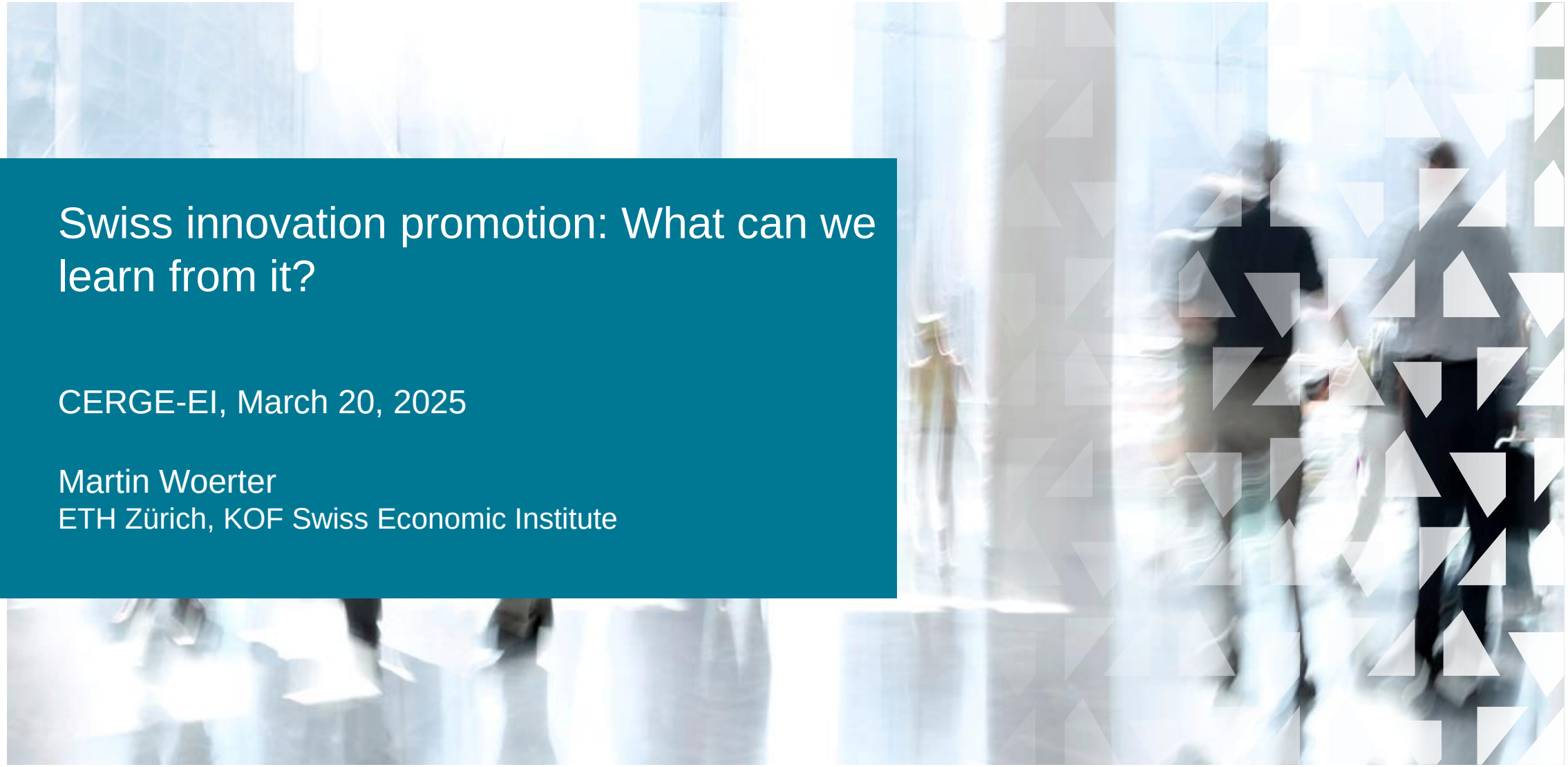

Swiss innovation promotion: What can we learn from it?

CERGE-EI, March 20, 2025

Martin Woerter
ETH Zürich, KOF Swiss Economic Institute

Content

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1. Swiss innovation performance: a look at the rankings
2. Strengths and Challenges of the Swiss innovation landscape
3. Innovation support: building on the strengths to meet challenges
4. The effectiveness of the innovation support in Switzerland
5. Can it serve as a model for other countries?

SWISS INNOVATION PEROFORMANCE: A LOOK AT THE RANKINGS

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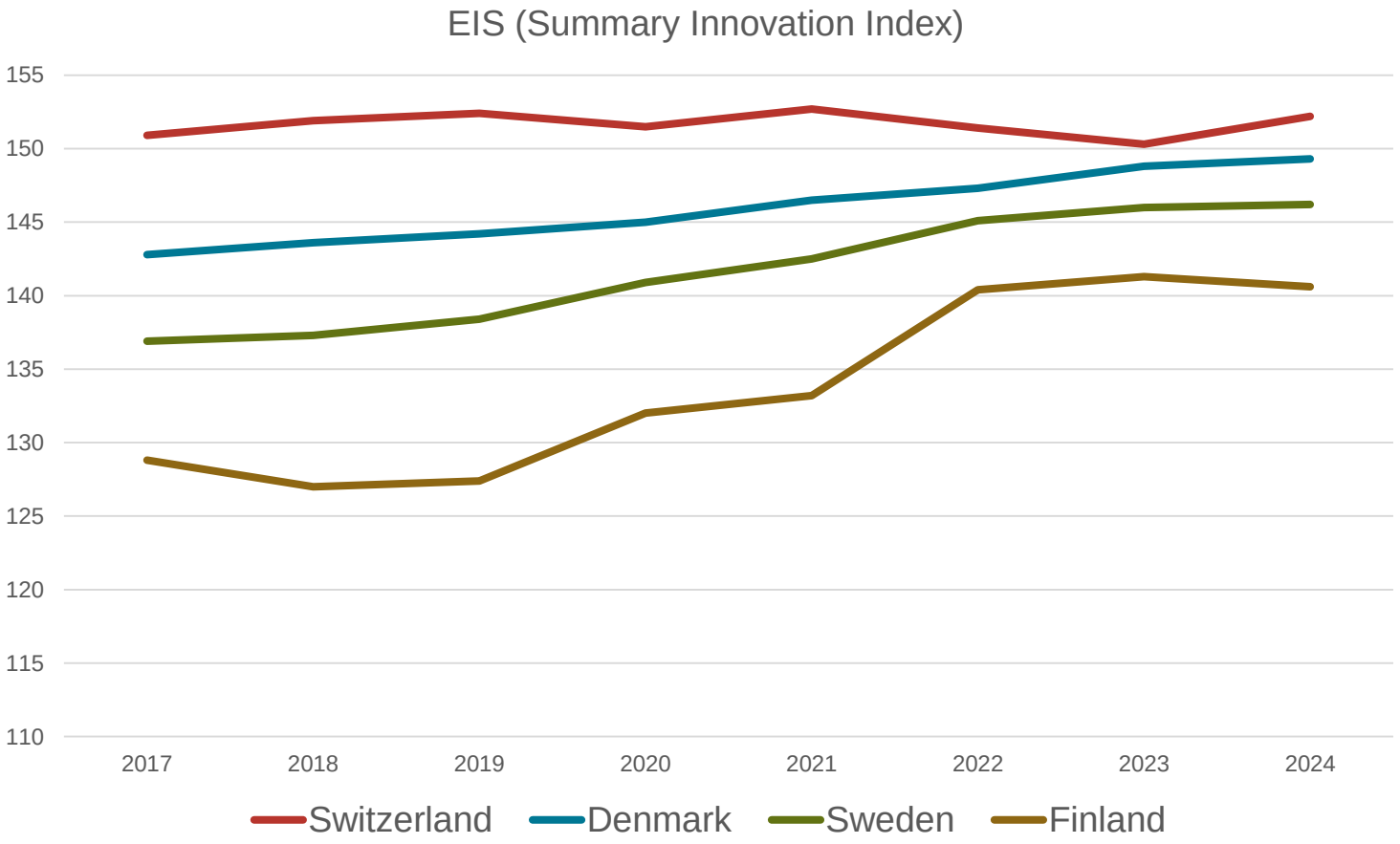
SWITZERLAND: INNOVATION LEADER ACCORDING TO EIS



- According to the European Innovation Scoreboard, Switzerland is one of the innovation leaders. And it is also one of the most innovative countries in the world.
- **The gap to the following countries decreased in the course of the years**

Source: EIS (2024)

MIND THE GAP: Government R&D support and private R&D investments

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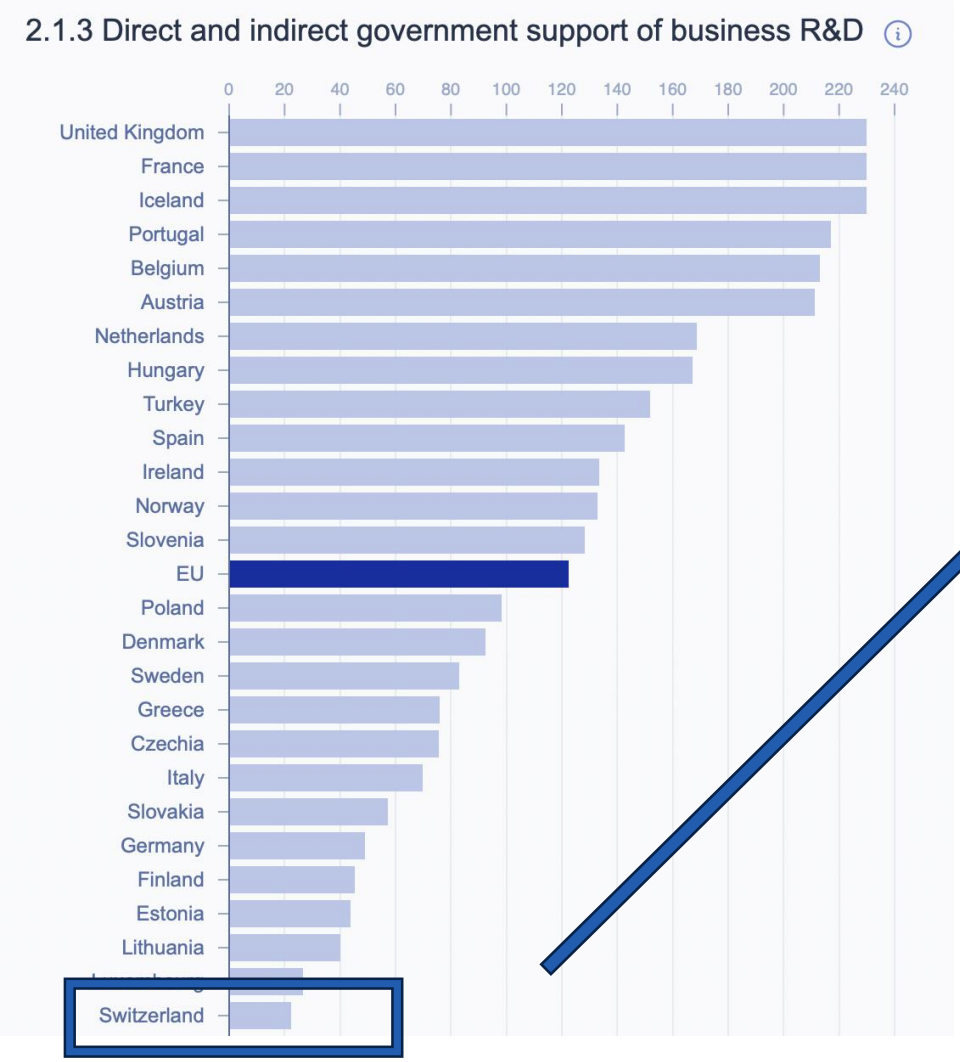

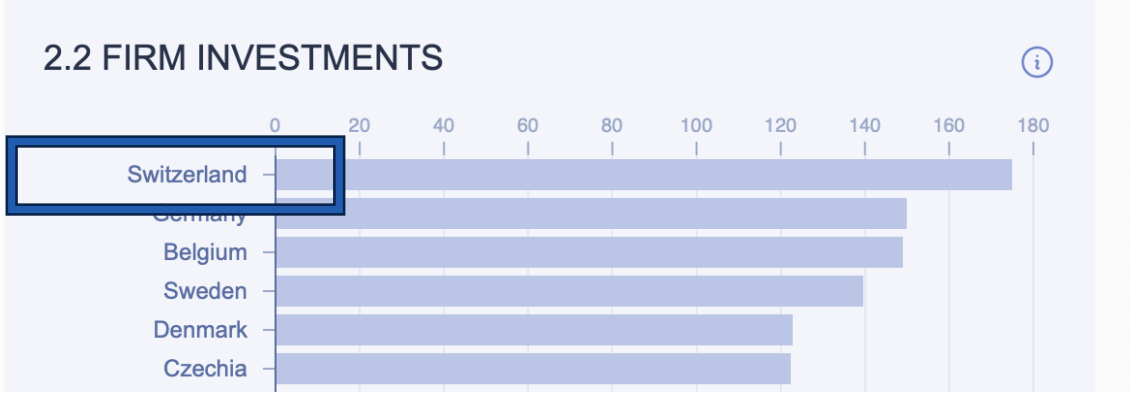

LOW SUPPORT AND HIGH PRIVATE INVESTMENTS IN R&D

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Source: EIS (2024)

GOOD FRAMEWORK CONDITIONS (for instance)

