

Startups in Germany seen through the lens of Mannheim panel datasets

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**Research, Innovation and Entrepreneurship: A new agenda for
the enhancement of structural competitiveness
26-29 November, Goethe-Institut Athen**

Agenda

- **Data Infrastructure for Entrepreneurship Research at ZEW**
 - Mannheim Enterprise Panel
 - Mannheim Startup Panel (IAB/ZEW-Startup Panel)
 - Employee Historic Files
 - Links between data
- **Examples: Research questions and results**
 - Determinants of (regional) startup activities
 - Funding of new firms
 - Digitalisation in young firms
 - Short- and long-run growth effect of economic crisis
- **New opportunities and challenges**

**Entrepreneurship
Research Infrastructure
at ZEW**

ZEW Panels for Research on Startups

Source: Creditreform
Creditrating Agency

Mannheim Enterprise Panel (MUP)

Stratified Random Sample
Link via Company ID

Mannheim Startup Panel (IAB/ZEW)

Link via company name
and address

Establishment Data

Link via name &
birthday of Individual

Individual Employee
Career Files

Link via company
& owner nme(s)

Other data

- Patent Application
- VC Transaction
- Public R&D support

Employment Research Institute of
Federal Employment Agency

Mannheim Enterprise Panel

Source: Creditreform
Creditrating Agency

Mannheim Enterprise Panel (MUP)

Bi-Annual Cross-section (since 1999)

All firms in Germany

- Name and address, Legal form
- Start date and legal form at start
- Management and Owner(s)
- Industry code(s)
- (estimated) number of employees, Sales
- Sales
- Credit rating
- Bank account

Other data

- Patent Application
- VC Transaction
- Public R&D support

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(IAB/ZEW)

Link via company name
and address

Establishment Data

Individual Employee
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Employment Research Institute of
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IAB/ZEW Startup Panel

Source: Creditreform
Creditrating Agency

Mannheim Enterprise Panel

Stratified Random Sample
Link via Company ID

Mannheim Startup Panel (now IAB/ZEW Startup Panel)

Random, stratified sample

Annual phone / internet survey

- Motivation to start firm, Founding team
- Employment & Sales & Investment & Exports
- Source of financing
- Collaboration & Source of technologies
- Market strategies & Competitive position
- Innovation input & results, R&D activities
- Obstacles to Innovation & Investment
- Technologies

Link via company
& owner name(s)

Other data

- Patent Appl
- VC Transact
- Public R&D

Company name
Address

Patent Data

Employee
Files

Research Institute of
Economic and Social Sciences
of the University of Mannheim
Creditrating Agency

Employment history and establishment data (LEE data)

Individual Employee Career Files
Based in individual social security data
Register

- Full individual employment and unemployment records (History of each employee)
- Employers (establishment level)
- Industry code and size of establishment
- Work experience
- Education (university, ...)
- Typ of jobs performed (Management, production, research, etc.)
- Wages
- Age/Birthday,
- Sex

- Patent Application
- VC Transaction
- Public R&D support

W)

