

Unleashing the transformative potential of innovations

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Institutional affiliations



UiO **Centre for Technology, Innovation and Culture**
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Financing



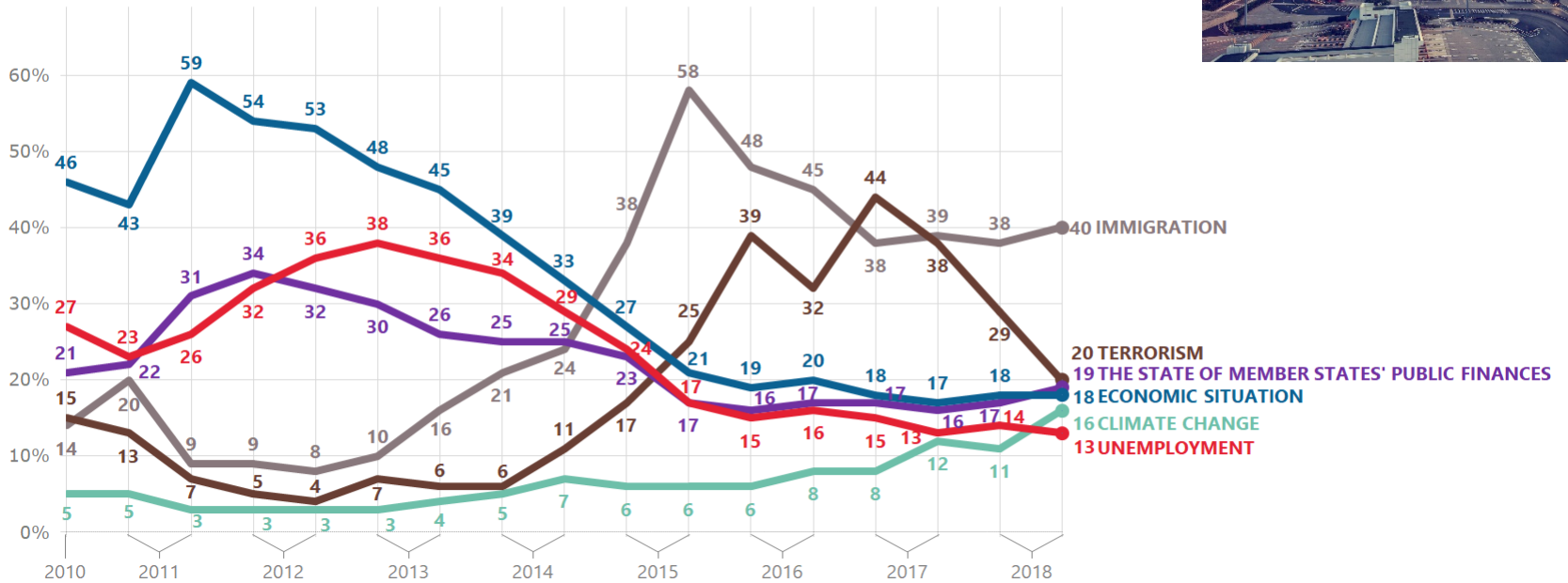
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RISING CONCERNS ABOUT CLIMATE CHANGE AND ECONOMIC RECOVERY



QA5 What do you think are the two most important issues facing the EU at the moment?
(% - EU)



Source: European Commission, *European Barometer*, November 2018.

INDUSTRIAL CONSEQUENCES NEED MORE ATTENTION IN SUSTAINABILITY TRANSITIONS

- QUESTION: *HOW THE DEVELOPMENT OF ENERGY TECHNOLOGY INNOVATIONS CONTRIBUTES TO CHANGES IN THE INDUSTRIAL CONTEXT?*

- AGENDA
 - THEORY
 - EMPIRICAL SETTING
 - METHODOLOGY
 - RESULTS
 - CONCLUSION

TRANSFORMATIVE POTENTIAL HAS VARIOUS EXTENTS, SCOPES AND DIMENSIONS

- **SYSTEM REVOLUTION VS INDUSTRY “REDOMAINING”** [SCHUMPETER, 1934, 1942; ARTHUR, 2009]
- **INDUSTRIAL TRANSFORMATION SHOULD LEAD TO THE DIVERSIFICATION OF THE ECONOMY** [HAUSMANN ET AL., 2014; HIDALGO ET AL., 2009, 2007]
- **DIMENSIONS OF TRANSFORMATIVE POTENTIAL** [ARTHUR, 2009; AGARWAL & TRIPSAS, 2008; GRUBLER, 2012]
 - **CONTEXT:**