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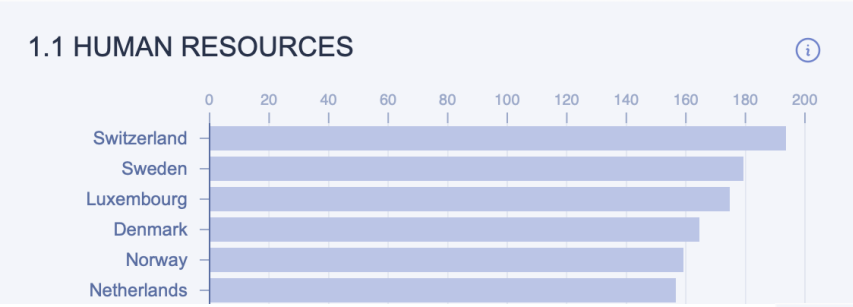

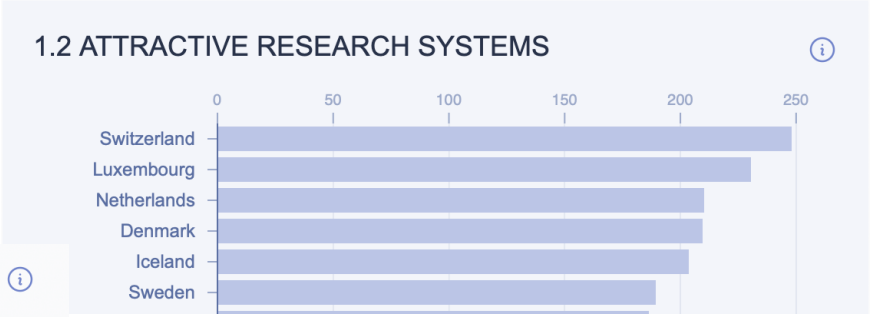

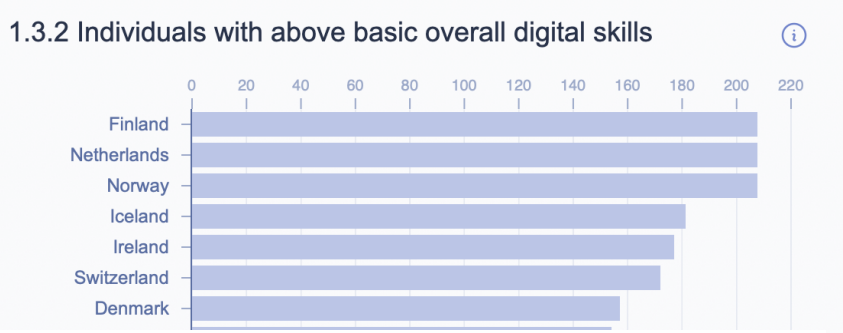

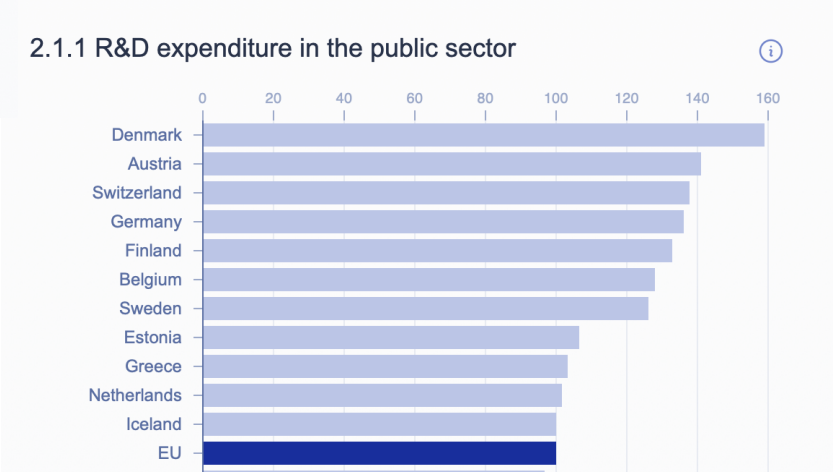

- HR: Many doctoral students in STEM, live-long-learning, population with tertiary education
- Research System: international scientific publications, most cited publications, foreign students.
- Digitalization: Share of individuals with above basic overall digital skills
- R&D expenditures in HERD and GOVERD

Source: EIS (2024)

SWISS INNOVATION PERFORMANCE: CHALLENGES

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THE MAIN CHALLENGES (IN A NUTSHELL)

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Innovation and Technology	• Switzerland's position in developing new technologies and products is being challenged • The performance distance among the innovation leaders declined

Changes in geopolitics, world trade, and international investments	• China, EU, USA have embarked on large-scale industrial subsidy programs to decrease external dependencies, increase domestic sourcing of local firms to increase self-sufficiency in key technologies
	  • US: CHIPS Act and Inflation Reduction Act, Staregate (AI initiative)
	  • EU: European chips Act (ECA), AI Champions Initiative
	  • China: to advance "strategic industries"

OECD - minimum tax	• This could mean a relative loss in attractiveness for Switzerland as a (innovation) business location.

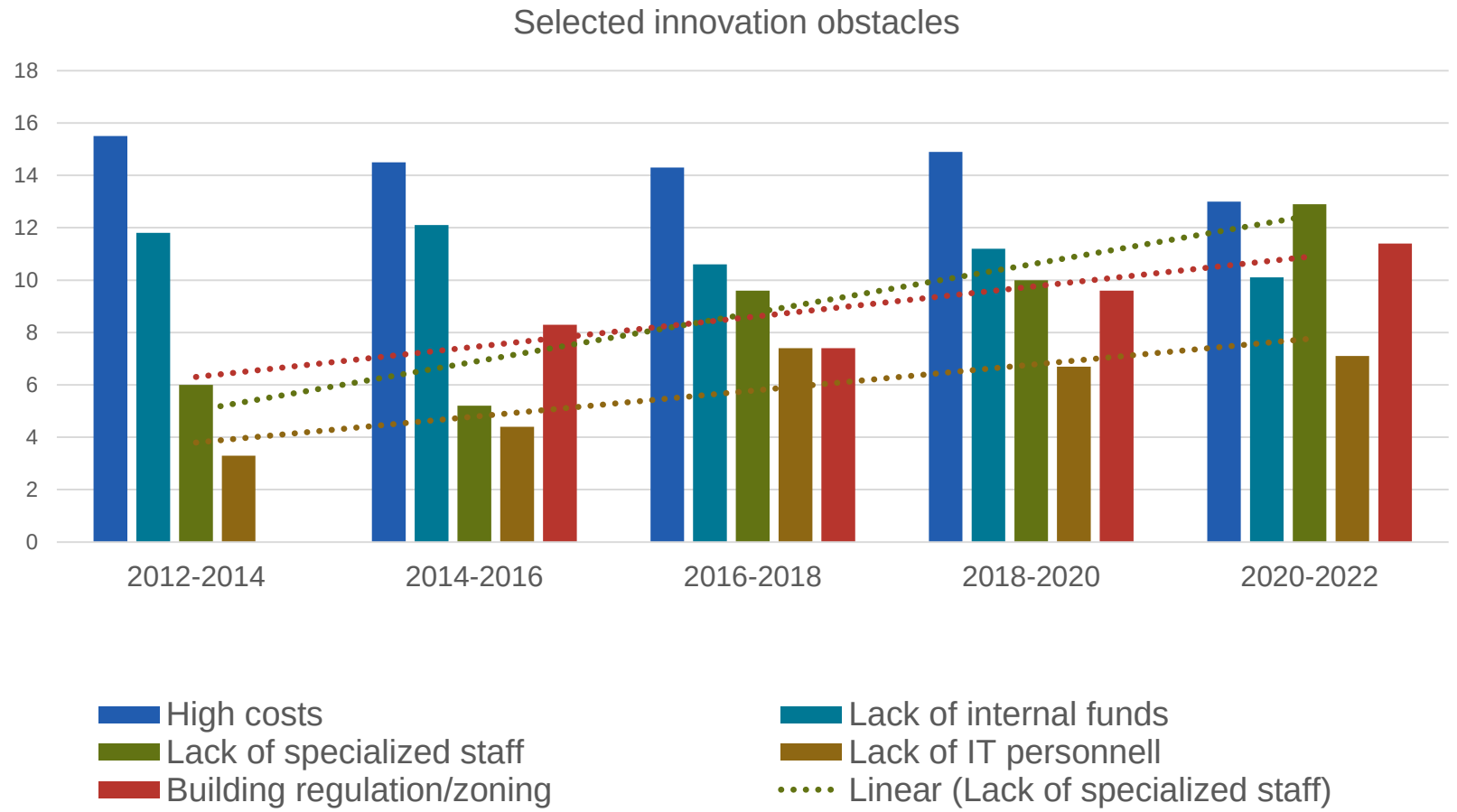
Source: Gersbach and Wörter, Challenges for the Swiss Innovation System, KOF Studies No. 177, https://doi.org/10.3929/ethz-b-000657551

Innovation challenges in detail

CHALLENGES: INNOVATION BARRIERS

- Main barriers: High Innovation costs, lack of specialized staff, building regulations/zoning
- Less important are “lack of external funds”

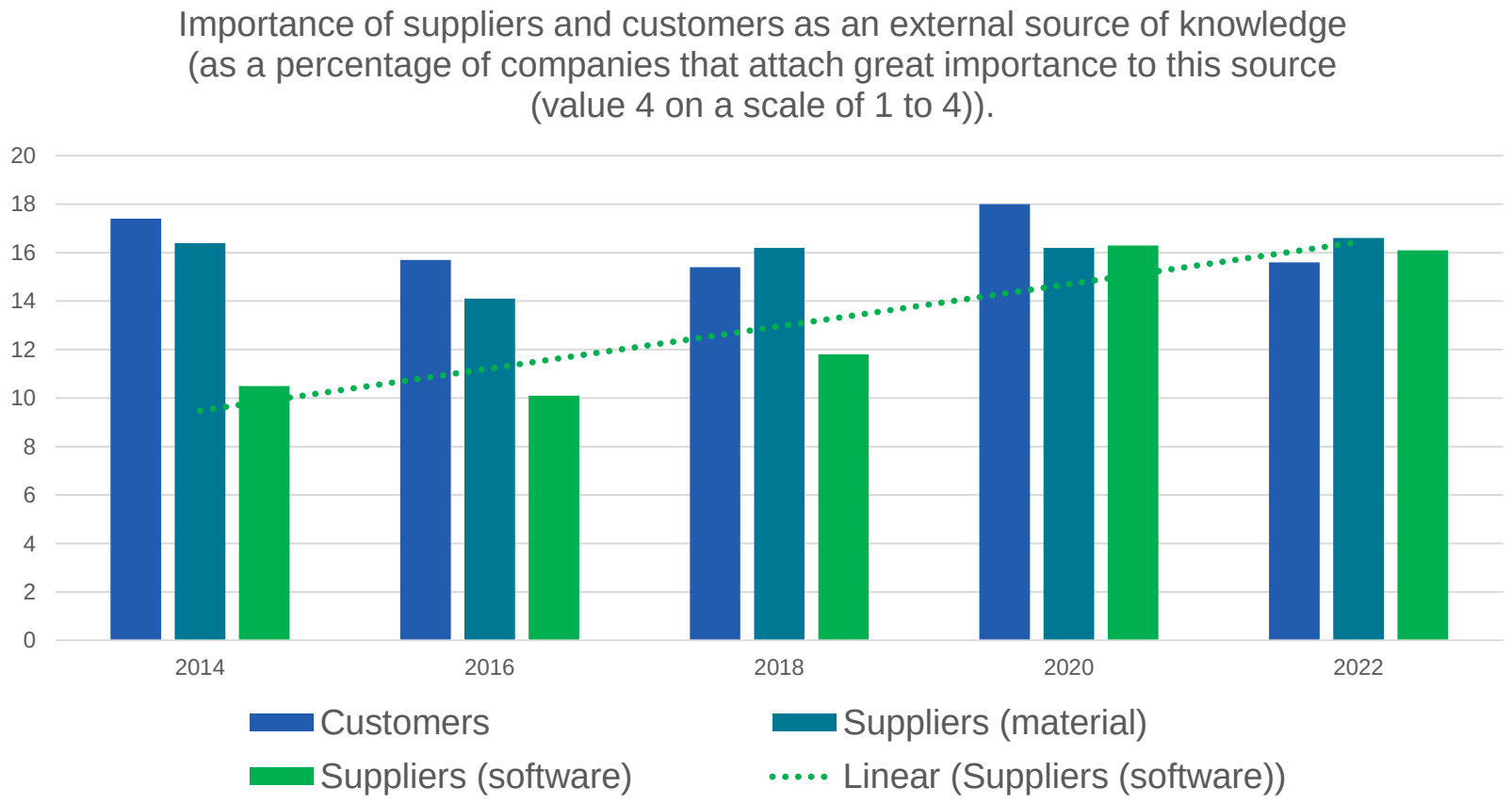
CHALLENGE: LACK OF SPECIALIZED STAFF, REGULATION, AND HIGH INNOVATION COSTS



- High innovation costs and a lack of internal capital were by far the most important obstacles for many years.
- A shortage of skilled labour/specialized staff and building regulations/zoning have become significantly more important and now rank second and third.

The graph shows the percentage of companies that attach great importance to the respective obstacle (value 4 on a 4-point scale).

CHALLENGE DIGITALISATION: DEPENDENCY ON (INTERNATIONAL) SOFTWARE PROVIDERS



- Suppliers and customers are often very important sources of knowledge for a company's innovation activities.
- Suppliers of software have become much more important.
- This indicates the high relevance of digitization for innovation performance.

