THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

LOCAL ECONOMIC IMPACT OF LARGE RESEARCH INFRASTRUCTURES PROCUREMENT

Riccardo Crescenzi and Gabriele Piazza

London School of Economics and Political Science

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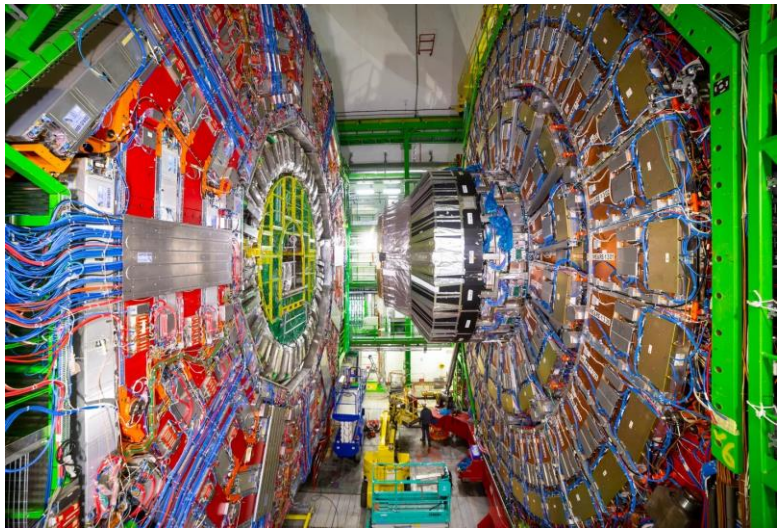
Outline

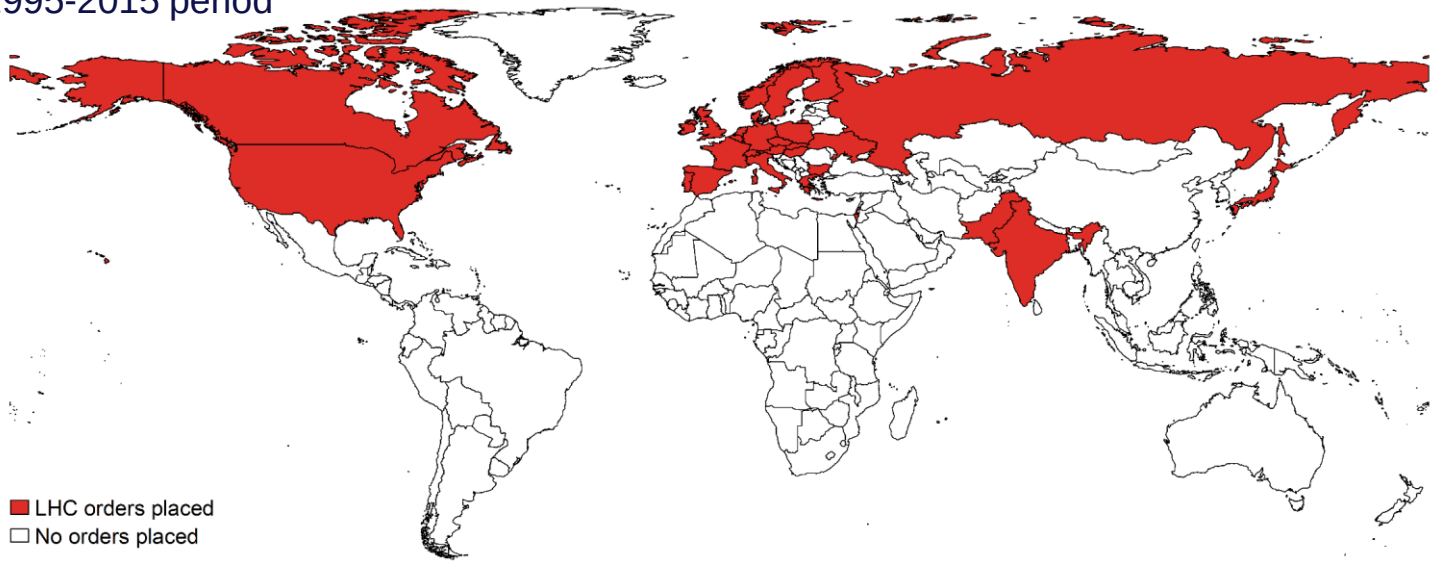
- **Motivation and aims**
- Case study
- The conceptual framework
- Counterfactual approach: Trajectory Balancing Method
- Main results
- Conclusions

There are different channels through which Research Infrastructures can have a socio-economic impact



