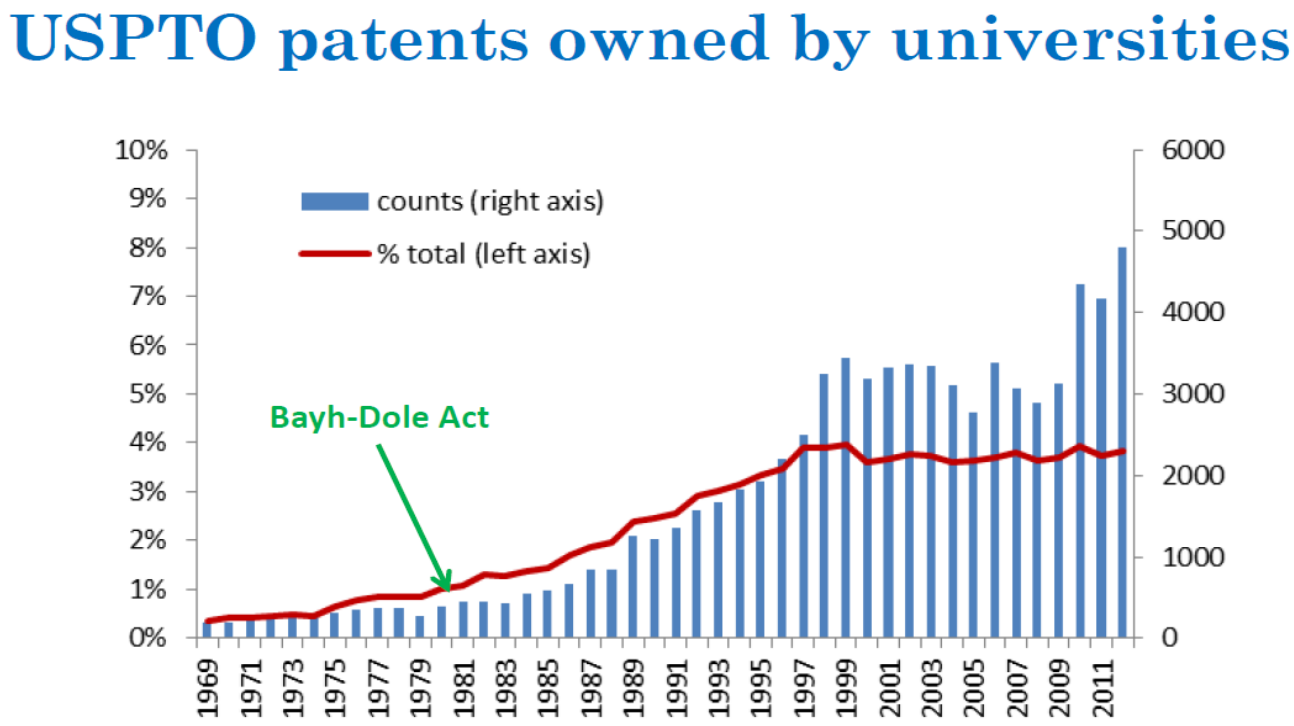
- **The institution retaining the title (universities, small businesses and other non-profit):**
  - Committed to the commercialization of the invention
  - Required to disclose invention to government (max. 2 months after disclosure to university)
  - Required to share income with inventors and to support lab/department research (typically “1/3 rule”)
  - Can control the title for the inventions
  - Can create revenue by exclusively licensing the patent or selling it entirely to a private company

- **Government:**
  - Retains royalty-free, non-exclusive, non-transferrable license for government purposes
  - Has the right to require the contractor who owns either the title or an exclusive license to the invention to grant a non-exclusive, partially exclusive, or exclusive license in any field of use to a responsible applicant (to protect the public from having universities withhold licenses for patents that could affect public safety)

- **The private sector**
  - Can purchase exclusive rights to produce the inventions from university → incentive to develop the invention
  - Product sales lead to government gains from the sales taxes, in spite of losses from non-exclusive licenses