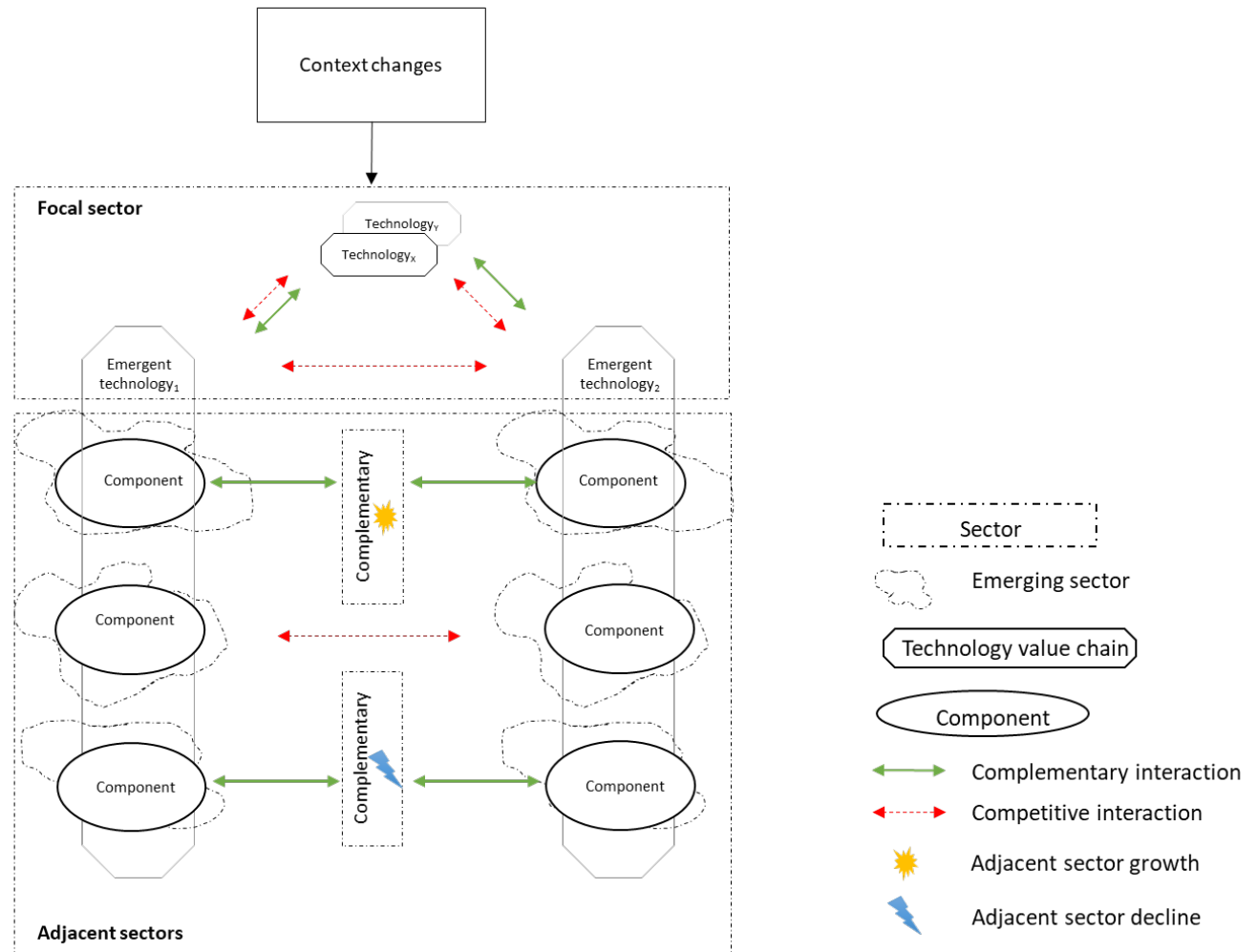
SELECTION ENVIRONMENT INFLUENCE TRANSFORMATIVE POTENTIAL [BERGEK ET AL., 2015; GEELS, 2002]
 - **COMPLEMENTARITY:**