From blue sky research to down-to-earth (local) benefits

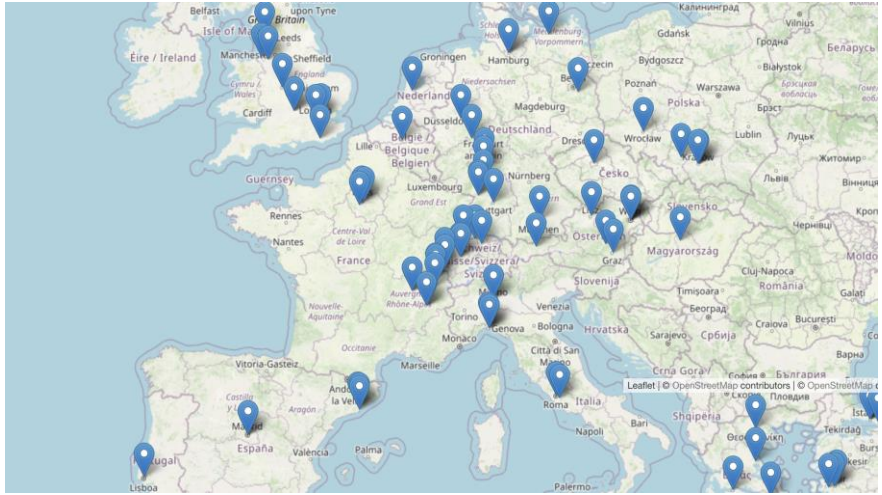
Approx. 4,200 firms located in 47 countries have collaborated with CERN for the LHC project during the 1995-2015 period

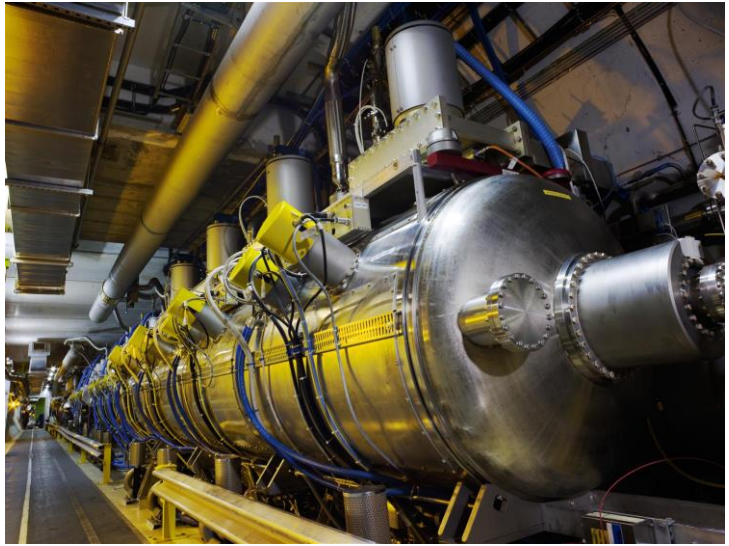


Source: CERN procurement 1995-2015

Understanding the local economic impacts of RIs can help secure political support for future projects

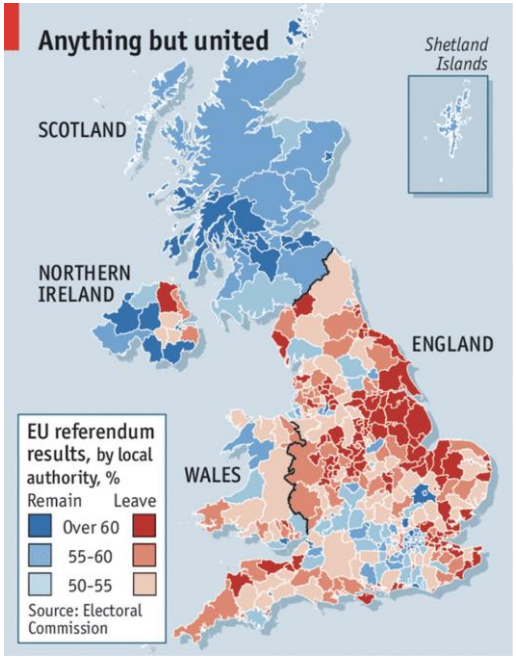
FCC participating institutes





Impacts of public policies are felt **at the local level** … and politicians are also often elected in **‘local’ constituencies**

Credit: Shuttershock



Source: The Economist

What we know

- Positive effects on suppliers of RIs through procurement.
  - ➢ Benefits for high-tech suppliers over LHC lifetime ≈ €2 billion (Florio et al. 2016)
  - ➢ Increase in R&D investment, patents, labour productivity and profitability (Castelnovo et al. 2018)
  - ➢ Benefits spill over **along the whole supply chain** (Florio et al. 2018)

What we want to know

- Can a RI set up as a worldwide distributed project generate local socio-economic benefits **beyond the boundaries of the supplying firms**?
- What is the nature, magnitude and spatial extent of these wider economic effects?
- How can we use estimates on the local impacts of past projects to understand the potential local economic effects of future procurement activities, such as the FCC?