CHALLENGE: CONCENTRATION OF R&D ACTIVITIES

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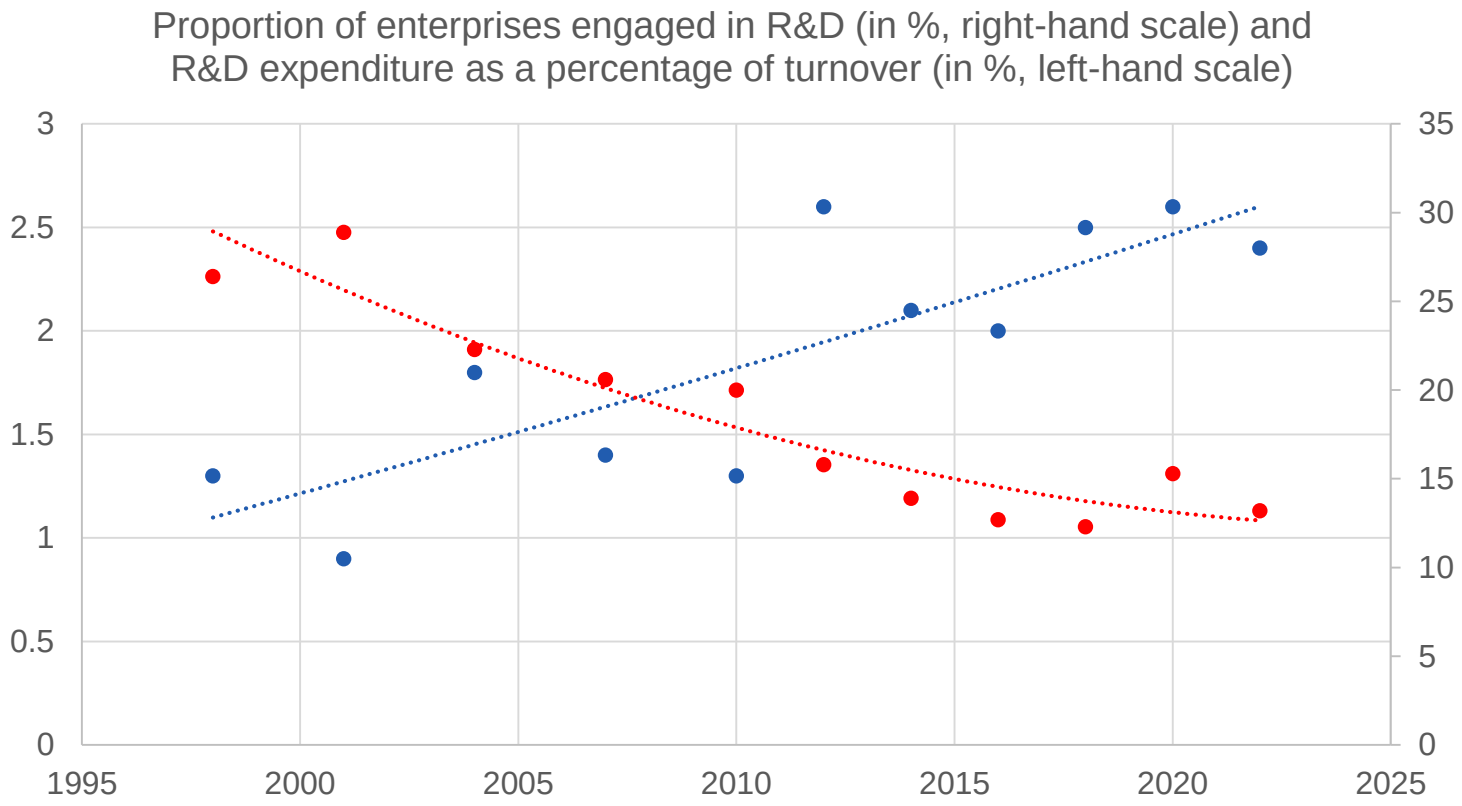

- Significant increase in the share of R&D spending in total economic output
- Decreasing share of companies active in R&D
- Increasing concentration of R&D activities. Fewer companies spend relatively more in R&D
- **MIGHT REDUCE THE ABSORPTIVE CAPACITY OF THE ECONOMY AS A WHOLE**

CHALLENGE: LOWER INNOVATION DEPTH (1)

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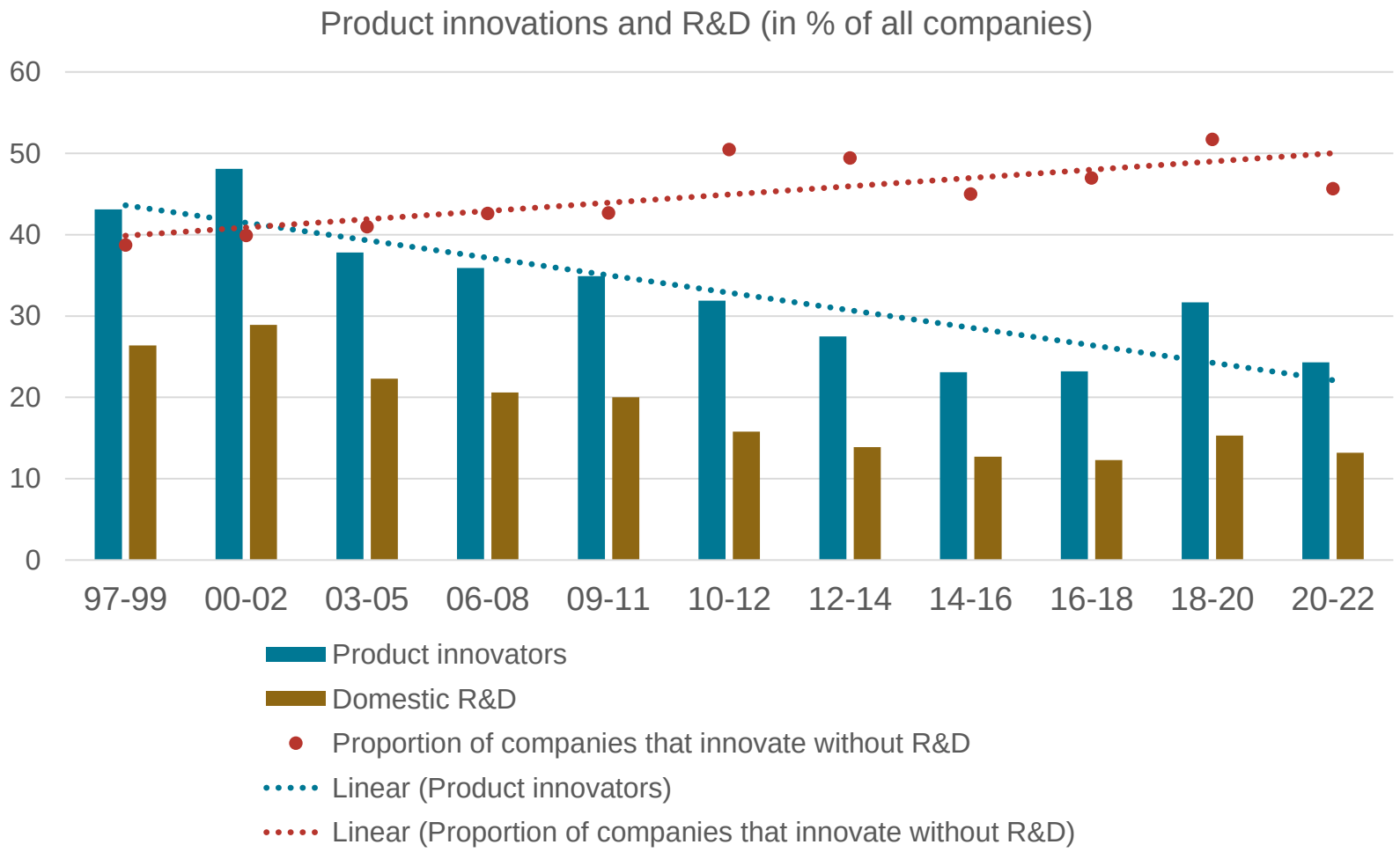

- Decline in the share of companies with product innovations over the whole period
- However, since 2014-16, the share of companies with product innovators increased
- Over time, the share of companies with product innovations without R&D has increased.

THIS COULD REDUCE THE INNOVATION DEPTH OF NEW PRODUCTS AND SERVICES

CHALLENGE: LOWER INNOVATION DEPTH (2)

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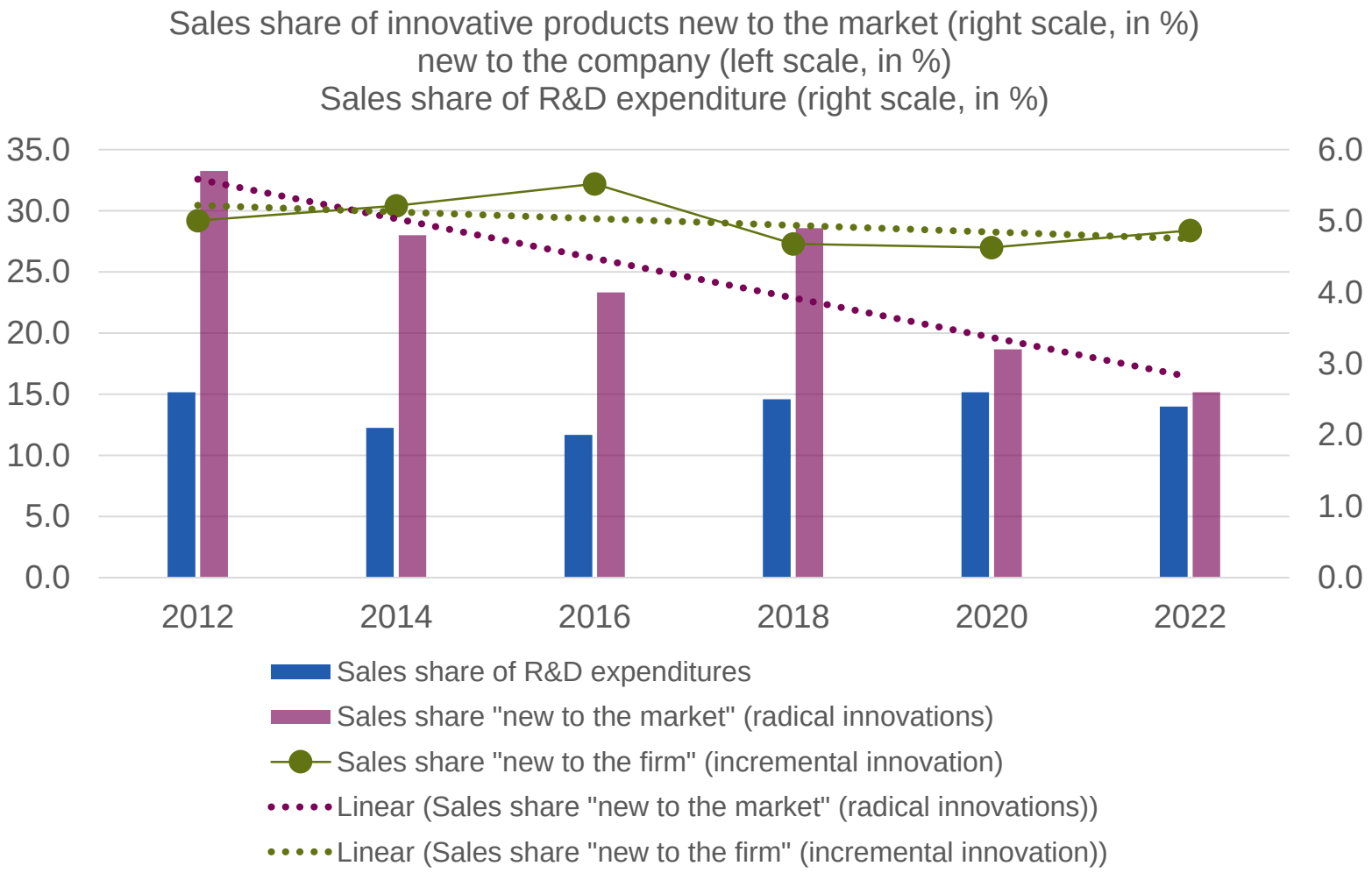
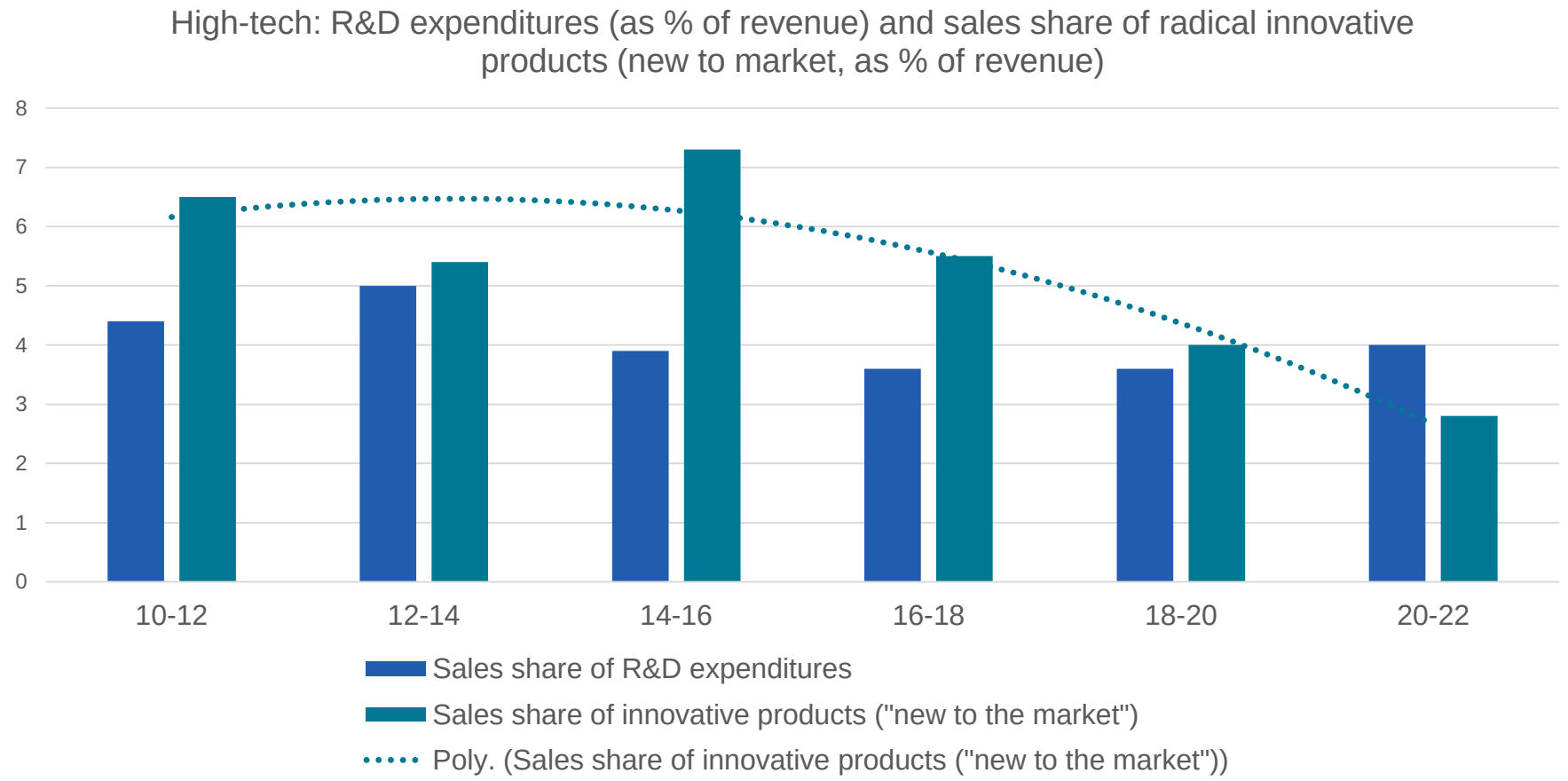