Link via company name
and address

Establishment Data

Individual Employee
Career Files

Employment Research Institute of
Federal Employment Agency

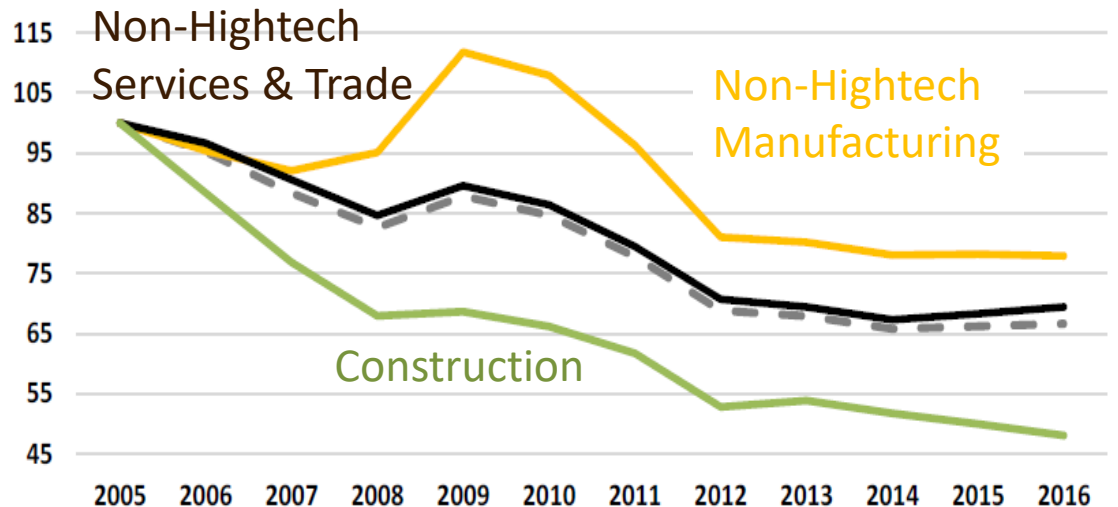
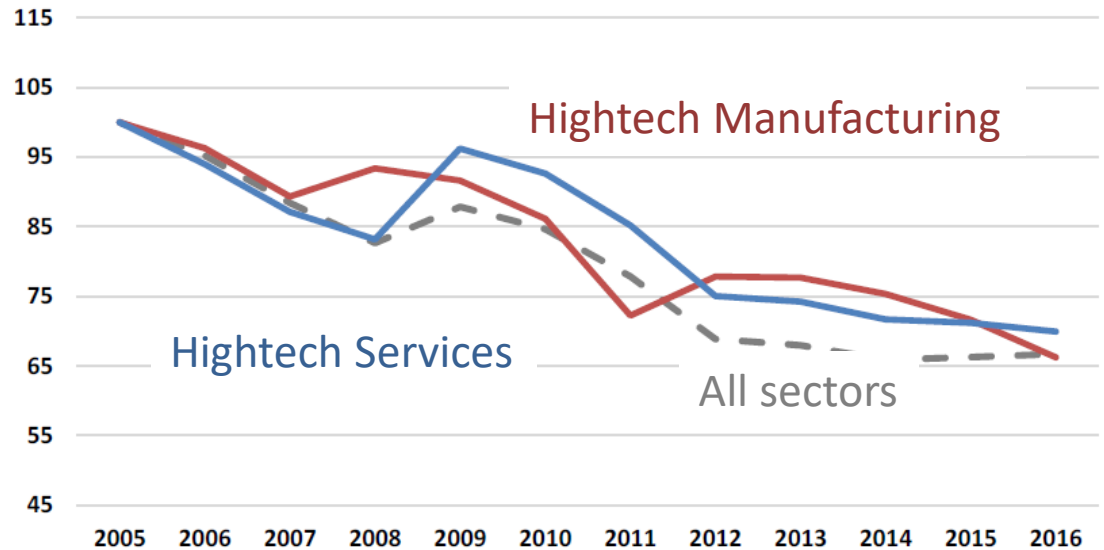
Selected Usage and Research Questions

Selected Use

PART 1: Mannheim Enterprise Panel

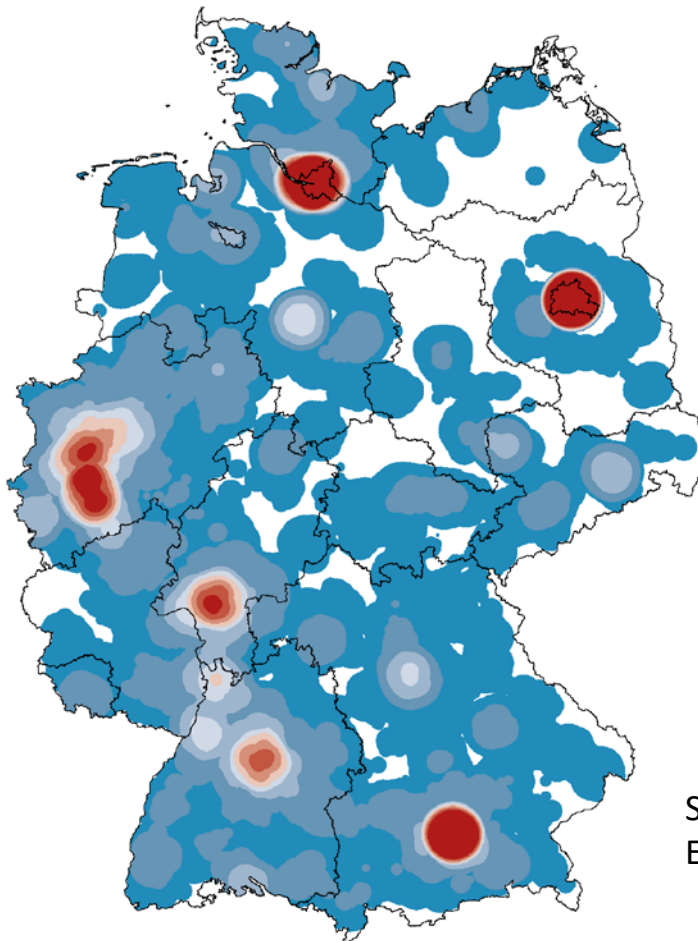
Startup Activity in Germany 2005-2016

- Strong trend decline in all sectors
- Significant reduction of „necessity entrepreneurship“ to economic upswing in Germany
- Legal reforms („limit liability companies) „explain“ the temporary increase in 2008/9