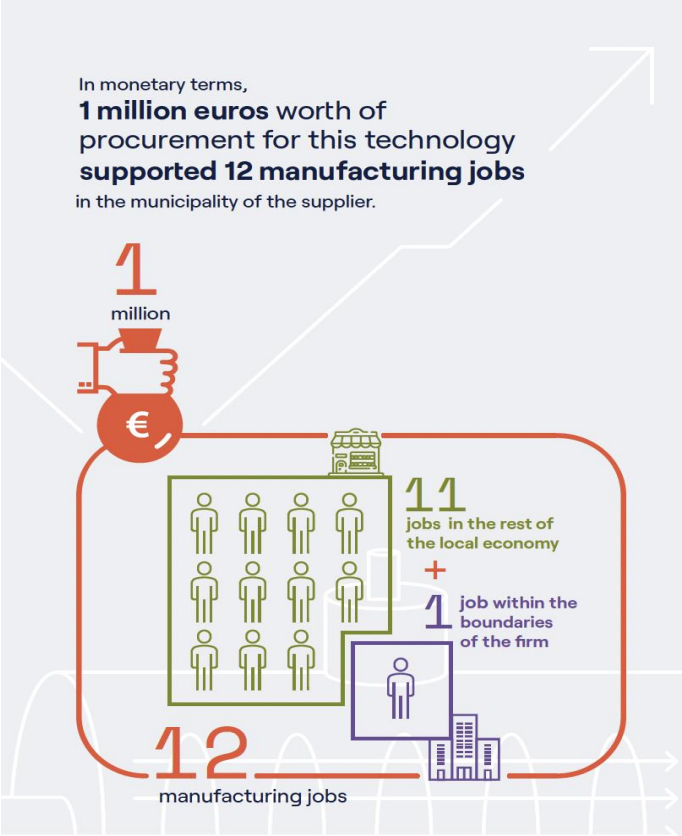
The challenge

- We need to estimate the additional territorial impact of procurement **over and above what would have happened in its absence: a suitable counterfactual is needed.**

What we do

- We look at **Superconducting Radiofrequency cavities (SRF) -** a key technology for the Future Circular Collider (FCC)
- We focus on the European XFEL (Germany) procurement– the largest production of SRF cavities to date(~€40M) – and its impact on Schio (Italy), where one of the two suppliers is located.
- We use Trajectory Balancing Method – a novel counterfactual technique – to estimate this impact.
- We develop a set of guidelines to replicate this study for other technologies and regions.

What we find


In monetary terms,
1 million euros worth of procurement for this technology supported 12 manufacturing jobs
in the municipality of the supplier.
1
million
11
jobs in the rest of the local economy
+
1
job within the boundaries of the firm
12
manufacturing jobs

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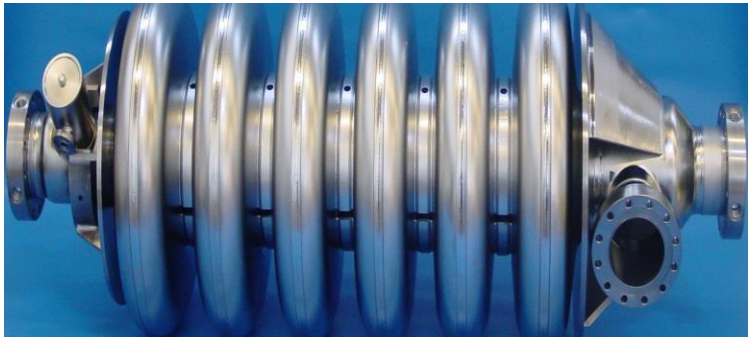
Scoping study: Why SRF cavities?

We focus on specific types of procurement activities that have the following characteristics

- **Relevant for FCC-ee** ✔
- **Technology mainly developed for HEP** ✔
- **Production requires close collaboration between RIs and industry** ✔
- **Potential use outside HEP** ?



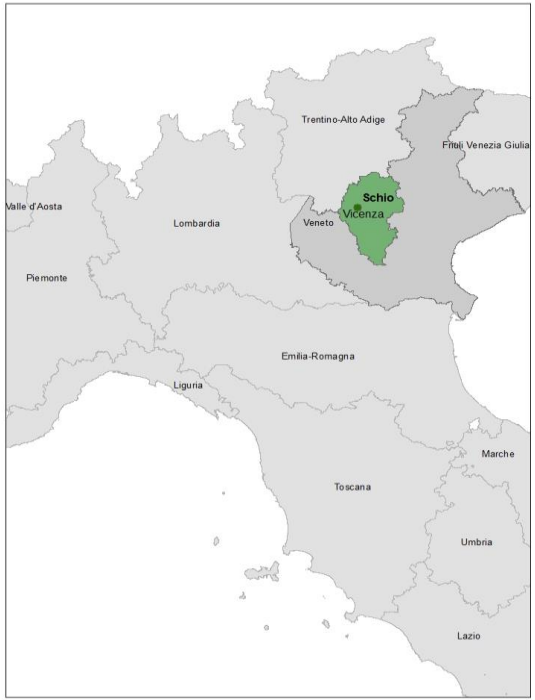
Scoping study: Why XFEL?