Positive effects of the Bayh-Dole Act

Exponential rise in the number of patents granted to research universities



Notes: Patents were identified as university owned based on the name of the first assignee.
Data: USPTO official data from https://www.uspto.gov/web/offices/ac/ido/oeip/taf/univ/asgn/table_1_2012.htm
Source: Martínez, Catalina and Valerio Sterzi, 2018. University patenting and the quest for technology transfer policy models in Europe, chapter in Varga A. and Erdos K. (Eds.), Handbook of Universities and Regional Development, Edward Elgar (forthcoming)

- Increase in the number of patents granted to research universities
- 10x increase in the number of universities actively engaging in patenting their research
- Economic revenue and jobs (about $30 bn/year, 250,000 jobs) attributed to technologies born in universities
- New firm formation (over 2,200 new firms since 1980) based on the licensing of an invention from an academic institution

Martinez, C. (2018), From academic inventing to university patenting

Similar Bayh-Dole legislation adopted in Europe

Legal changes	Country	Year of change
Abolishment of Professor's privilege	Finland	2007
	Norway	2003
	Germany	2002
	Austria	2002
	Denmark	2000
Stronger enforcement of institutional ownership	Portugal	1998
	Belgium	1997
	Switzerland	1991
	France	1999
	Spain	1986
	United Kingdom	1977
Introduction of Professor's privilege	Italy	2001
Continuation of Professor's privilege	Sweden	1949

Viromii

- **Before 1980s:**
  - ❑ *"Professor's privilege"* (US, Germany or Sweden) - researchers were owners of their patents
  - ❑ Strong institutional ownership (Spain, France, UK)
- **After 1980:** similar Bayh-Dole legislation adopted in Europe → universities owned innovations developed by their researchers
- **Abolition of "Professors' privilege" in many European countries, except for Italy and Sweden**
- Most of the European TTOs were born - universities responsible with transfer and exploitation of university-based innovations
- **Are universities more successful than professors in commercializing innovations?**
- Success not related to the "Professor's privilege" (high in Sweden and the Netherlands, low in Spain and Italy), but to other social, political factors, e.g. strength of U-I links, policies

Martinez, C. (2018), From academic inventing to university patenting

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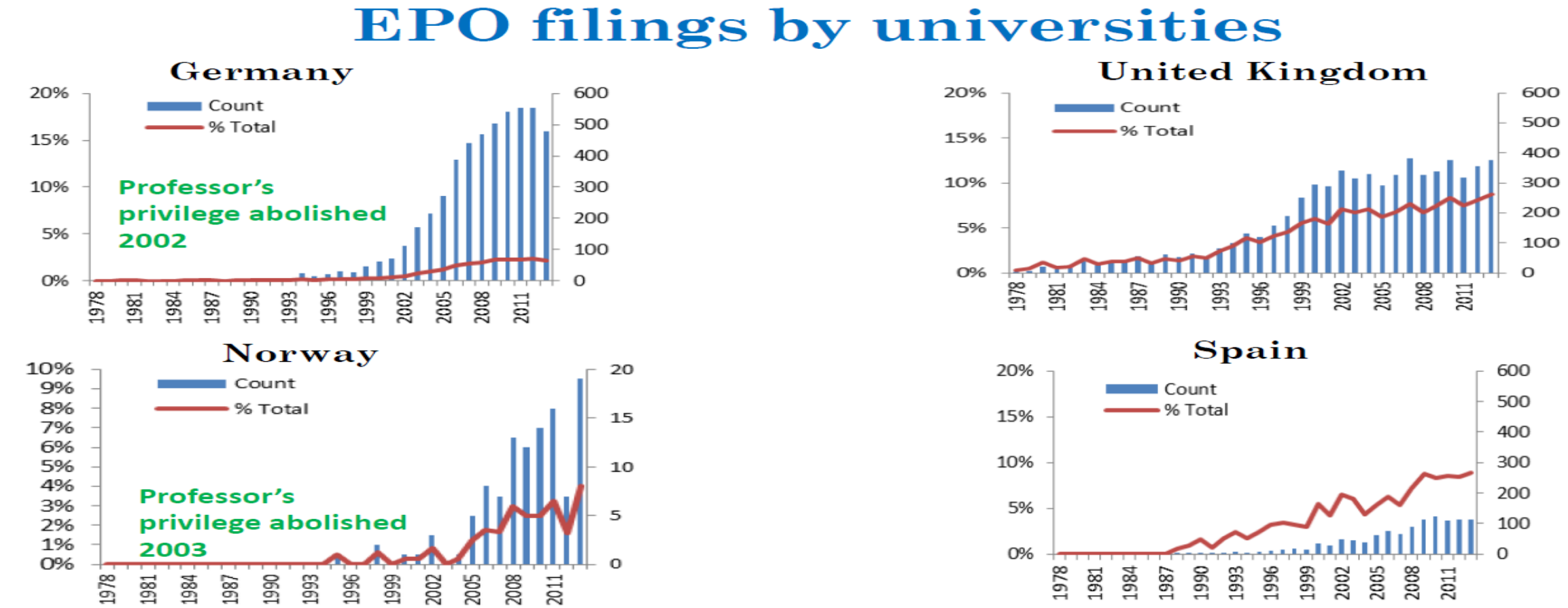
Impact of similar Bayh-Dole legislation in Europe