INTERACTION WITH ADJACENT SECTORS INCREASE POTENTIAL [HIRSCH-KREINSEN ET AL., 2005; WEITZMAN, 1998, HIDALGO, 2018; MARKARD & HOFFMANN, 2016]
 - **COMPETITION:**

RELATIVE ABILITY TO RAISE RESOURCES HAS INCREASING RETURNS [ABERNATHY AND UTTERBACK, 1978; ANDERSON AND TUSHMAN, 1990; ARTHUR ET AL., 1989; GUSTAFSSON ET AL., 2016]

TRANSFORMATIONAL CHANGE RESULT FROM THE INTERPLAY BETWEEN CONTEXT, COMPLEMENTARITIES AND COMPETITION

[ADAPTED FROM ANDERSEN AND MARKARD, 2017]



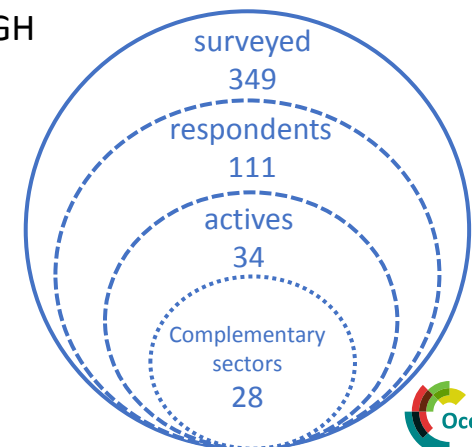
MARINE RENEWABLE ENERGY TECHNOLOGIES ARE EXAMPLES OF EMERGING INNOVATIONS WITH MANY SYNERGIES

- COMPLEX SYSTEMS
- HETEROGENEOUS ACTIVITIES: DEVELOPMENT, MANUFACTURING AND ASSEMBLY OF CONVERSION SYSTEMS, INSTALLATION AND O&M, ETC.
- COMPLEMENTARITIES WITH ADJACENT SECTORS
- INTERACTIONS CAN CREATE NEW ACTIVITIES
- A FEW CASES OF FRONTRUNNERS (PORTUGAL, NORWAY,..)