About the European XFEL

- The largest production of SRF cavities in industry to date.
- **Manufacturers:** Production equally split between Research Instruments (HQ in Bergisch, Germany) and E. Zanon's physics branch (Schio, Italy) – the first time, the surface treatment of the cavities was entirely done by firms.
- **Production period:** 2012-2015; the two companies were supervised by INFN (Italy) and DESY (Germany) – contracts were assigned in 2010.

Scoping study: Why E. Zanon and Schio?

Schio is a 39,000 municipality, located in the province of **Vicenza**, in Northeastern Italian region of **Veneto**



Scoping study: Why E. Zanon and Schio?

We interviewed managers at both companies. We found out that:

- **E. Zanon Physics branch** (part of E. Zanon) has only **one site** in Schio (Vicenza), Italy. It had up to **60 employees (30 additional employees were recruited to fulfil the contract)** during the production for XFEL. Almost **all employees were involved in the XFEL project. ***
- **Research Instruments GmbH** has **two sites**: Bergisch Gladbach and Dortmund. It has 280 employees. **Only a third of the employees were involved in the XFEL project**.
- **E. Zanon is a more self-contained case and more suitable to test our approach for the territorial impact.**

**E. Zanon produced other cryomodule components for XFEL, but these were of low technological intensity*

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Why do we expect an impact?

Procurement contract as a positive economic '*shock*' (something that is exogenous and unpredictable) that can have:

- **Direct effects:**
  The firm increases its workforce to fulfil the procurement contract and subsequent ones (+)

- **Indirect effects:**
  Rest of the supply chain:
  Increase in demand for intermediate goods and services → higher employment (+)

  Rest of supplier's industry:
  Competition (-)
  Demonstration (+)
  Labour mobility (+)

  Local services:
  Negligible and non-detectable in this case study, given the size of the procurement

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Trajectory Balancing Method in a nutshell

To estimate the **additional impact**, we would like to compare the effect of this large HEP procurement contract on Schio municipality with a **counterfactual;**

Ideally, you would compare the change in the variables of interest in Schio with other municipalities with similar characteristics (**control group**)**.** But:

- Location choice can be endogenous;
- Only two companies in the world can produce SRF cavities in large quantities.

The **Trajectory Balancing Method (TBM)** is the best way to compare the effect on Schio with a 'counterfactual'.

TBM creates a synthetic Schio by making a weighted average of other municipalities that resembles Schio as closely as possible *before* the European XFEL procurement contract.

- **Main advantages**:
  - ➢ It identifies the **causal effect** of the procurement contract.
  - ➢ It can be replicated for other case studies (different technologies, firms, and regions)