Base: innovative companies

- Relatively constant share of sales from innovative products
- Clear differences in the development of the sales shares of radical innovations (new to the market) and incremental innovations (new to the company)
- Constant development of the R&D share of sales
- **IT HAS BECOME MORE DIFFICULT TO DEVELOP PRODUCTS WITH GREAT MARKET POTENTIAL (HIGH INNOVATION DEPTH).**

CHALLENGES: INTERNATIONAL INNOVATION COMPETITION (E.G., HIGH-TECH SECTOR)



- Constant share of R&D spending in sales
- Declining share of sales of innovative products that are new to the market (radical innovations)
- Indicates a declining competitive advantage – stronger (international) competition.

HOW TO APPROACH THE CHALLENGES: THE SWISS INNOVATION SUPPORT SYSTEM

The rationale behind innovation support

The rationale behind innovation support

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Market failures

In a perfect market economy, private firms would best know how much they should invest in R&D. Government intervention would only lead to misallocations. In a real market economy, however, we **observe several market failures, especially in connection with innovation activities.**

1

Output from R&D is **partly a public good** that creates knowledge spillovers. Other firms can use the results without themselves having to pay the full R&D costs. This means that the **social returns to R&D are higher than private returns** and firms underinvest in R&D from a social perspective.

2

R&D projects are risky, and their **outcomes are uncertain**. Public innovation support allows firms to pursue risky projects that they would not have executed otherwise.

3

Firms often face difficulties in raising capital for R&D due to **imperfect financial markets**, because potential investors and creditors do not have access to all necessary information. They may therefore refrain from investing or lending credit.

Government support

These three types of market failures can make **support of R&D activities of firms by the government desirable**.

Innovation support in Switzerland

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The Swiss innovation support system

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The success of the Swiss innovation system rests on **several pillars, e.g.**:

- High quality universities
- Good infrastructure
- Competitive product and factor markets
- A technological/engineering focus based on vocational education
- Political stability

The innovation system in Switzerland **builds on this strong foundation**.

The organization and implementation of the **innovation support in Switzerland is bottom-up**. Firms and universities have to take the initiative. There are only few and small-scale top-down programs.

Federal level

SNSF: Basic research at universities, but also NCCR, NRP

Innosuisse: supports innovation mainly through **knowledge and technology transfer (KTT)** between private firms and public universities. Other Innosuisse instruments are networking, coaching, and project set-up support as well as direct support of start-ups.

Cantonal level

Art. 15 (RIPA)

Innovation-parks

R&D tax credits

Patent boxes

Corporate tax incentives, support for start-ups, and the creation of clusters and regional networks

International level

E.g., EU framework programs for research and innovation (i.e., Horizon 2020 / Horizon Europe), Eurostars.

The Innosuisse model

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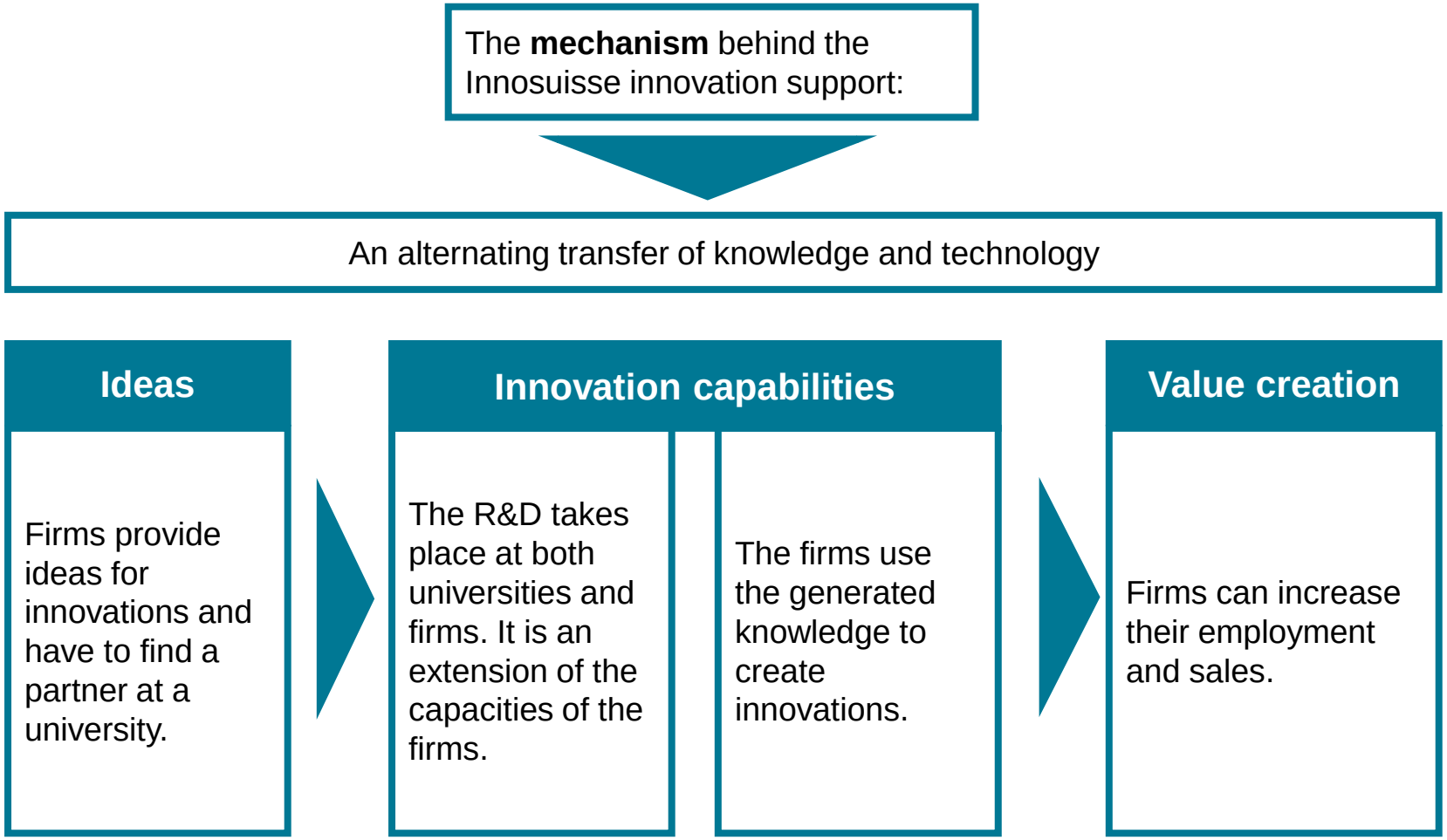
Some facts about the Innosuisse Innovation support:

The main funding instrument of Innosuisse supports **R&D cooperation between private firms and public universities** in the form of joint innovation projects.

Extension of knowledge capacities	Shared costs	Annual budget	Funding policy	Clients
In contrast the innovation support in most other countries, Innosuisse does not just provide funding, but instead allows for an **extension of the knowledge capacities of the firms**. The support comes in the form of **access to qualified research personnel and an accompanying infrastructure**.	Innosuisse covers the **costs arising at the universities**, while the firms have to contribute **their own financial means**. The split between public and private funds is **50%-50%** (as a rule**).**	The **annual budget** of Innosuisse for the funding of joint innovation project ranged over the years 2019-2023 between **140 and 170 million CHF**. The average contribution of Innosuisse to the innovation projects has been about 360’000 CHF.	Innosuisse aims to fund **high quality projects** with a high market potential, but at the same time also tries funding those innovation projects that would **otherwise not have been pursued**.	Innosuisse explicitly **targets small and medium-sized firms, but also start-ups and spin-offs (about 30%)**. Given this target clientele, the size of the average innovation project is substantial

The mechanism behind the Innosuisse support

An alternating transfer of knowledge and technology



THE EFFECTIVENESS OF INNOSUISSE SUPPORT

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Data sources

Data sources

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KOF Enterprise Panel

- Stratified random sample representative for the Swiss economy
- Only firms with more than 5 employees
- 9500 firms
- Stratified on geography, firm size, and industry
- Response rates between 25% and 40%

Basis for multiple survey waves

Population of Innosuisse applicants

Information recorded for all firms that have applied for Innosuisse funding

Basis for three survey waves (e.g., addresses)

Full data

Surveys conducted by KOF

- Swiss Innovation and Digitalisation Survey (2011, 2013, 2015, 2017, 2019, 2021, 2023)
- Swiss Digitalisation Survey (2016, 2020)
- Swiss Knowledge Transfer Survey (2011, 2018)

Innosuisse Survey (2019, 2021, 2023)

Detailed data on the innovation project level for all Innosuisse applicants

Final dataset

- Comprehensive firm-level dataset ranging from 2010-2022
- 3220 unique firm-year observations with 920 unique firms, of which 383 are funded firms and 537 are control firms
- Three cohorts of funded firms: 2017-2018, 2019-2020, and 2021-2022

Results

Firm employment outcome

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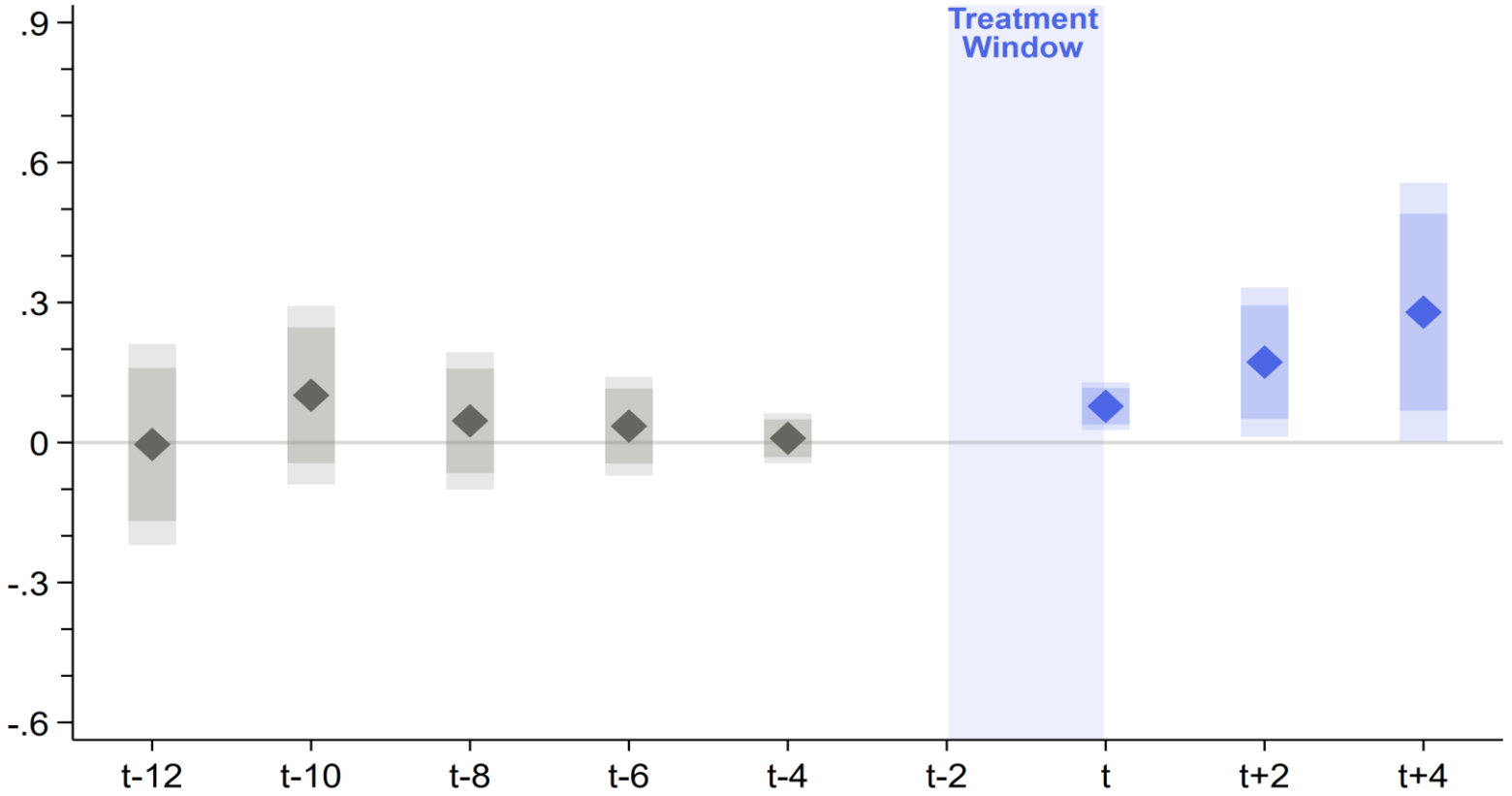

Note: The lighter shaded bands ( ) correspond to 99% and the darker shaded bands ( ) to 95% confidence intervals.