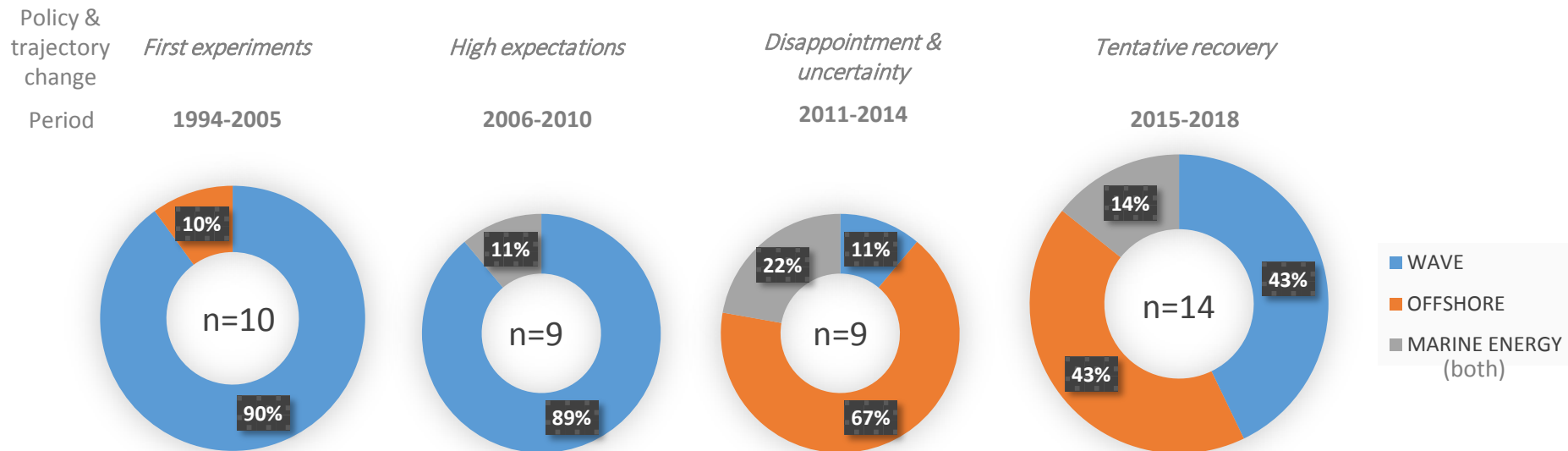
ASSESSING INTERACTIONS WITH ADJACENT SECTORS

- PORTUGUESE MRET: 20+ YEARS OF RD&D
- 1ST STEP: IDENTIFICATION OF FIRMS OF EXISTING SECTORS INVOLVED IN MRET
 - PARTNERS IN RESEARCH, TECHNOLOGICAL DEVELOPMENT AND DEMONSTRATION (RTD) PROJECTS (N=43)
 - SUPPLIERS IN THE CONTEXT OF EXPERIMENTAL ACTIVITIES (N=32)
 - IDENTIFICATION OF POTENTIAL CONTRIBUTORS TO MRET THROUGH SECONDARY MATERIAL AND INTERVIEWS (N=274)
- 2ND STEP: SURVEY TO IDENTIFIED FIRMS
- COMPARISON WITH NORWAY



CONTEXT IMPOSES BARRIERS AND OPPORTUNITIES TO EMERGING TECHNOLOGIES

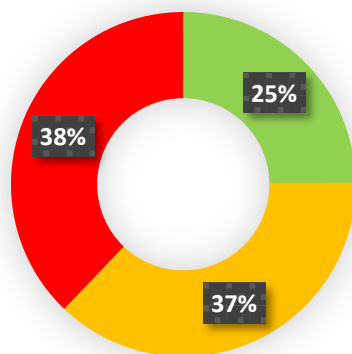
Complementary sector firms in MRET by period and technology



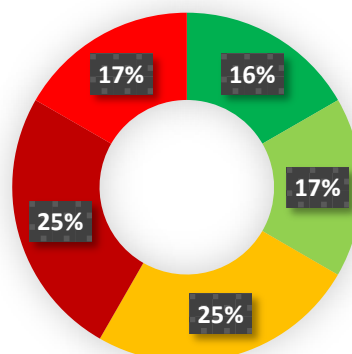
COMPLEMENTARITIES ARE MORE TRANSFORMATIVE WHEN INDUCE INNOVATION

Novelty of products or services currently supplied, by technology

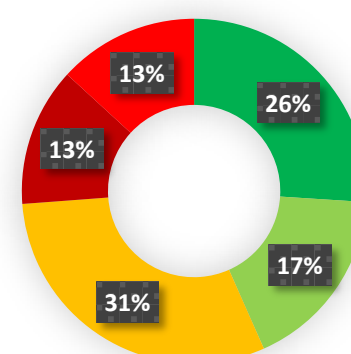
Wave
(n=8)



Offshore wind
(n=12)



Marine
(n=23)