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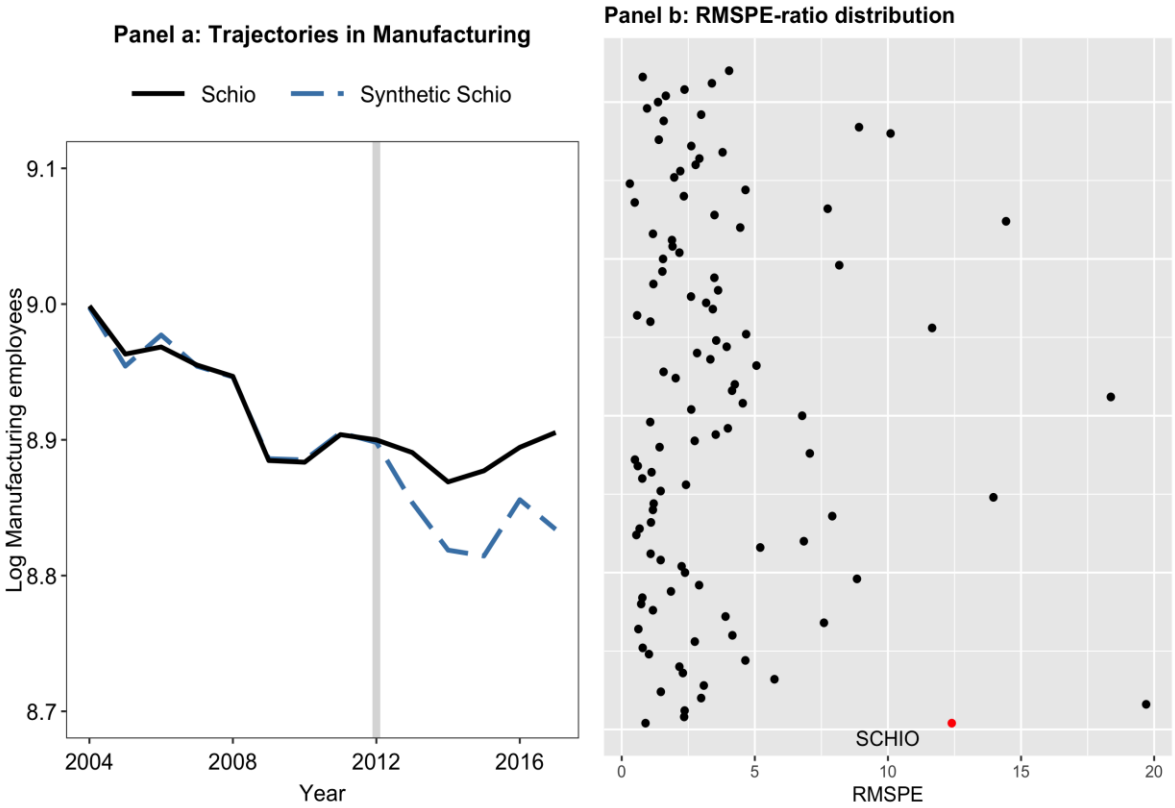
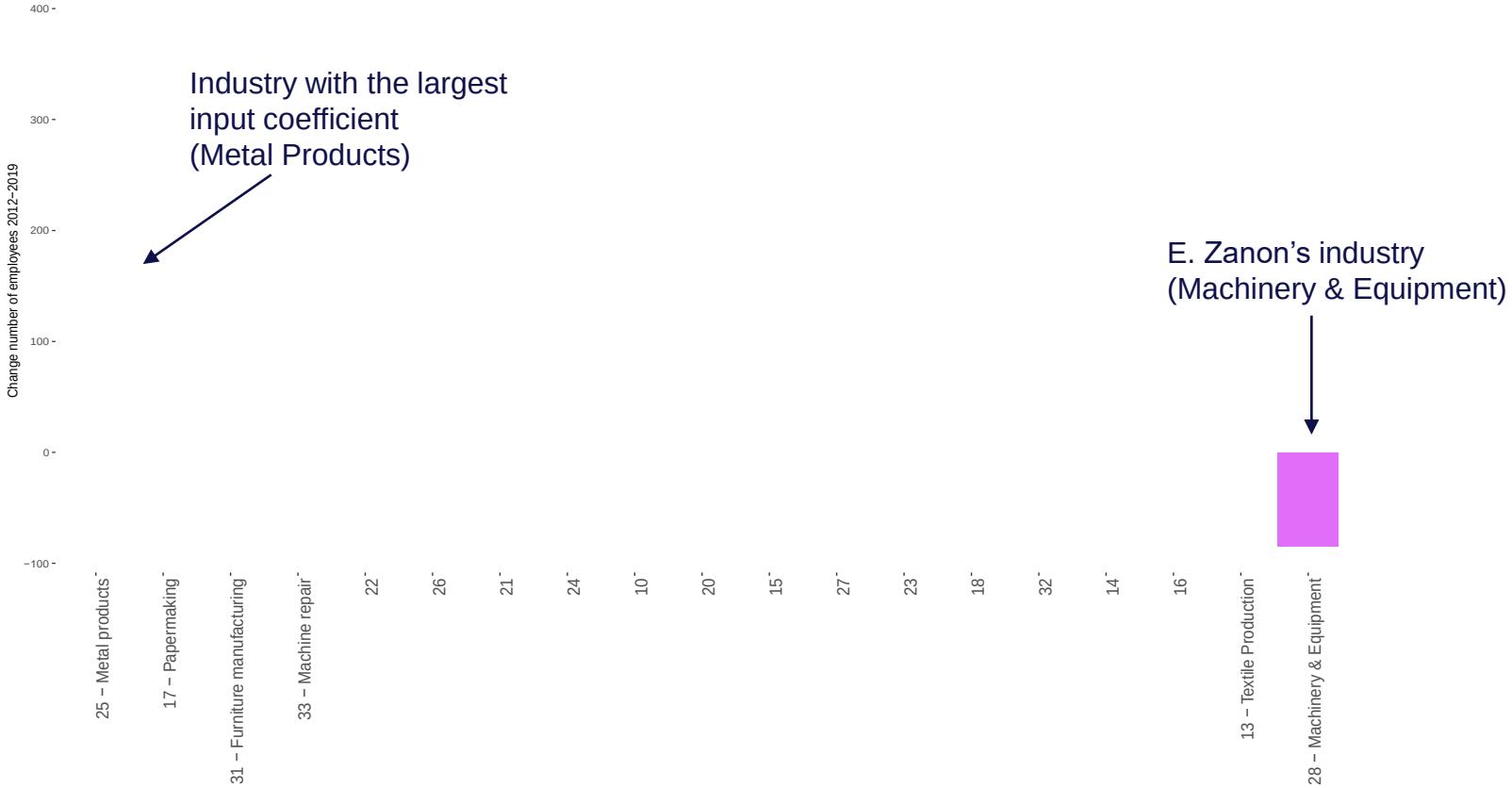
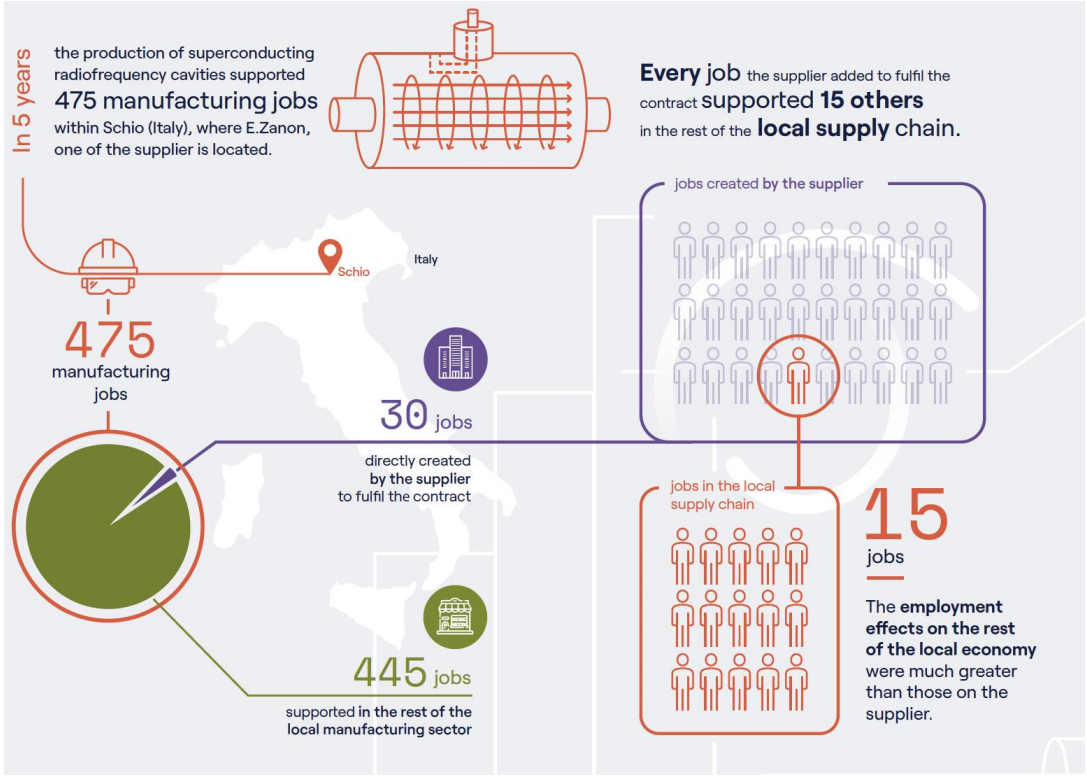
Positive impact on manufacturing…