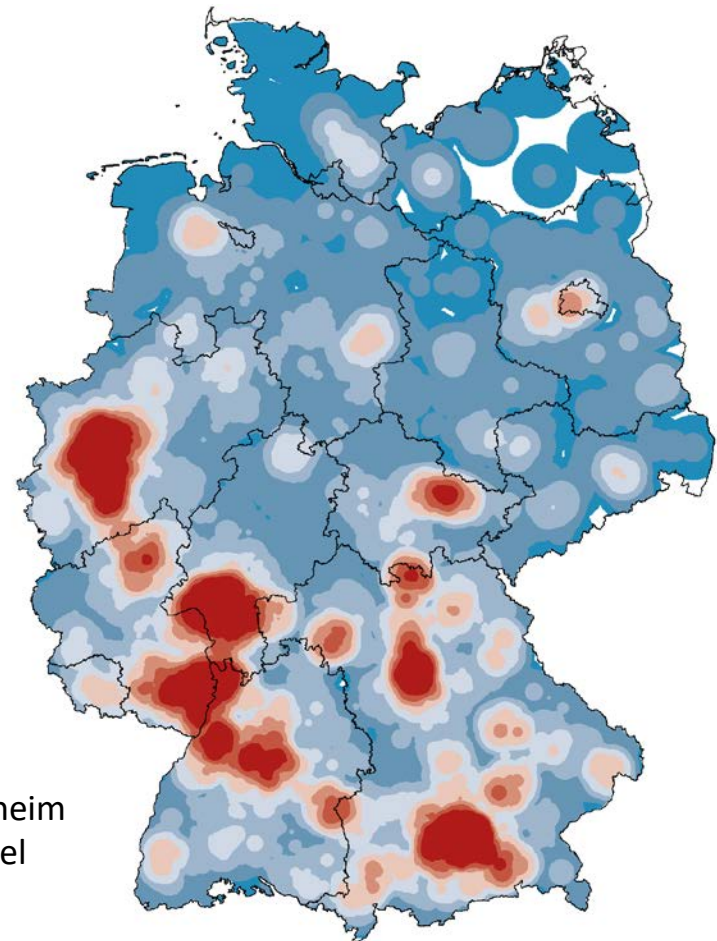


„Heat Maps“: Regional Distribution of Startup Activity in Germany in R&D and Knowledge-intensive Industries