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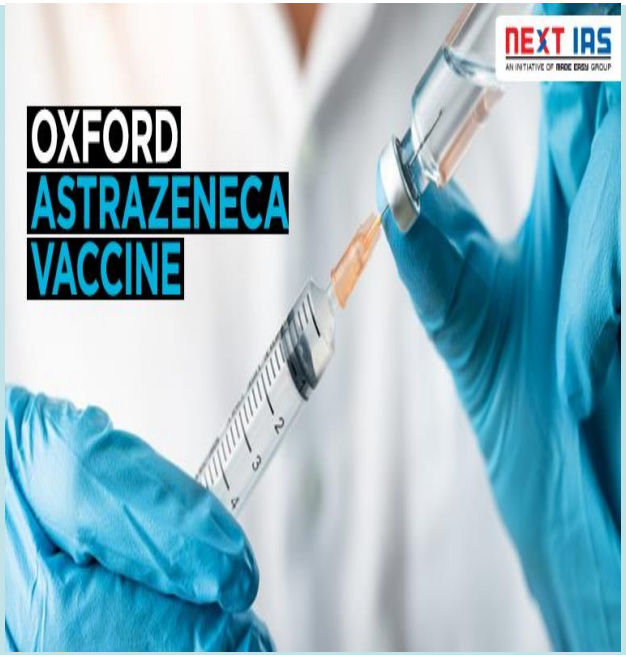
Martinez, C. (2018), From academic inventing to university patenting

Criticism to the Bayh-Dole Act



Oxford University/AstraZeneca anti-COVID 19 vaccine

Agreement envisages exclusive rights (via patents and trade secrets) and use of IP licensing, with non-profit regime during the pandemic

- **Conflicts of interest** arising from the universities' right to grant exclusive licenses for their patented invention or sell the title to the patent to private industry
  - ❑ Companies can offer direct financial rewards to individual faculty members (consulting fees, royalties, equity in companies), while funding these faculty members' research
  - ❑ Favouring of certain companies by academics who consulted for/worked for those companies, when licensing out the patents, no fair competition.
- **Skewed research** toward marketable products, not basic research (less patents and applicable inventions)
- **Government funding of biomedical research (largest % for academic research)**
  - University biomedical patents (new drugs and therapies) made with federal funds are called "research tools" ((no final products, not available to commercialize)
  - Industry must pay for the license to use the biomedical patent + its own R&D costs to develop the final drug/therapy.
  - High cost of the final product → the consumer pays also the cost of the original licensing fee

McDonagh, L. (2020), Could university patents stand in the way of universal global access to a COVID-19 vaccine?