…mainly driven by backward linkages



How does this translate into local jobs?



Conclusions

Effects:

- Procurement for RIs **can generate local economic benefits** beyond the project location and supplier's boundaries, through backward linkages, **greater than those for the individual supplier.**
- It can also **make the supplier's local economy more resilient**, in periods of downturn.

Policy lessons:

- Governments funding these projects should take these wider benefits into consideration.
- Given the importance of backward linkages, policymakers should **strengthen the links between local firms to maximize the effects of RI procurement.**

Replicability and scalability:

- The methodology we developed for this project can be applied to other types of procurement and RIs.
- We developed a protocol – a set of guidelines – on how to replicate it in different settings.

Thank you!

Read more about our study:

https://bit.ly/3BJw6Iv

r.crescenzi@lse.ac.uk

g.piazza@lse.ac.uk

Appendix: E. Zanon

- Zanon was set up in 1919 by Ettore Zanon and started by manufacturing tanks for the local textile industry.
- It started its activity with Research Institutes in the 1970s.
- In the 1990s, it started producing the first niobium cavities.
- In 2010, with the award of the EXFEL contract, a new facility was installed.
- After EXFEL, E. Zanon won other scientific research contracts, including ITER.
- The pressure equipment division was acquired in 2019 by Brembane & Rolle S.p.A.
- In 2020, the “Physics” business branch was acquired by Simic Spa, another Italian company, and a new company, Zanon Research & Innovation was set up.