Number of Startups



Number of Startups
per population per county



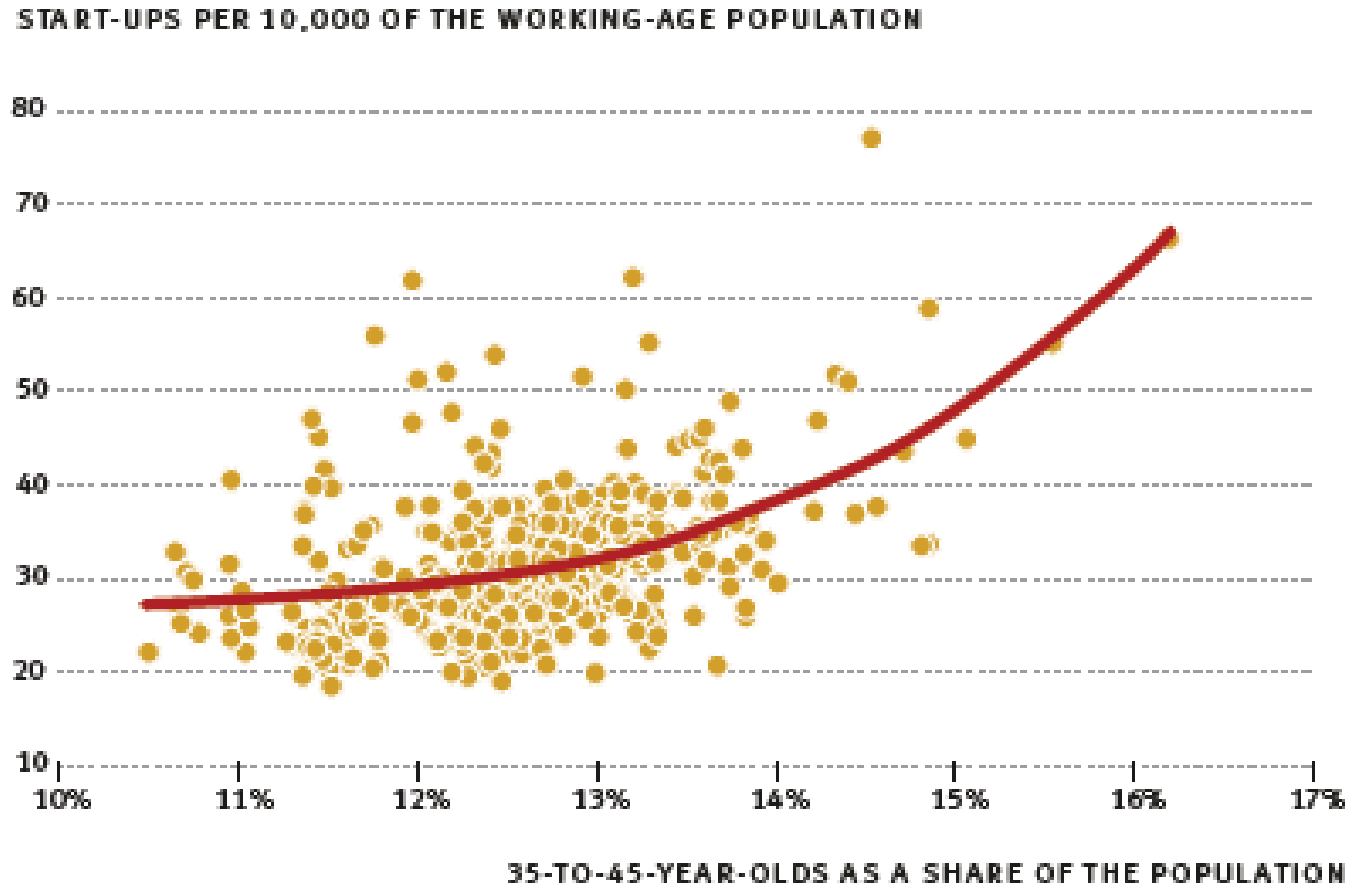
Source: Mannheim
Enterprise Panel

Determinants of Regional Startup Activity in Hightech Industries and Knowledge-intensive Services

- Access to traffic infrastructure (long distance connection via autobahn or train)
- Internet infrastructure (quality of high-speed networks)
- Aging population
- Opportunity cost of entrepreneurship (e.g. wages, career opportunities)
- Financing opportunities
(expected cashflow, banks, public support, VC/BAs)
- Access of knowledge infrastructure
(R&D labs of big firms, public R&D institutions)

Determinants of Regional Startup Activity in Hightech Industries and Knowledge-intensive Services

- Access to autobahn
- Internet
- Aging population
- Opportunities
- Financing (expected)
- Access to R&D labs



Each dot represents an urban or rural district.

Sources: Mannheim Enterprise Panel (MEP), INKAR online, calculations by ZEW

Determinants of (Regional) Startup Activity in Hightech Industries and Knowledge-intensive Services