Year	ln(Employment$_{it}$)
Effects	
t	0.078 (0.020)
t+2	0.172 (0.062)
t+4	0.279 (0.108)
Average	0.176 (0.049)
Placebos	
t-4	0.009 (0.021)
t-6	0.035 (0.041)
t-8	0.046 (0.057)
t-10	0.101 (0.074)
t-12	-0.004 (0.084)
Average	0.038 (0.045)
Firm-years	3220
Treated	1144
Control	2076

- The figure and the table show the **differences in employment** between the firms in the treatment group and the firms in the control group. Before the treatment, both groups develop similarly, while **after the treatment** (i.e., the Innosuisse funding) **they diverge**
- In our baseline specification, the Innosuisse funding shows **statistically significant effects on employment** that increase over time, with an **average effect of 17.6% after five years**.

Firm sales outcome

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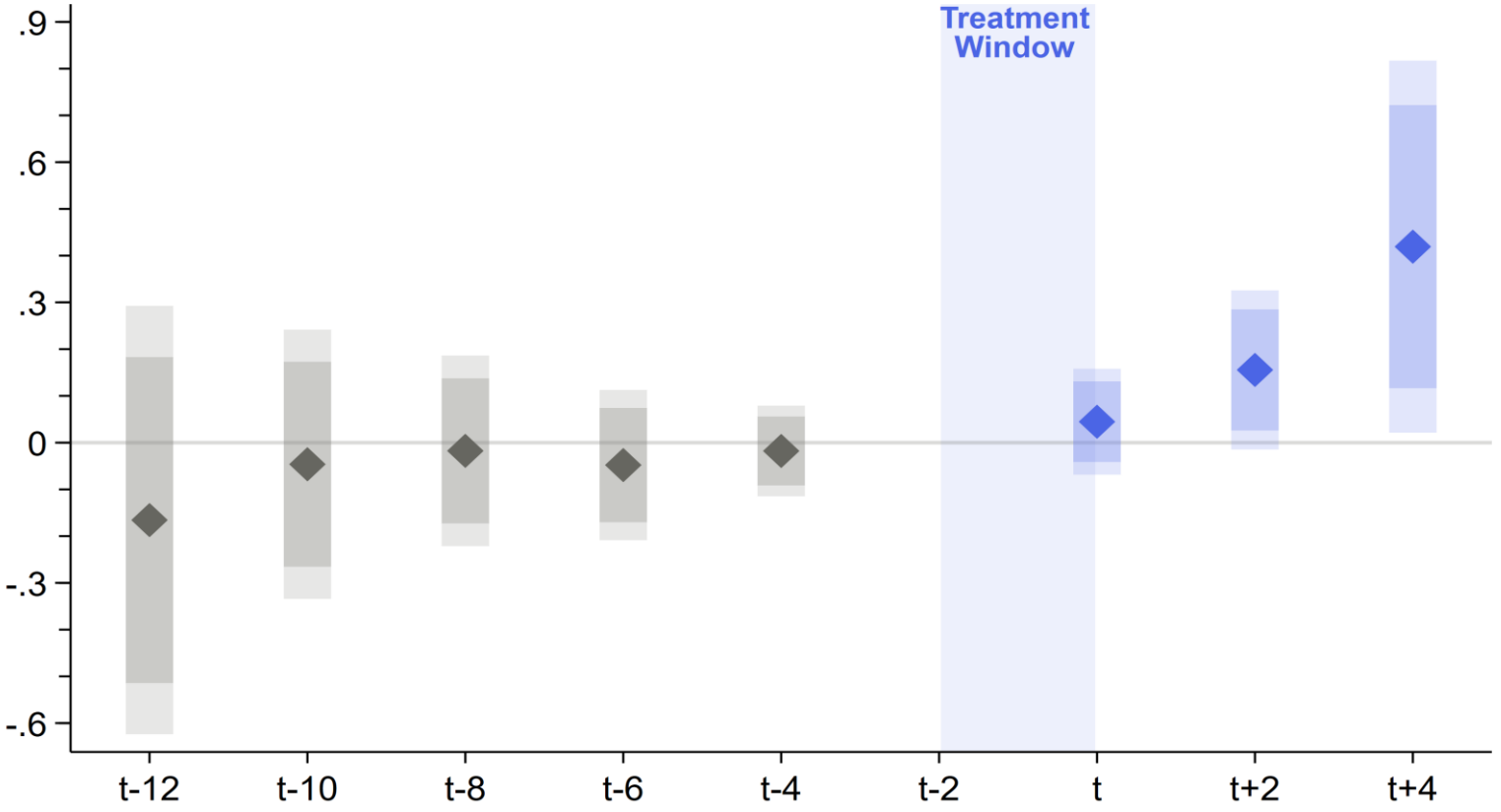

Note: The lighter shaded bands ( ) correspond to 99% and the darker shaded bands ( ) to 95% confidence intervals.

Year	$\ln(Sales_{it})$
Effects	
t	0.045 (0.044)
t+2	0.156 (0.066)
t+4	0.419 (0.154)
Average	0.207 (0.063)
Placebos	
t-4	-0.018 (0.038)
t-6	-0.048 (0.062)
t-8	-0.018 (0.079)
t-10	-0.046 (0.112)
t-12	-0.166 (0.178)
Average	-0.059 (0.077)
Firm-years	2866
Treated	944
Control	1922

- The figure and the table show the **differences in sales** between the firms in the treatment group and the firms in the control group. Before the treatment, both groups develop similarly, while **after the treatment** (i.e., the Innosuisse funding) **they diverge**
- In our baseline specification, the Innosuisse funding shows **statistically significant effects on sales** that increase over time, with an **average effect of 20.7% after five years**.

Heterogeneity of employment effects: Firm sizes

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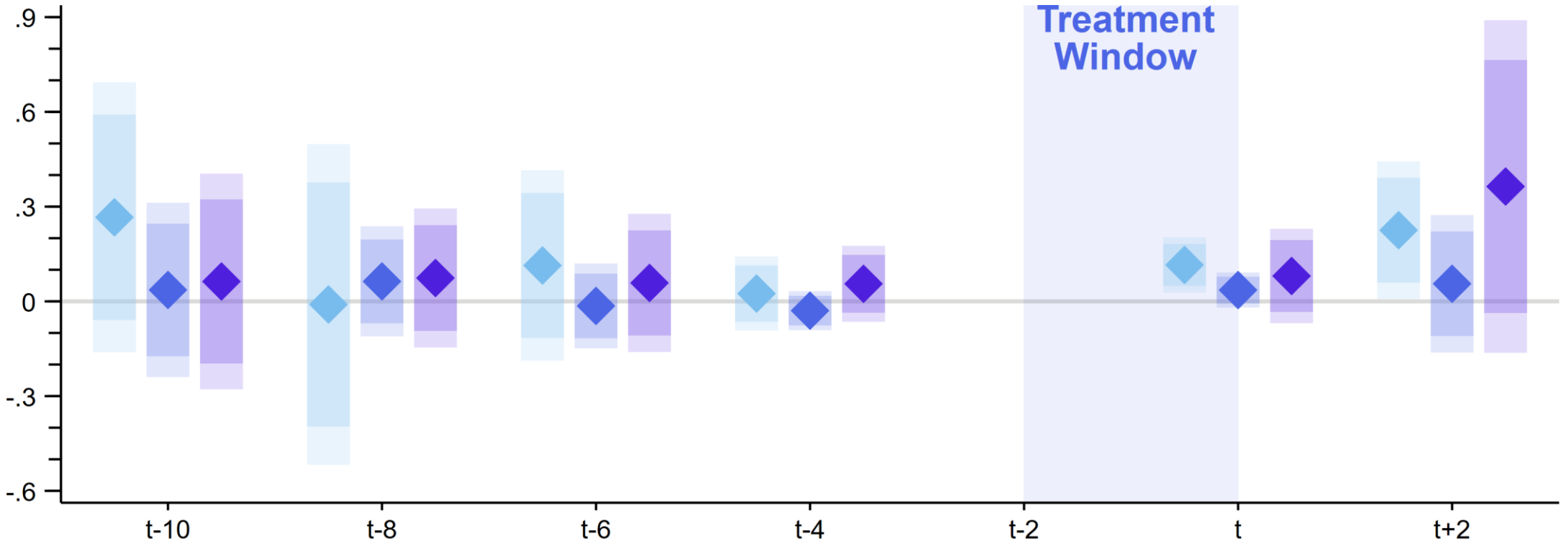

Note: The lighter shaded bands correspond to 99% and the darker shaded bands to 95% confidence intervals.

Small firms with between 5 and 50 employees (◆) and large firms with more than 250 employees (◆) show **positive and increasing effect sizes**. Medium-sized firms with between 50 and 250 employees (◆) show comparatively smaller increases in effect sizes. Importantly, the effects on employment are **statistically significant only for the small firms**. This is because they can rely on larger sample sizes than the medium or large firms, which increases the precision of the estimates.

Heterogeneity of employment effects: Higher education institutions

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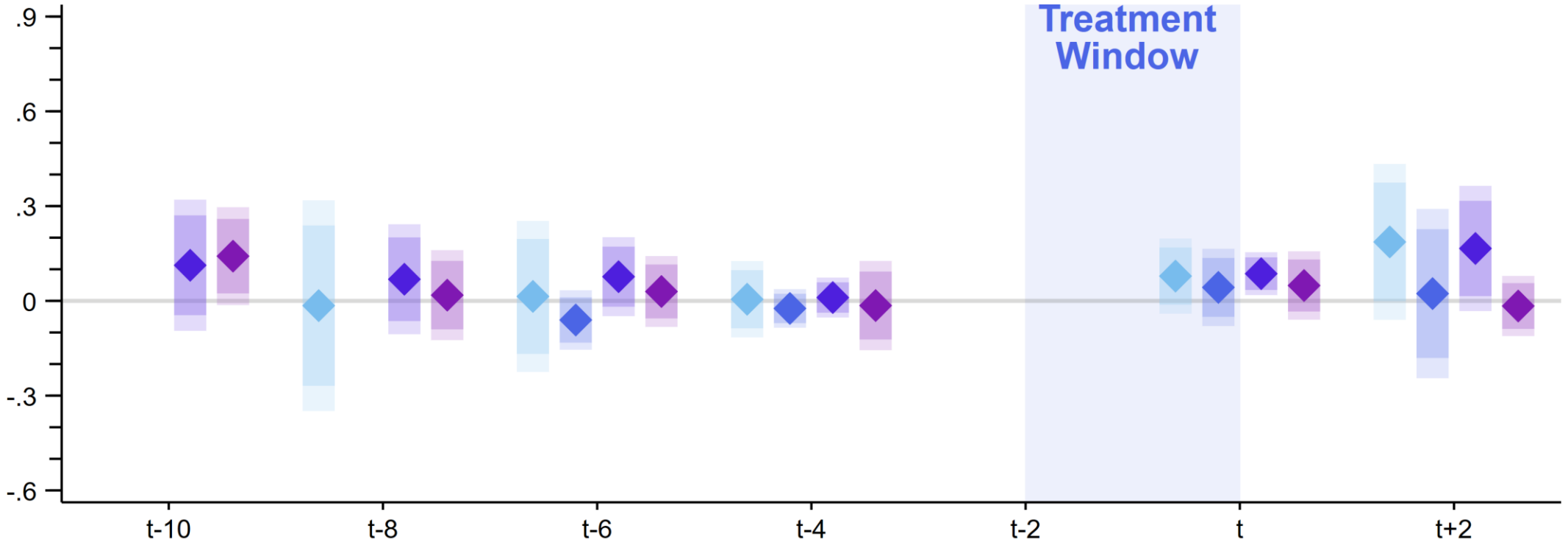

Note: The lighter shaded bands correspond to 99% and the darker shaded bands to 95% confidence intervals.

When the funded firms are split by their research partner, we see **small positive but statistically significant effects** of the Innosuisse funding on employment in year "t" for the ETH domain (◆) and for the universities of applied sciences (◆). The universities (◆) and the research institutions and government agencies (◆) show statistically insignificant effects. We see the same pattern two years after the treatment in "t+2", whereby the effects for the ETH domain and the universities of applied sciences **have increased by even more**.

SUMMARY OF THE RESULTS

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Results	• Public funding from Innosuisse has a **positive** effect on both **firms' sales** and **employment**. • A joint innovation project funded by Innosuisse increases firm sales **by about 21%** and **employment by about 18%** on average **over the next five years.** The funding effects thereby increase over time.
Heterogeneity	The funding effects are particularly **strong** for **small firms**, **innovation projects with the ETH domain** and **the universities of applied sciences**, and in the field of the engineering sciences.

CAN IT SERVE AS A MODEL FOR OTHER COUNTRIES?