Appendix: Data

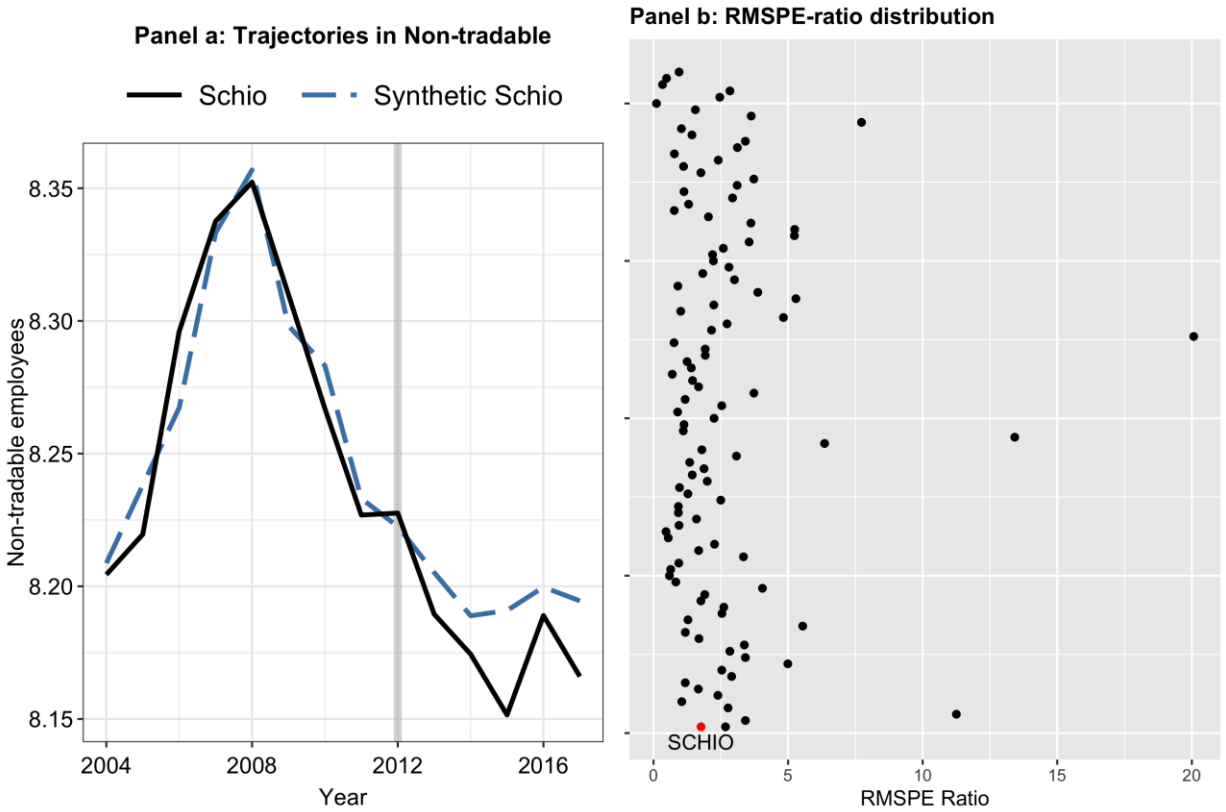
- **ASIA: Italian Business Register for Local Units – employees data:**
  - 2004-2018 panel, aggregated at the municipality level, by selected ATECO sections. We follow the OECD (2018) definition and we create:
    Tradable sector: Business activities, Manufacturing, Mining & Quarrying, Electricity, Finance;
    Non-tradable sector: Construction, Wholesale & Retail, Transport, Education, Health & Social, Hospitality.

- **Italian CENSUS 2011:**
  - Selected variables to use as covariates: population density, employment rate, population change (2001-2011), share of young population with a degree, share of workers in high-skilled occupations.

- **IRPEF Data**
  - Data on taxable income from subordinate employment provided by the Italian Ministry of Economy and Finance, 2004-2018 as a proxy for wages;

- **OMI (Italian Properties Observatory) valuations:**
  - data on house prices (*Work in progress*);

Appendix: Impact on non-tradable



Appendix: Data restrictions

- **When implementing the TBM, we follow Abadie (2021) and we impose the following restrictions:**

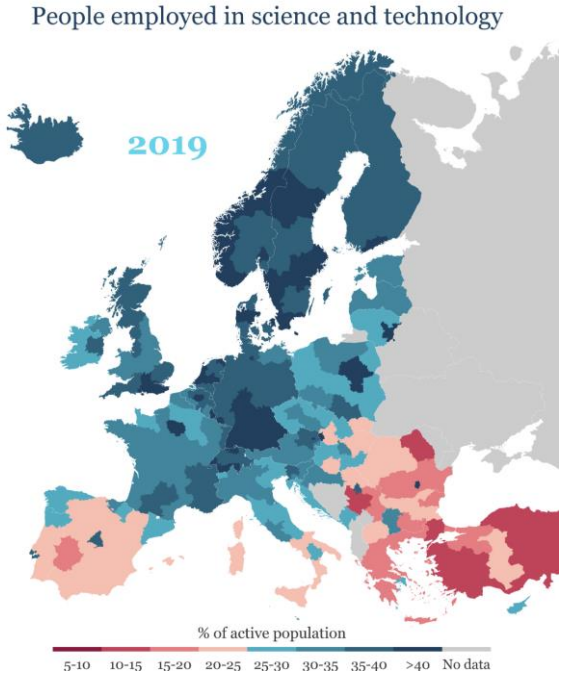
1. To ensure that the control units in the donor pool resemble Schio as much as possible, we follow Cerqua (2022) and include only the municipalities in Northern Italy with a population size close to Schio (% 50 more or less than Schio's population);

2. To minimize the possibility that other units in the donor pool have a received a similar treatment, we use CERN procurement data to exclude all the municipalities that have received large procurement contracts in the post-treatment period (sum of all the CERN procurement contracts assigned to local firms exceeded 1 million CHF);

3. To enforce the non-interference assumption, we exclude the neighbouring municipalities part of the same Local Labour Market System - a geographical unit created by ISTAT that takes into account for commuting and living patterns.