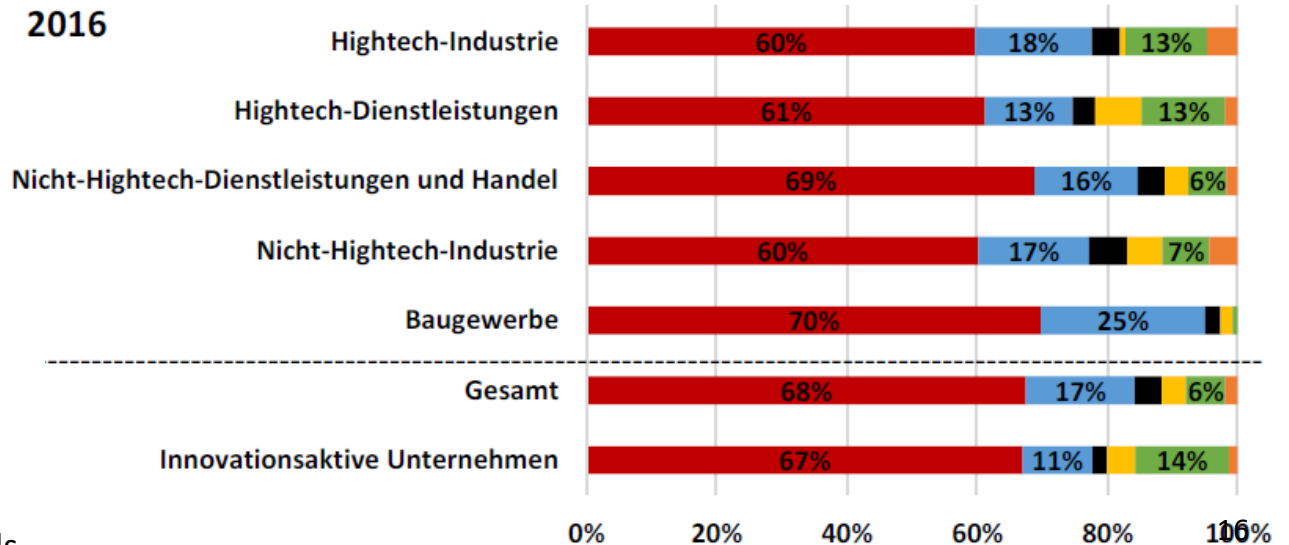
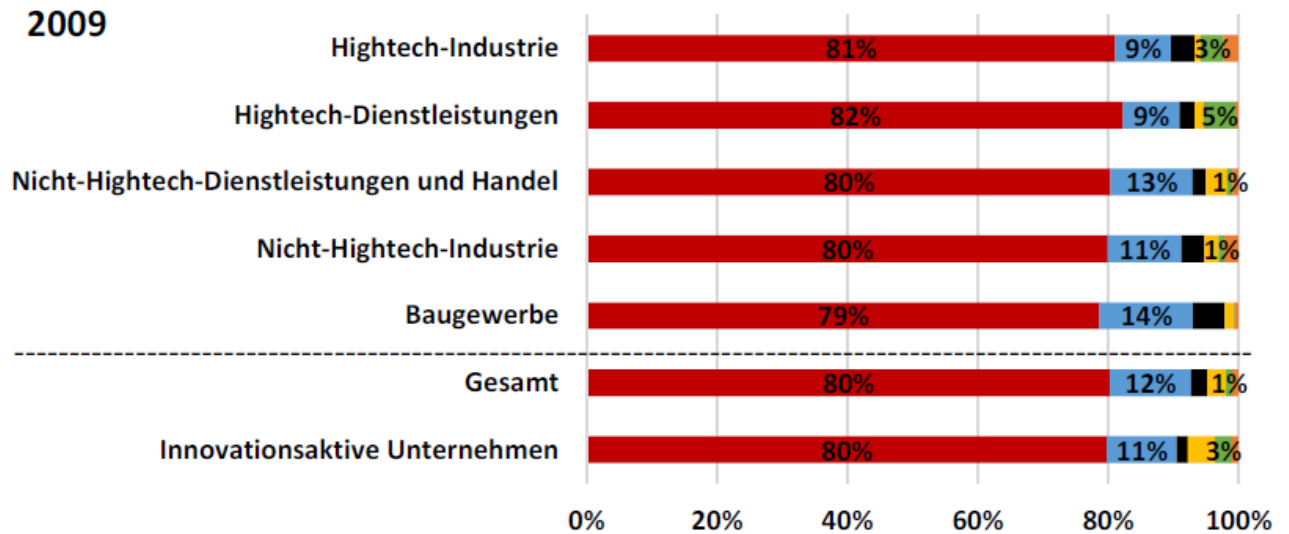
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Selected Use

PART 2: Financing of Startups and Young Firms

Structure of Financing of Business Activities

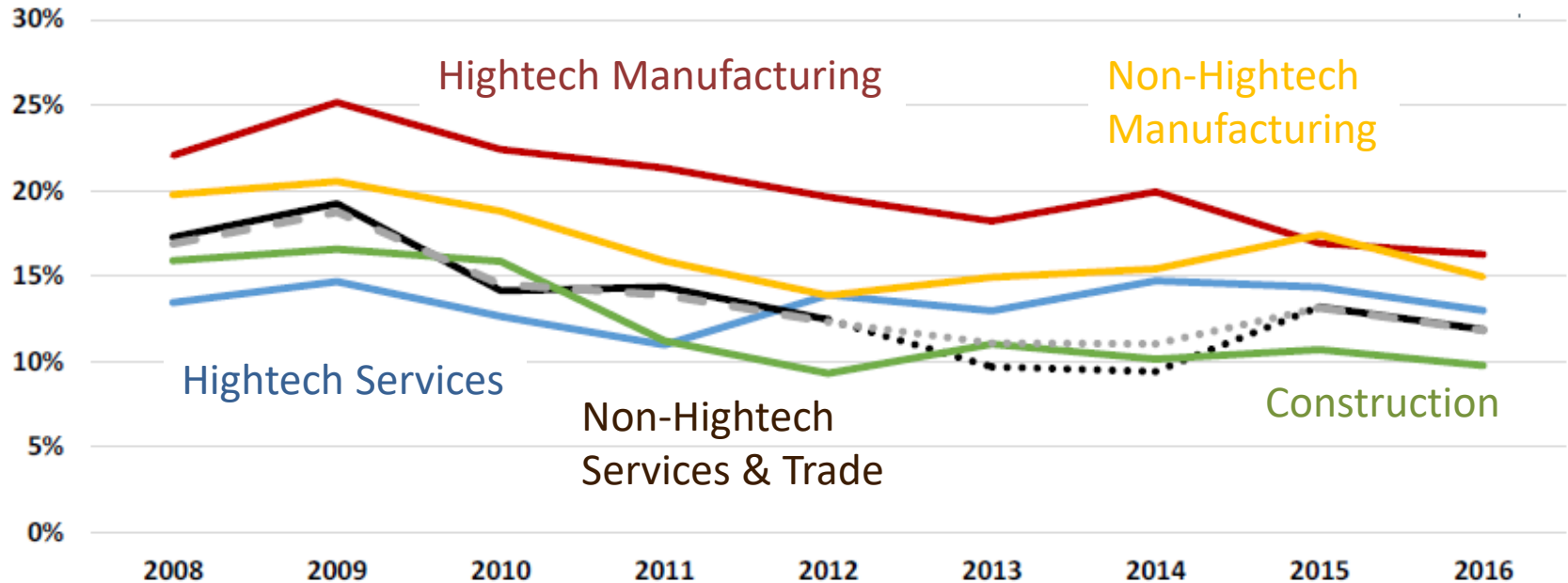
- Significant change in financing environment: use of banks, VC and business angels increased