JRC reports on TT and entrepreneurship in NW and NE universities

Evaluation based on 5 TTE dimensions:

1) Orientation and strategy;
2) People and organisational capacity;
3) Drivers and enablers;
4) Education, research and third-stream activities;
5) Innovation and impact

JRC reports: Comparative analysis of TT supply and demand in NW and NE regions

Comparative Analysis of Technology Transfer Supply in North-East and North-West Romania

Yannis A. Tolias*
29 December 2017

I. INTRODUCTION AND SCOPE

A European Parliament Preparatory Action (EPPA) centred on enhancing the competitive advantage and the potential for smart specialisation at regional level in Romania was launched in 2016. The project is implemented by the Territorial Development Unit of the European Commission's Joint Research Centre (JRC), in close cooperation with DG REGIO and the regional development agencies of North East and North West Romania, with the support of selected independent experts.

In line with the objectives of the Preparatory Action, support is provided to elaborate and implement the Regional Smart Specialisation Strategy in North-East and North-West Romania with a focus, among others, on supporting the regions in assessing their potential for technology transfer.

This report, building on the evidence provided through [1] and [2], aims to compare the degree of sophistication of the technology transfer approach of the regional higher education institutions and public research organisations in both regions, to quantify the inputs and outputs of ongoing technology transfer processes, and finally, to explain any differences in the enablers, or in the approaches, or in the outputs.

II. METHODOLOGY

According to [3], technology transfer takes place in channels of interaction between research/academia and other stakeholders (firms, public administration, individuals and the society as a whole). Knowledge can be produced, mediated, reproduced, acquired, and transformed in and between the different forms through these channels. The channels themselves can be direct or indirect/mediated. A typical (but not exhaustive) classification of channels includes networks (both formal-between organisations and informal-between individuals), continuous professional development, consultancy, collaborative research, licensing, spin-offs

Final Report on the activities for the Romanian regions North-West and North-East and for the implementation of Lagging Regions Initiative in Romania

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Analysis of Needs, Offers and Gaps - Increasing innovation in companies by supporting innovation and technology transfer entities in the areas of smart specialisation

Expert Contract N° CCI 2016CE16BAT071

Author: Dr. Jonathan Loeffler

Date: 27.12.2017

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Steps towards an Entrepreneurial University

Develop the strategic and institutional capacity for U-I cooperation/TTE

- Make U-I collaboration an explicit strategic institutional policy (mission statement)
- Develop a university-wide system for U-I cooperation, not limited to specific depts.
- Create specialised units/depts for collaboration with companies, with adequate staff
- Develop a culture conducive to thinking and acting entrepreneurially
- Enhance entrepreneurial education, appointment of entrepreneurship faculty
- Provide incentives and rewards for academics for entrepreneurship
- Include entrepreneurial skills in staff recruitment and promotion
- Define measurable goals and actions owned by different people in the institution
- Diversify funding sources, adjust fundraising strategies accordingly
- Keep a clear record of income, expenditure and investments in TTE
- Develop a solid QA and monitoring system for TTE
- Simplify administrative procedures, reduce costs of participation in TTE initiatives

Steps towards an Entrepreneurial University (cont.)

Facilitate two-way flows of people, ideas between U-I

- Facilitate participation of business professionals and entrepreneurs in university governance, in teaching and curriculum development
- More company placements and internships for students
- Develop programmes that focus on specific knowledge needs of the company

Disseminate more information on U-I cooperation benefits

- Promote social acceptance of the “entrepreneur”, entrepreneurship culture
- Promote role models of successful entrepreneurs
- Support more U-I fora or executive exchanges at regional, national level

Gain good understanding of the complexity of U-I cooperation

- Manage conflict and expectations at each stage of the cooperation

Thank you!

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