→ *After imposing these restrictions, our sample includes 142 municipalities*

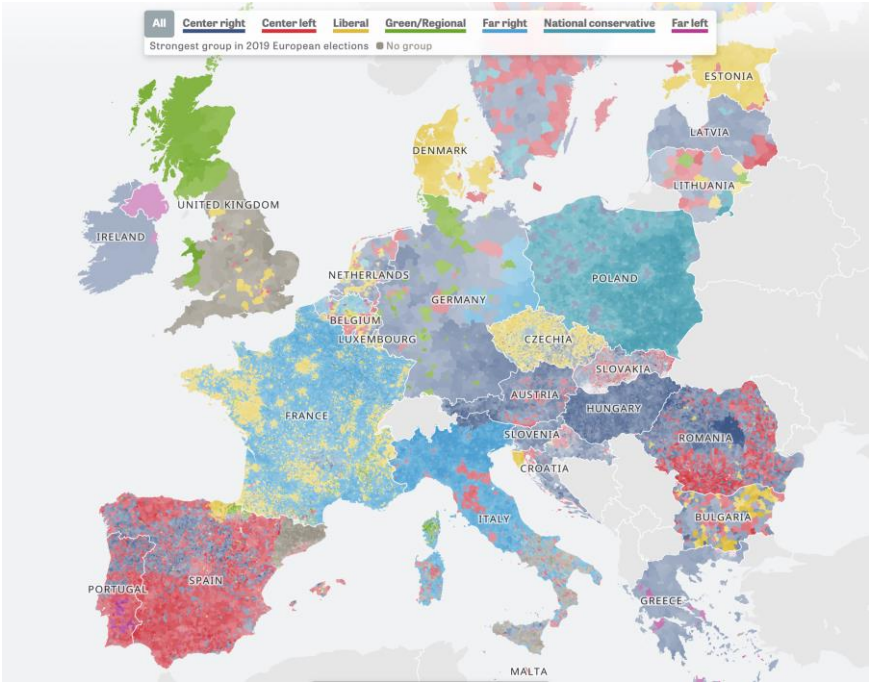
Impacts of public policies are felt **at the local level** …



Source: Popovic (2020) based on Eurostat data

Impacts of public policies are felt **at the local level** … and politicians are also often elected in **'local' constituencies**

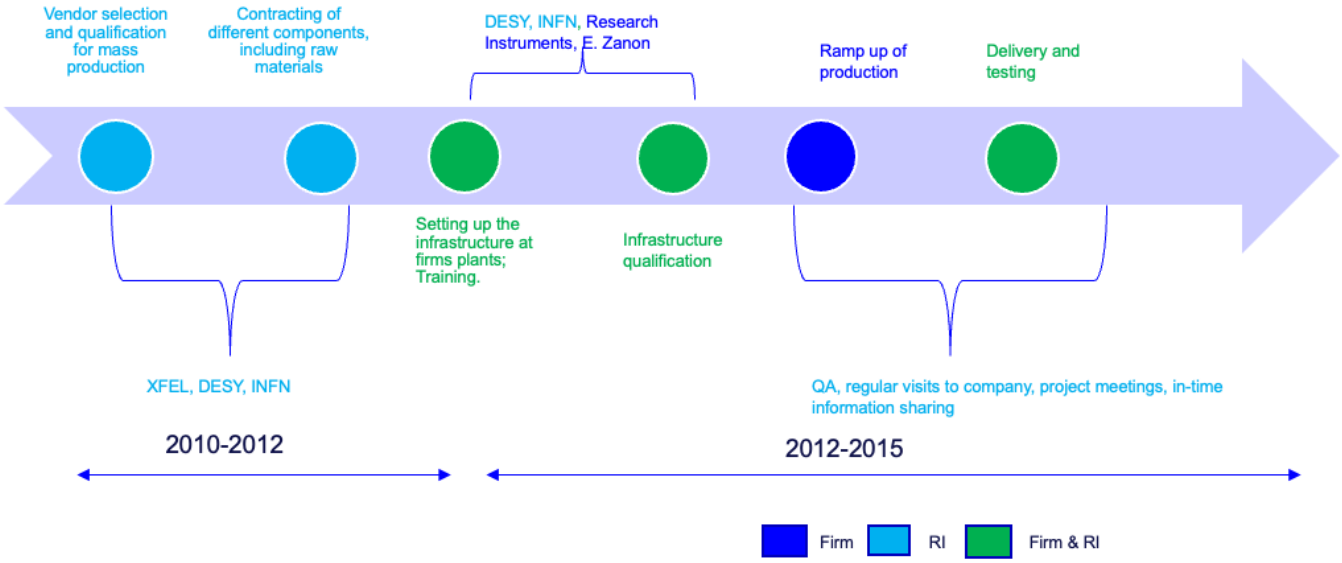
Credit: Shuttershock



Source: Die Zeit

Appendix: Scoping study: SRF procurement

Figure 1: Overview of SRF procurement and production process for XFEL. Infrastructure upgrade and “build-to-print” contract led to **close collaboration between suppliers and research institutes**



Source: Based on information from Pagani (2012); Singer et al. (2013) and input with INFN and DESY staff