- Business owners/Cash flow
- Family & Friends
- Banks
- Venture capital
- Public funds & loans
- Others

Financing as obstacle

Share of firms reporting difficulties in raising external finance



Selected Use

PART 3: Startup Panel linked with Individual Employment Record

Hiring by New Firms over the Business Cycle (Crises vs. No Crisis)

➤ **RESEARCH QUESTION**

- Understanding changes in employment growth and human capital structure of start-ups over the cycle

➤ **DATA**

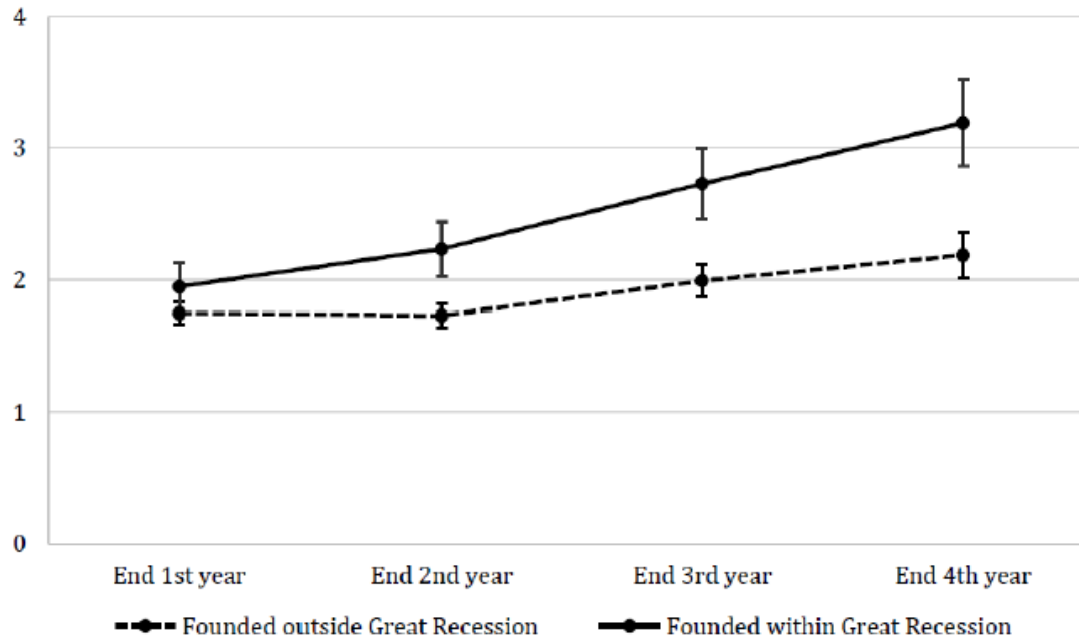
- Mannheim resp. IAB/ZEW Start-Up Panel survey data to correct for selection effects in the type of founders throughout the cycle
- MUP data to address selection effects in firm survival throughout the cycle
- LEE employment biographies to account for types of employees hired

➤ **RESULTS**

- (averaged-sized) start-ups grow countercyclically
- New firms struggle to grow optimally during upswings
- A key mechanism behind these findings is the differential in access to qualified career entrants that start-ups experience at different stages of the business cycle

Hiring by New Firms over the Business Cycle (Crises vs. No Crisis)

Figure 5: Development of predicted number of employees



capital
 effect for
 e
 throughout the
 years hired

Notes: Predicted number of employees conditional on the human capital of firm founders including a 95% confidence interval. Values fitted from weighted OLS models for crisis and out-of-crisis foundations at the mean values of all other covariates. Covariate balance is induced between crisis and out-of-crisis foundations for each business year using weights derived from entropy balancing. Marginal effects of the crisis dummy according to the weighted OLS model (robust standard errors in parentheses): 0.157 (0.100) after one year, 0.493 (0.116)*** after two years, 0.695 (0.142)*** after three years, 0.973 (0.179)*** after four years. Marginal effects of the crisis dummy according to the weighted Poisson model (robust standard errors in parentheses): 0.155 (0.100) after one year, 0.489 (0.117)*** after two years, 0.696 (0.144)*** after three years, 0.970 (0.177)*** after four years. Marginal effects of the crisis dummy according to the weighted Tobit model: 0.198 (0.085)** after one year, 0.648 (0.101)*** after two years, 0.826 (0.123)*** after three years, 1.087 (0.154)*** after four years. Significance levels: *** 1%, ** 5%, * 10%.