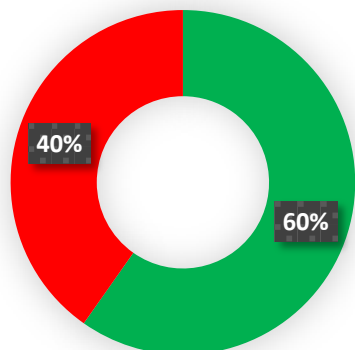


■ New product ■ New service ■ Adaptation
■ Current prod ■ Current service

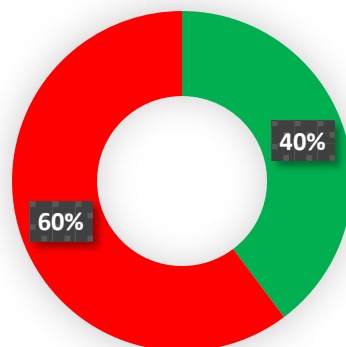
COMPETITION INFLUENCES THE CAPACITY OF TECHNOLOGIES TO ENGAGE ADJACENT SECTORS

Organizational changes by technology

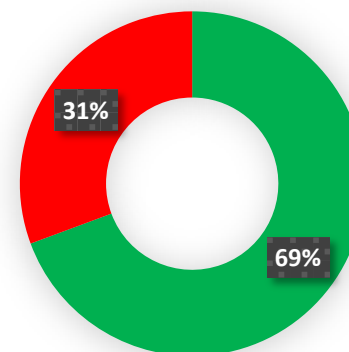
Wave
(n=5)



Offshore wind
(n=5)

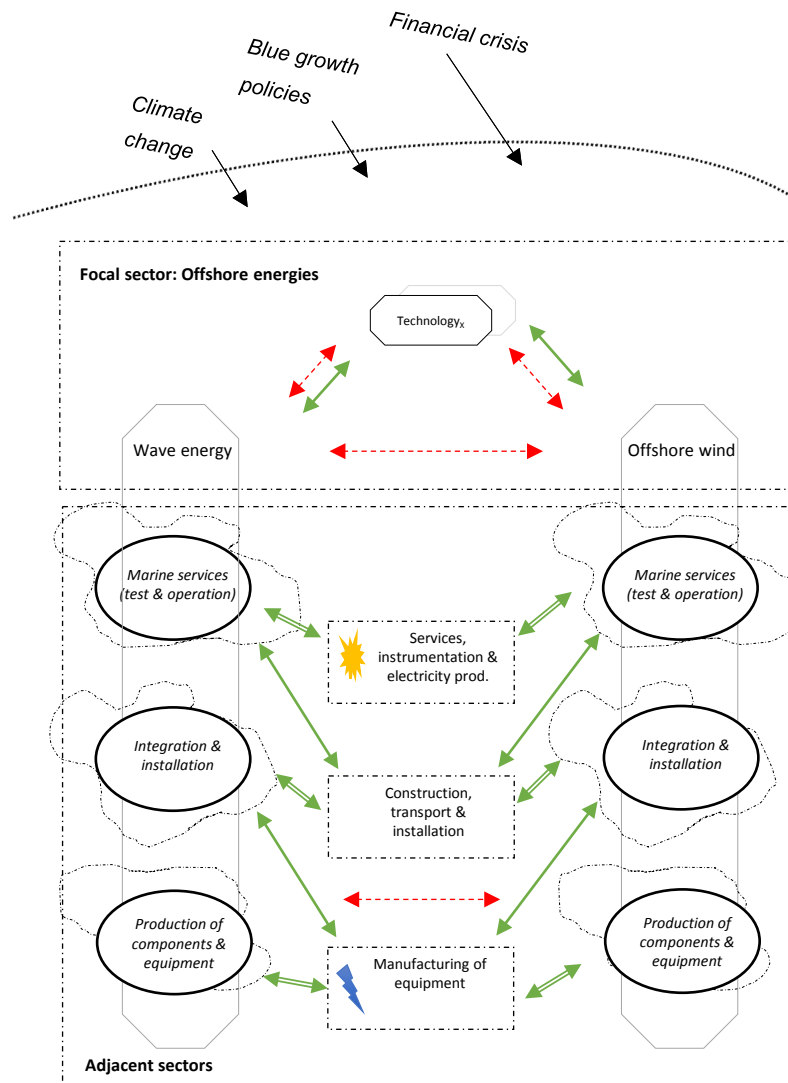


Marine
(n=13)