SOME PRECONDITIONS (necessary but maybe not sufficient)

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Good universities	• To attract international students, PhDs, and researchers • Incentives for publications, transfer, and education • Good (technical) infrastructure • Efficient regulations of IPR
High investments in basic research	• Rational for small countries: benefits from investments in basic research are local • It provides knowledge, graduates, and technology for the business sector
High absorptive capacity of the business sector	• High share of the manufacturing sector, in particular the research-intensive sectors, on total GDP • High R&D expenditures • Skilled workforce
Access to international markets	• To leverage the investments in basic and applied research • To gain access to local knowledge to complement domestic knowledge.

INVESTMENTS IN BASIC RESEARCH: HOW MUCH? (see Gersbach et al. 2021)

Some determinants	• Stage of the economic development of a country • Share of R&D-intensive industries (high-tech) on total GDP • Openness of the economy • Share of domestic firms owned by foreign companies
General rule	• A country should invest more in basic research the **closer** it is to the **technological frontier**, the **bigger the manufacturing sector** and the **more open** it is.

SUMMARY

SUMMARY

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Switzerland is an innovation leader with relatively low direct and indirect government support for business R&D and high and constantly increasing business R&D expenditures.

Challenges:

- High innovation costs, lack of specialized staff, regulation (e.g. building laws)
- Dependency on international software providers
- Concentration of R&D activities (absorptive capacity)
- Keeping innovation depth high (radical innovations).
- Increasing international competition

SUMMARY

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Features of Innovation promotion:

a) Attractive framework condition for innovation and R&D activities.

- good universities
- good infrastructure
- high skilled employees
- attractive tax system, political and macroeconomic stability
- access to international markets, etc.

b) ”Bottom up” innovation promotion

- mainly indirect support for innovation through knowledge and technology transfer between universities and private companies.

c) Rigorous scientific evaluation of the main funding instruments and comprehensive quantitative monitoring of the support mechanisms.

Under certain conditions, the Swiss innovation promotion program can serve as a model for other countries and complement or replace existing support instruments.

Thank you for your attention

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CONCENTRATION OF R&D ACTIVITIES BY SIZE CLASS (SME)

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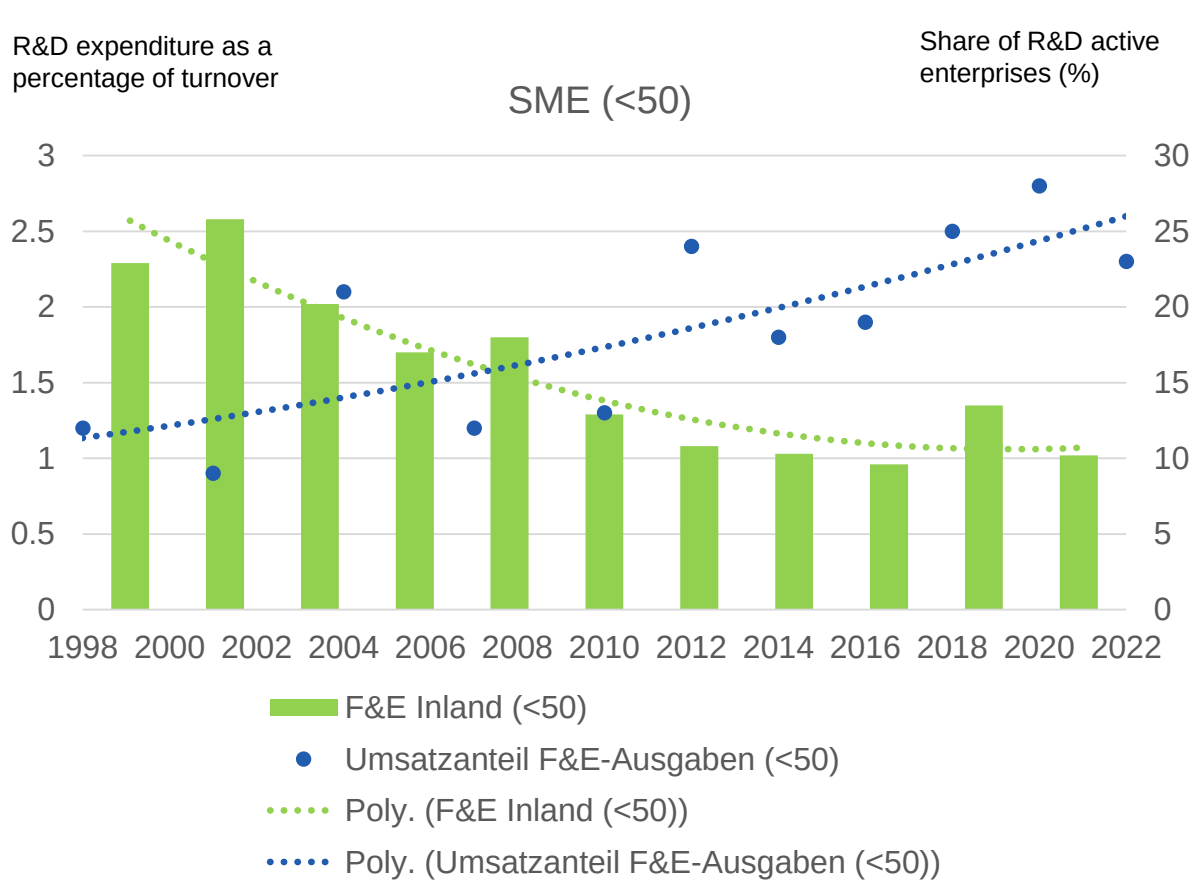

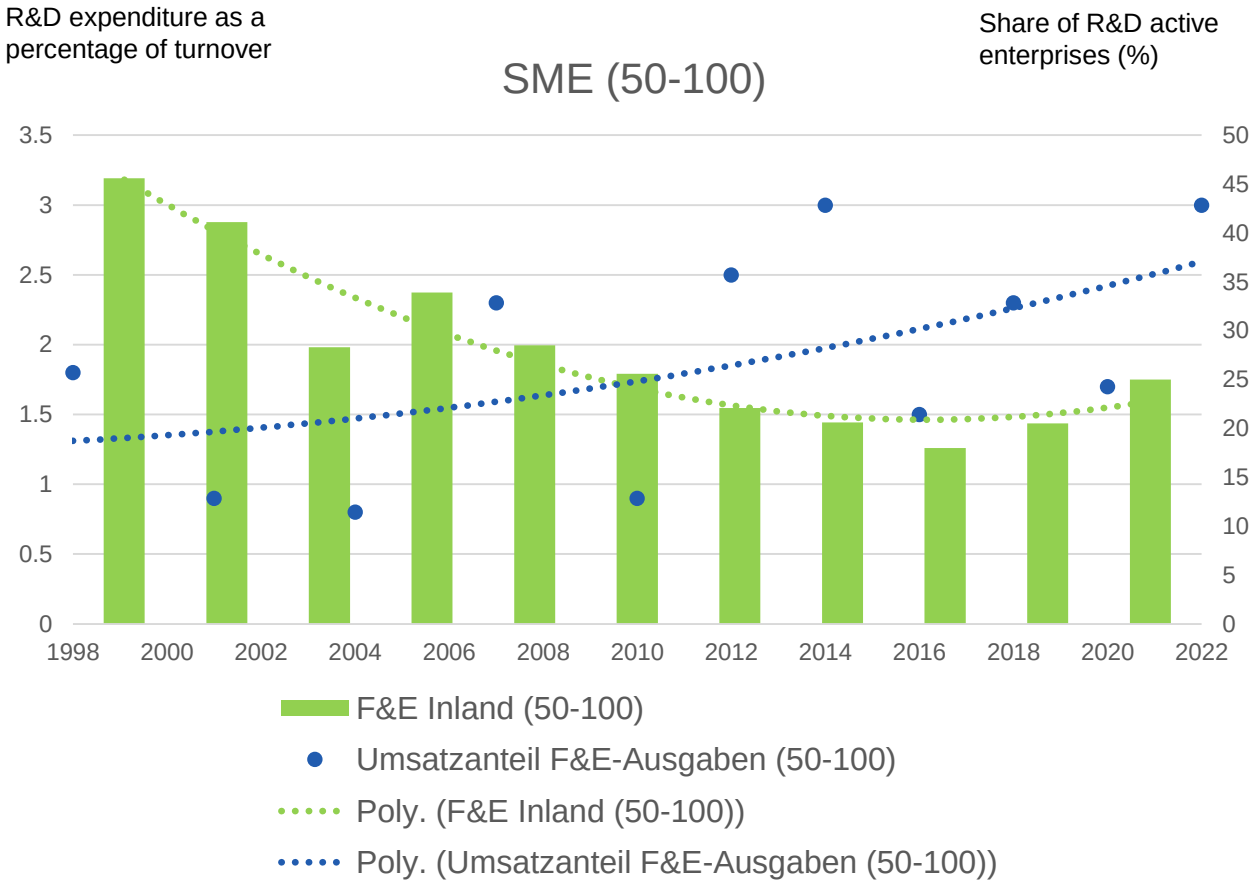

F&E Aktivitäten und Multifaktorproduktivität (2015=100)

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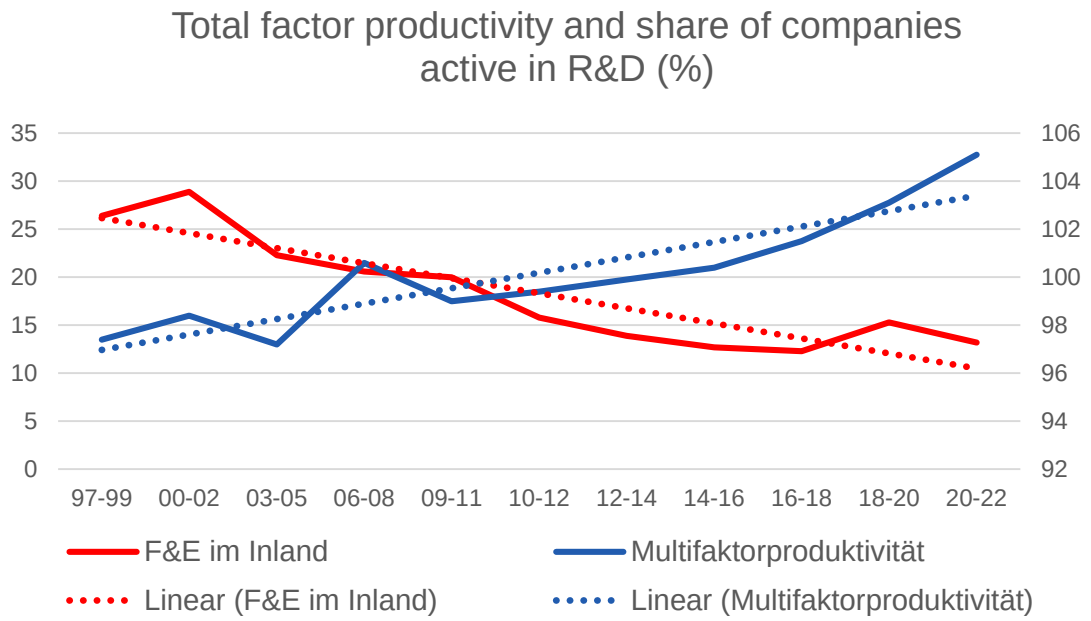
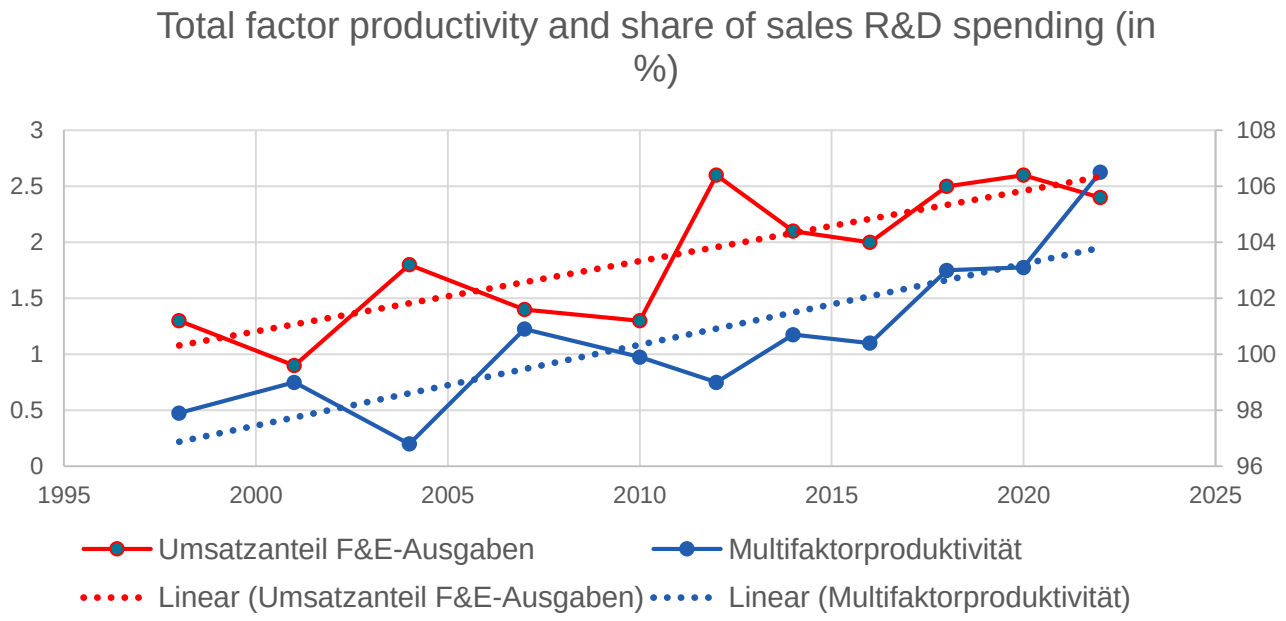