access to
 ent stages

New opportunities and challenges

- **Using text as data**
 - E.g. Short description of firms, texts of patents
 - How to turn text into indicators
- **Using the web as data source**
 - E.g. browsing firm's home pages, Social media content
 - Analytical tools (?)
 - Too much data, too much details?
- **Privacy issues**

Thank you for your attention

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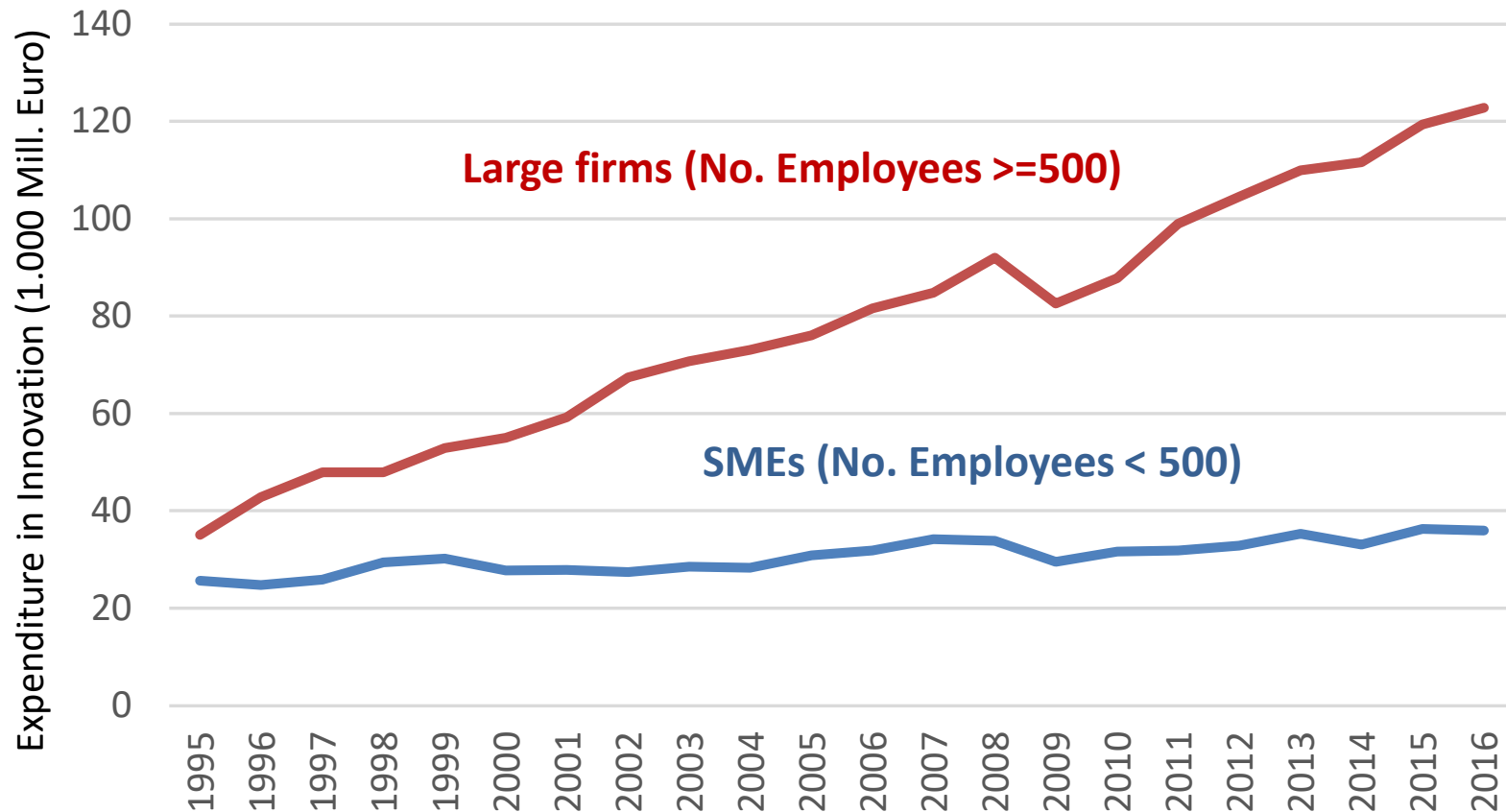
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+49 (0)621 1235 177