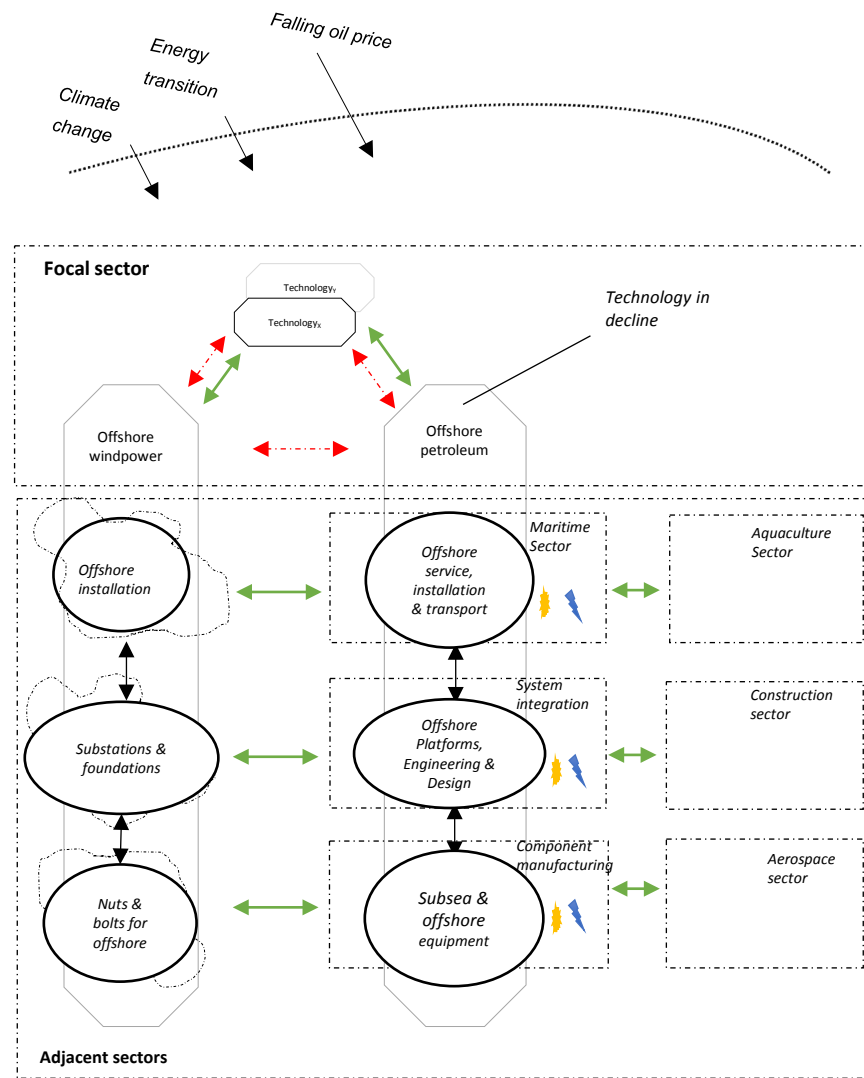


■ Changes ■ No changes

NEW DEMANDS FROM EMERGING TECHNOLOGIES PULL A DIVERSITY OF INTERACTIONS WITH ADJACENT SECTORS



EXISTING OFFSHORE ACTIVITIES ACCELERATE INNOVATION IN NORWAY BUT CHANGES ARE MORE INDIRECT IN OTHER SECTORS



Adapted from Andersen & Gulbrandsen, 2018;
Mäkitie et al., 2018.

CONCLUSION

- TRANSFORMATIVE TECHNOLOGIES INDUCE CHANGE IN INDUSTRIAL CONTEXT
- NEW FOCUS ON THE EXTENT AND NATURE OF ACTIVITIES IN ADJACENT SECTORS UNCOVERS TWO PATTERNS:
 - SUPPORT TO MATURE INNOVATIONS LEAD TO FASTER RESULTS IN FOCAL SECTOR
 - COMBINED TECHNOLOGY DEVELOPMENT RESULT IN MORE DIVERSIFIED ACTIVITY, INNOVATION AND ORGANIZATIONAL CHANGE IN ADJACENT SECTORS
- COMPARISON WITH NORWAY REVEALS THAT CONTEXT CONSTRAINS INTENSITY AND NATURE OF COMPLEMENTARY AND COMPETITIVE RELATIONSHIPS
- FUTURE RESEARCH: NATURE OF INDUCED ACTIVITIES & PROFILE OF THE FIRMS

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THANK YOU!