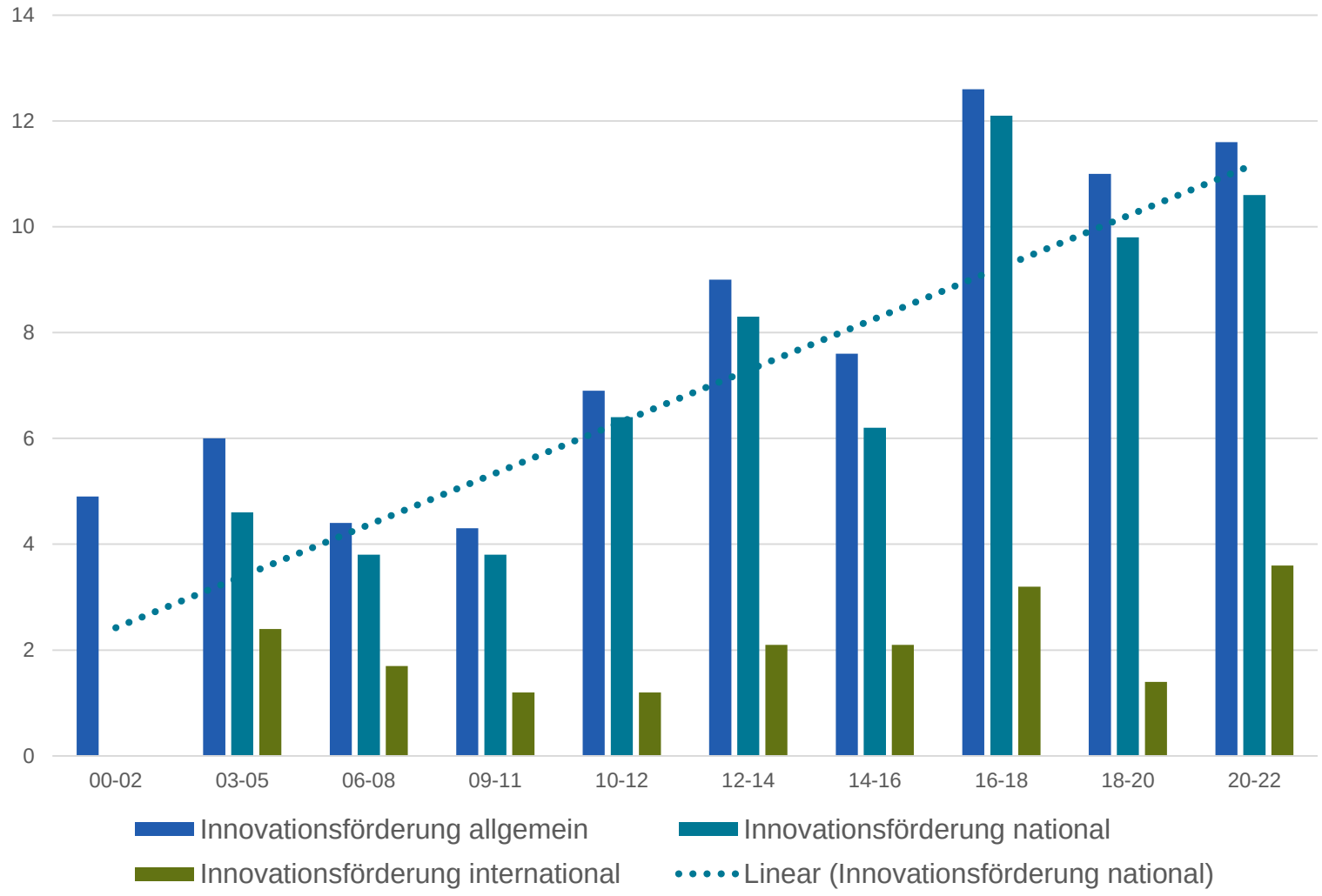
Correlation: -0.69

Correlation: +0.82 (t-1)

The declining share of companies actively engaged in R&D has at least not prevented productivity growth.

Innovationsförderung mit neuen Instrumenten

INNOVATION SUPPORT IS GAINING IN IMPORTANCE

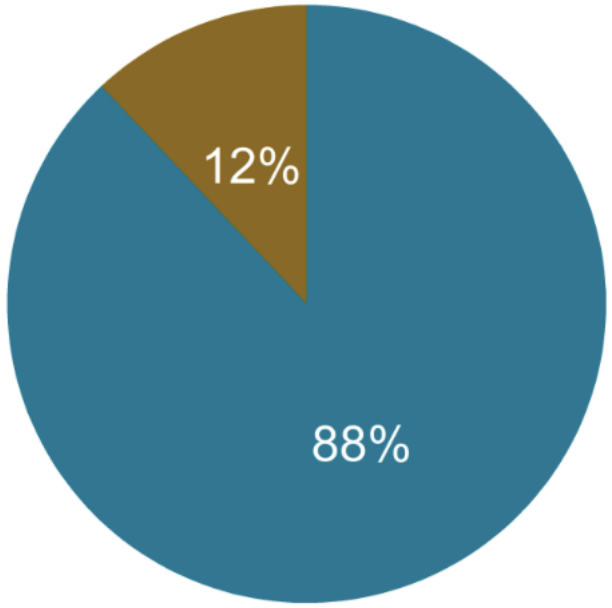


Basis: innovative companies (in %)

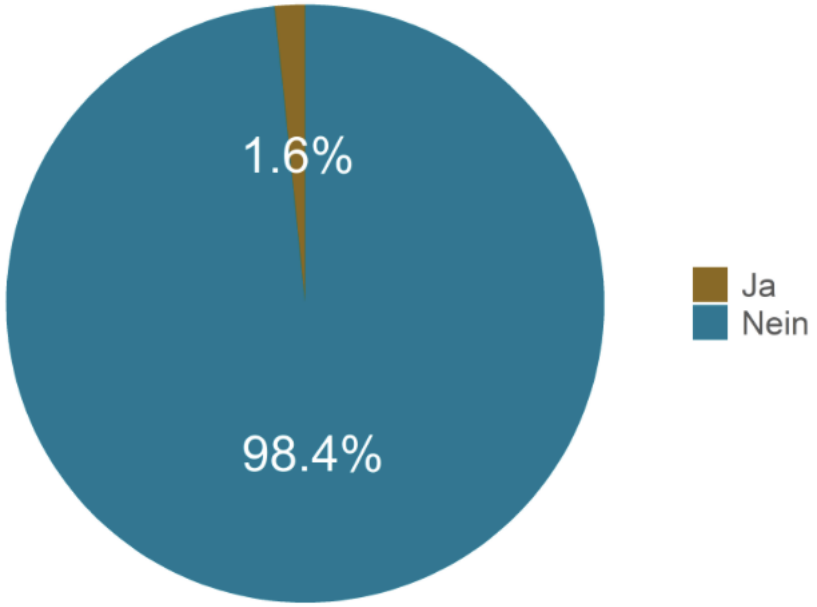
The proportion of innovative companies with national innovation funding has increased significantly.

NEW FUNDING INSTRUMENTS AT CANTONAL LEVEL

Tax credits for R&D spending



Tax deductions for profits from patents



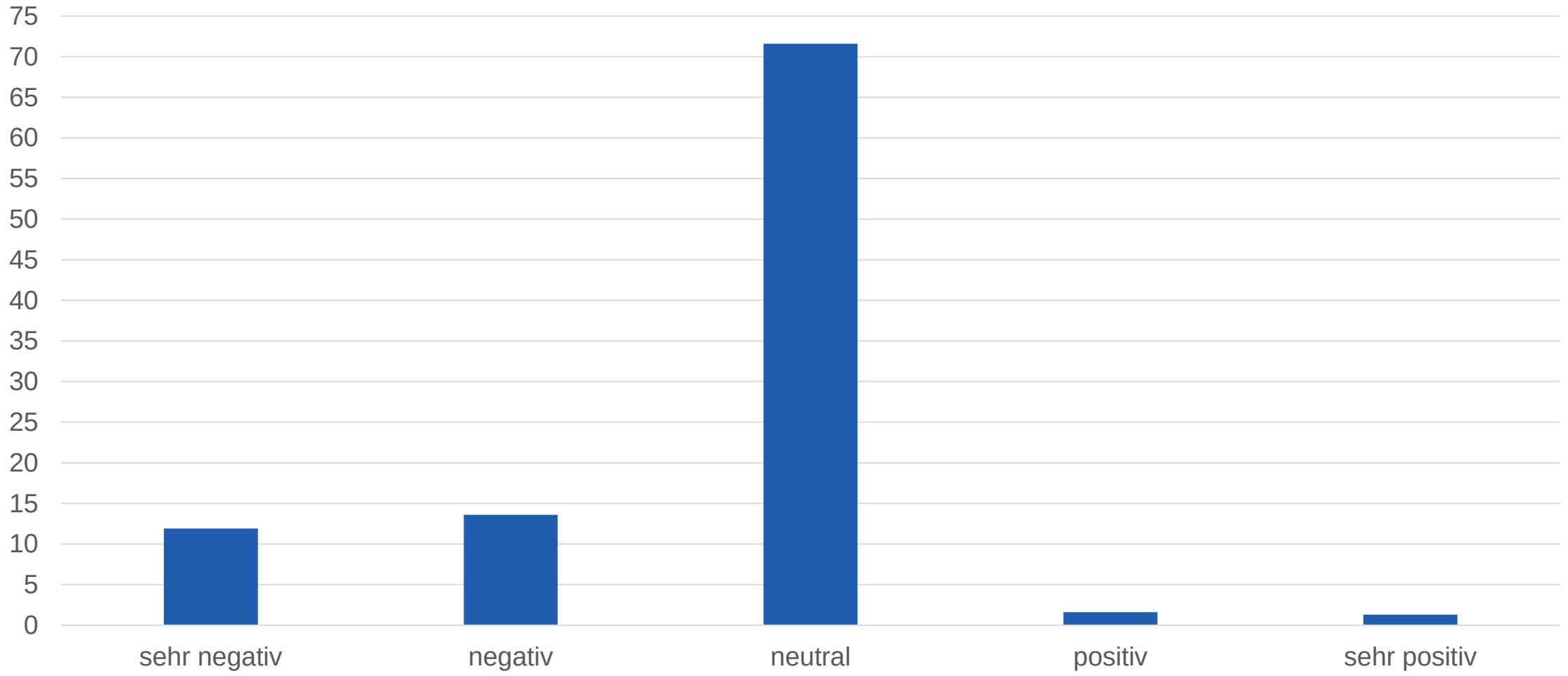
Basis: innovative companies

The high proportion of companies with regional funding may be related to the new funding instruments (R&D deductions and patent box).

The patent box is still not widespread (less than 3% of companies apply for patents).

12% of innovative companies can benefit from increased tax deductibility of R&D expenses at the cantonal level.

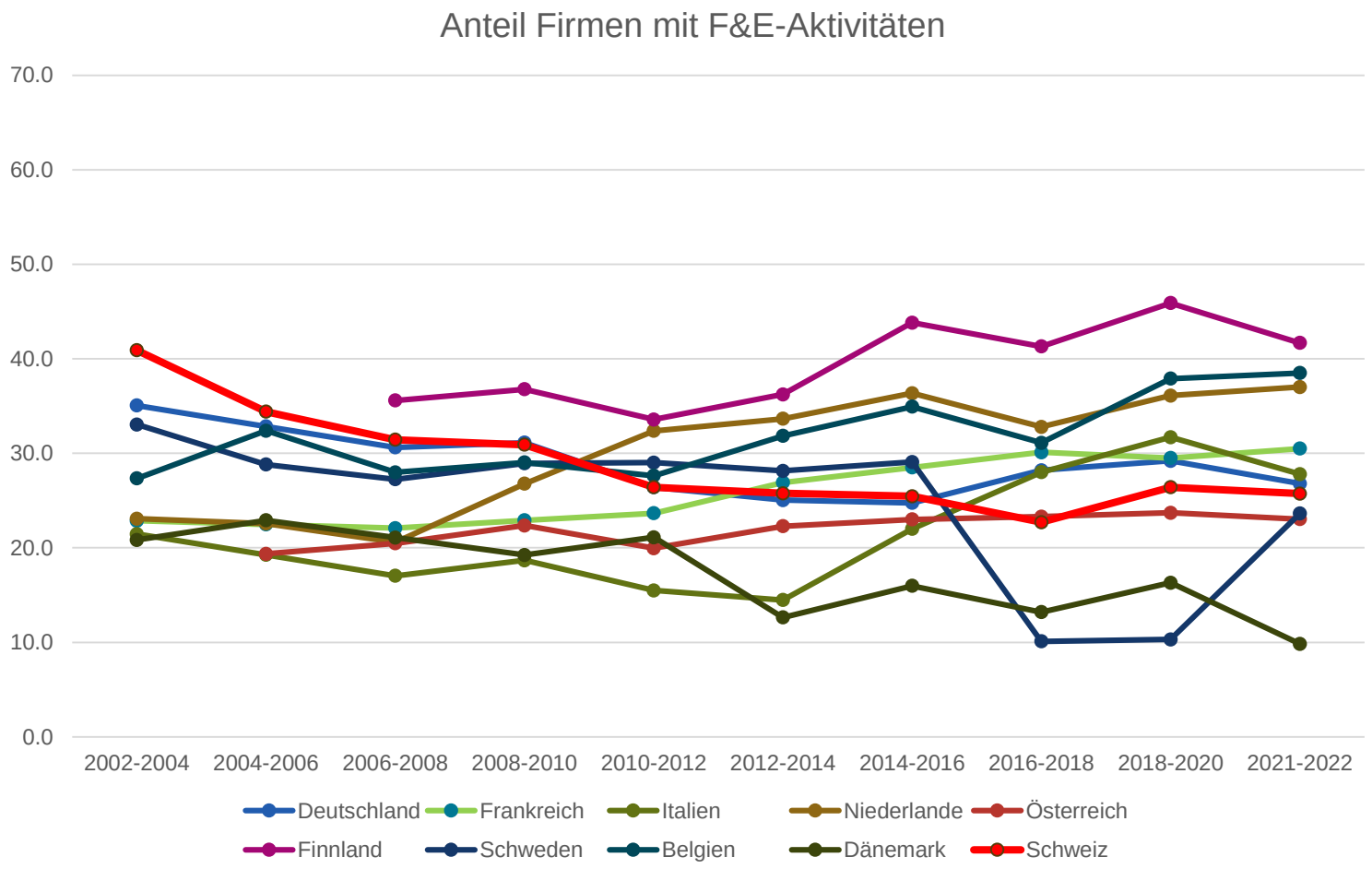
HORIZON EUROPE: A QUARTER OF INNOVATIVE COMPANIES VIEW EXCLUSION (IN PART) NEGATIVELY