Appendix

The Structural Gap in Private Investments into Innovation

Example: Expenditure on Innovation in Germany



Source: ZEW (2018) Mannheim Innovationspanel

The IAB/ZEW Start-Up Panel

Motivation

- ❖ Follow young firms through the first years of their lives
- ❖ Cover topics and questions relevant to start-up success
- ❖ Improve availability of information to policy makers and researchers

Panel econometric analyses

Development of young firms over time



Cross-sectional analyses

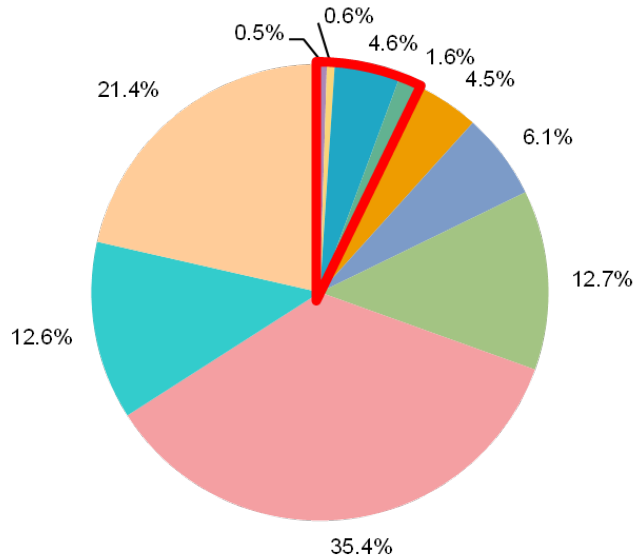
Yearly changing focus topics addressing relevant issues

Concept

- ❖ Random sample based on MUP stratified by KfW funding (until 2011), founding year, and sector → overrepresentation of high-tech start-ups
- ❖ Survey started in 2008 with 5,500+ legally independent start-ups founded 2005-07
- ❖ Each year the sample is extended by new firms founded in the past three years
- ❖ Follow-up surveys until firms have participated 7 times (or refused to participate in two subsequent years)

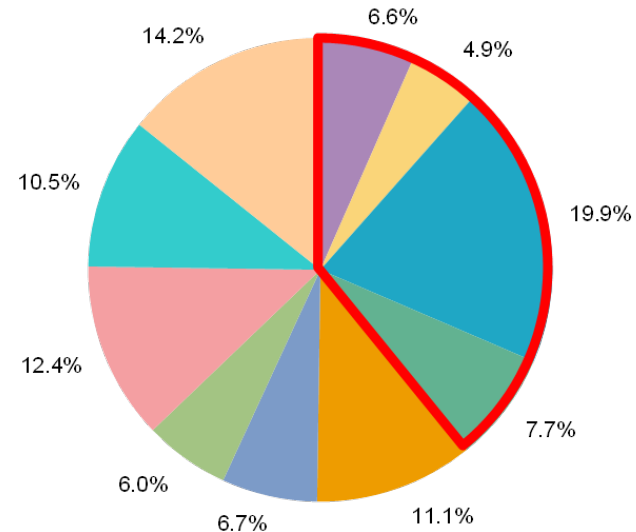
Distribution Across Sectors - Population vs. Sample

Start-ups in Germany 2005-2012



Source: Mannheim Enterprise Panel, 2012

Net Sample



Source: KfW/ZEW Start-up Panel, 2012

■ CTM
 ■ HTM
 ■ TIS
 ■ Software
 ■ NTM
 ■ SIS
 ■ BOS
 ■ COS
 ■ Construction
 ■ Trade
 ■ High-tech sectors

Four high-tech industries: Cutting-edge manufacturing, high-technology manufacturing, technology-intensive services, software and consultancy

Seven non-high-tech industries: Non-high-tech manufacturing, skill-intensive services, other business-oriented services, creative consumer-oriented services, construction, trade

Linked-Employer-Employee Data

- ❖ Linked-Employer-Employee (LEE) database for German start-ups
- ❖ Links IAB/ZEW Start-up Panel with employment biographies of the IAB (Research Institute of the German Federal Employment Agency)
 - Register data on complete employment biographies for all employees subject to social insurance contributions
 - Allows to track any changes in employment on a daily level
 - Encompasses e.g. age, sex, wages, education, unemployment spells
 - Found around 85% of founders (not all of whom necessarily appear in social insurance register)
- ❖ At the moment: Linked sample of 12.500+ start-ups
 - Linked via firm-names and addresses (SearchEngine, Doherr (2017))
 - Found nearly 90% of the firms
 - Correlation of employment size in survey and register data above 0.95