Presentation BdE - Effect of LEZ in economic outcomes:

Title

- My name is _____ and I will present my final MSc project on the effect of Low Emission Zones in the economy: A Synthetic Control Approach to German Cities.

Contents 1

- I will first do an introduction on the topic and present the research questions.
- Then we will look at the data collection and data analysis techniques where I will talk about the Synthetic Control Method and the "Synthetic Treated Method", a methodological contribution to the policy evaluation toolbox.
- Finally we will look at the results and some final notes

Introduction

Who I'm I?

- UPF, TSE - Economics,
- LSE - Applied Social Data Science,
- LSE - Economic Geography: the effect of air pollution and environmental policies in economic outcomes.

- As it will become clear in the presentation **this is a work-in process.** An example of a more finished work by me is on the strategic positioning of air quality stations around Europe, and I can send it on request.
- So let's go back to the main topic: **The effect of Low Emission Zones in the Economy**.

Pollution and Low Emission Zones

- Air pollution is a very relevant issue recently as pollution levels are high and this has a Strong effect on pleople
- This has caused STRONG european legislation on the topic

LEZ in the EU and Germany

- Germans were transpassing EU limits and HAD to pass legislation and LEZ
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Theoretical background

- Sub-optimal allocation + critiques from the Retail and Transport sector
- Externalities (pollution, congestion)

New evidence on the effect of pollution in the economy + citations

- LEZ
    - Reduces pollution and congestion
    - Which increases productivity, reducces mortality and absentism. All of this has positive effects on the labour imput of the economy.
- But, as I said there can be other effects that are negative...
- These are just the sources for the diagram above

Why German LEZ? - Why this subject of study?

Research Questions

A)

B)

C) I will focus more on this one as it is in a better development stage.

Data collection

T. status in Europe

- Show interactive map

Temporal application of LEZ in Germany

- Graph
    - Different stages
- Scrappage program
    - Part of a group of similar programs around the world in 22 countries 2008-2010. It was **the biggest of the world** (€5Bilion, Japan €2.9b and the US €2b).
    - **61€ per capita** in GER (an average of 0.15% of GDP per capita)
    - **Timing**: Announcement of idea: 27 dec. 2008. Becomes 2 weeks latter. Starts on January 14 2009. Points published Jan 16. Applications were possible until September 2, 2009.

- **Size**: 2500€ for each old car (older than 9 years, licensed for 12 months) to buy a new one (that had at least the Euro 4 standard and was licensed to the claimant - "Actually, for the German case, this prerequisite was redundant since all new cars bought in 2009 were Euro 4 equipped anyway.") Only for private individuals. 2 million cars were subsidized.

Units of study: NUTS 3 regions

- Statistical units of geographical areas for all of the EU
- Can coincide with local administrative boundaries and represent big and mid-sized cities.

Data analysis Strategies

What are we going to do?

Introduction on the Synthetic Control Method (SCM) (1)

Introduction on the Synthetic Control Method (SCM) (2)

End:

- This can be done with actual weights from a pool of control regions or by other methods. I use a specific type of synthetic control called the "Generalized Synthetic CM" that uses factors instead of weights.

(SCM) (3) - Linear Factor models and Gsynth

We model the counterfactual as a set

- Usual Covariates
- Lambda
- Coefficienrs

Gsynth

Gsynth (2)

Identifying assumptions

The usual Identifying assumptions are the same as DID

Robustness tests

The usual robustness tests...

The potential treatment effect on non-treated regions (1)

The potential treatment effect on non-treated regions (2)

Notes on creating counterfactuals for control regions

- .
- .
- Not the best setting because

The effect on GDP - Presentation of cases

The effect on GDP - Individual Results

The effect on GDP - Diagnostics

Factor loadings

- Here we can see the different factor loadings of each unit with controls in salmon and treated in blue.
- It is reassuring is that the estimated factor loadings of the 6 treated units lie in the convex hull of those of the control units
    - Treated counterfactuals are produced mostly by more reliable interpolations instead of extrapolations.

Factor's Evolution

- Factor 1 decreases over time
- Factor 2 increases over time
- Factor 3 looks like being "more" affected by the finantial crisis

The effect on GDP - Factor Interpretation

Factor 1 is just a negative transformation of mean gdp per capita which makes sense:

- smaller absolute value, smaller ablosute growth...

The potential treatment effect on non-treated regions

- **Now we look at the last results regarding the potential treatment effect on non-treated regions**
- I choose 2011 as a year where more LEZ were announced in my sample I am able to create credible synthetic treated for 3 non-treated regions (X,Y, Z). Here we can see the different implied weights for these regions.

- In 2011, 7 cities implemented a LEZ two of which had a predicted strong negative effect, one being Magdeburg and are the ones that create the conterfactual.

- Cottbus anf Chemnitz are both East german mid sized cities while Lübeck its a very important port city close to Hanburg in West Germany.

Results of the Synthetic Treated Method

- Placebo tratment, 3 years beffore actual announcemnt
- Real control and Synthetic Treated paths
- Potential treatment effect for each city

Next steps and discussion

Next steps:

- Contact localities (such as Magdeburg) to check for anystrong economic shock in the post-intervention period
- See the effect on each sector, especially retail and transport.

Points I would like to discuss:

- Credibility of the main results
- How you perceived the "Synthetic Treated" idea, possible weak points and related literature.
- Anything else!