Basis: innovative companies (in %)

INTERNATIONAL COMPARISON

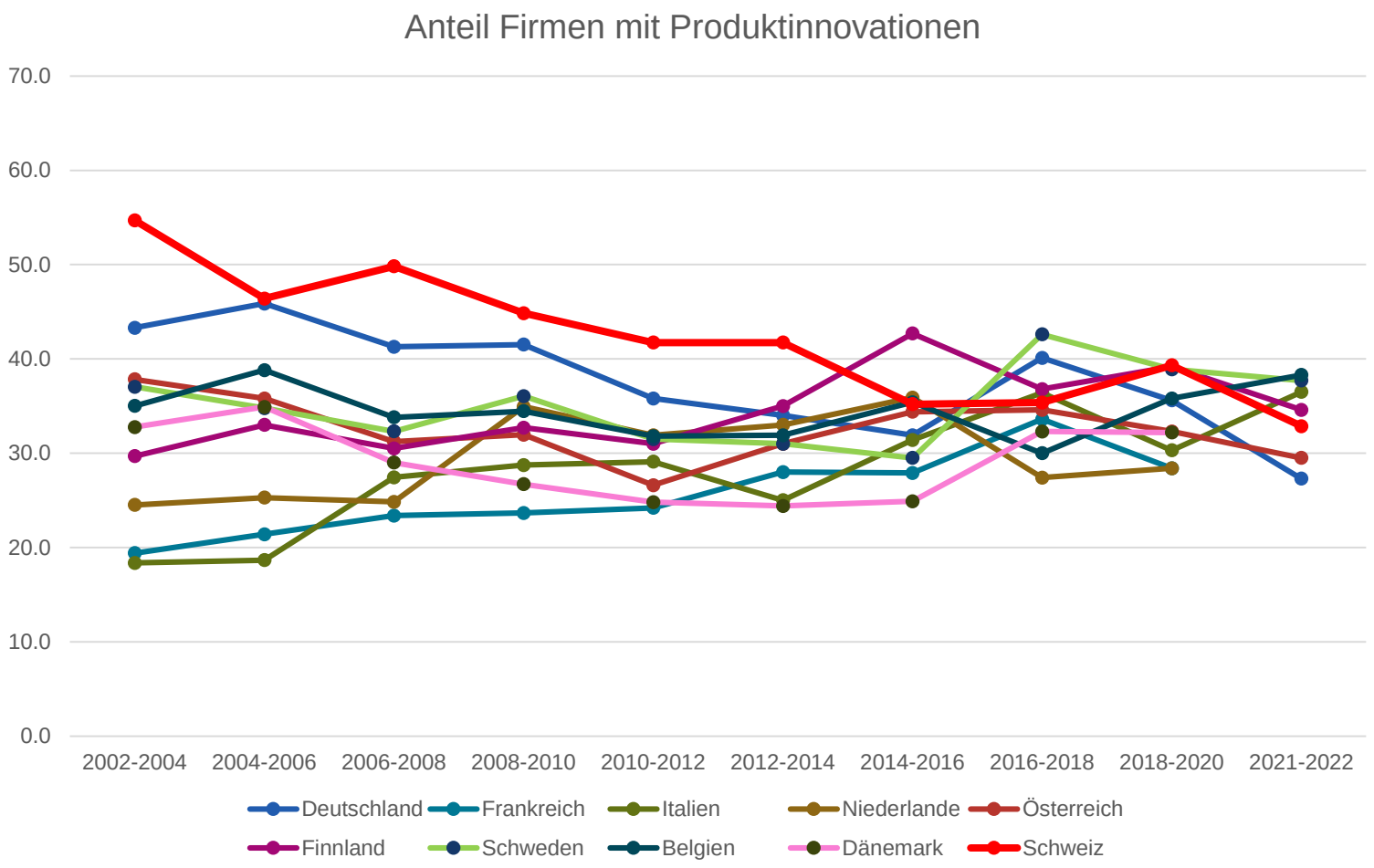
Innovation input: Switzerland in the middle range



In a European comparison, Switzerland is in the middle range in terms of the proportion of companies actively involved in R&D.

Increasingly large differences between countries

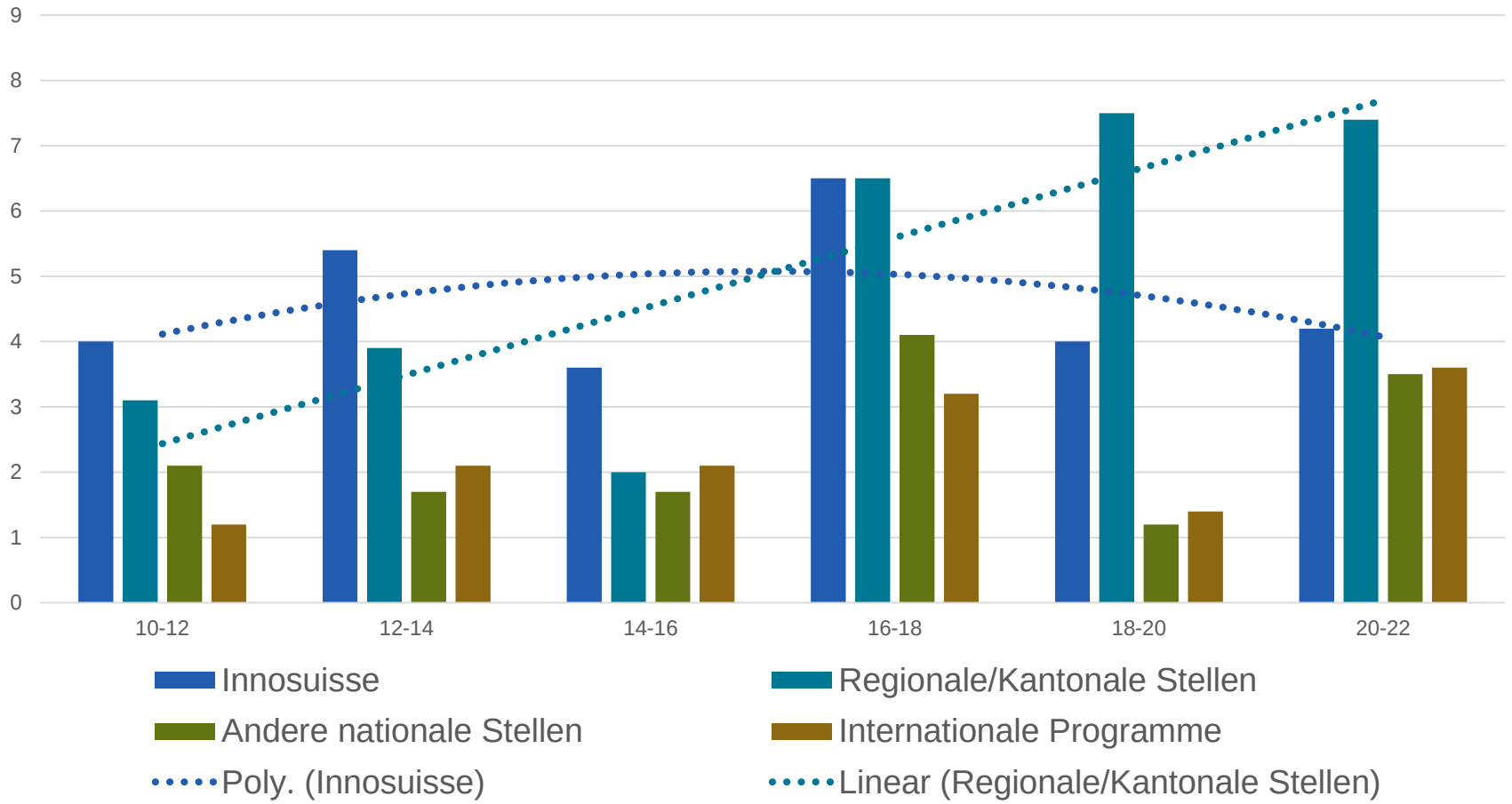
Innovation output: product innovations



Share of companies with product innovations: Switzerland in the middle range

At the current margin, very small differences between the countries compared

CANTONAL SUPPORT WITH A CLEARLY POSITIVE TREND



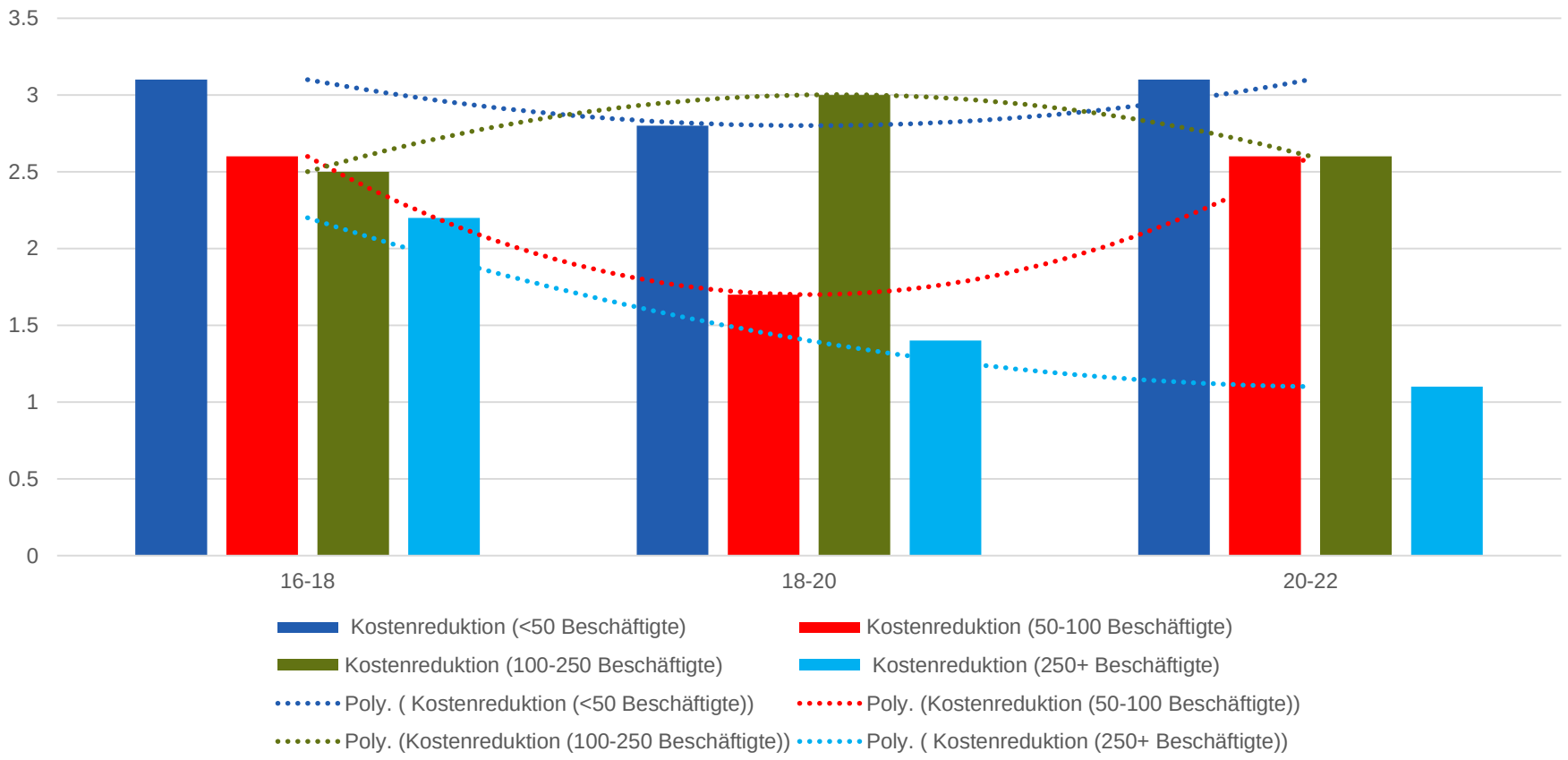
- Positiver Trend beim Anteil innovativer Unternehmen mit kantonaler Innovationsförderung
- Innosuisse-Förderung mit stabilem Trend - trotz sinkender F&E-Quote
- Uneinheitliche Entwicklung bei der internationalen Förderung

Basis: innovative companies (in %)

High cost pressure for small SMEs

PROCESS INNOVATION WITH HIGH COST SAVINGS FOR SMALL COMPANIES

Cost reduction due to process innovations (as a percentage of production costs)



Uneven development by company size

SMEs achieve significantly higher cost savings (as a percentage of production costs)

Significant increase in cost savings for smaller SMEs

This indicates greater cost pressure for SMEs