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Global Trade Analysis Project

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Preliminary

Grounded!
The Impact of Disrupted Transport Networks on International Trade

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Abstract

In April 2010, the eruption of the Eyjafjallajökull volcano led to a week-long closure of European airspace. Some 100,000 flights were cancelled, and the journeys of 10 million passengers were grounded. This paper examines patterns of trade adjustment when transport networks are (temporarily) disrupted. Analyzing monthly trade of European countries at highly disaggregated product level, I empirically characterize the responsiveness of trade along the intensive and the extensive margin as well as the speed of trade adjustment.

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Keywords: air transport; networks; supply chain; integration; disaster; volcano

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1. Introduction

In recent years, there has been a growing (policy) interest in the effects of trade disruptions. Cross-border trade may drop suddenly and sharply for widely unexpected reasons, such as terrorist attacks, strikes (e.g., in major ports), weather extremes (e.g., floods), disasters or financial turbulences.

In this paper, I examine a natural experiment that allows analyzing the effects of such events on international trade. In April 2010, the eruption of the Eyjafjallajökull volcano led to a week-long closure of European airspace. Some 100,000 flights were cancelled, and the journeys of 10 million passengers were grounded.

This paper examines patterns of trade adjustment when transport networks are (temporarily) disrupted. Analyzing monthly trade of European countries at highly disaggregated product level, I empirically characterize the responsiveness of trade along the intensive and the extensive margin as well as the speed of trade adjustment.

Specifically, I explore the evolution of monthly bilateral trade values and quantities of 27 EU member countries with more than 200 partner countries at the 8-digit level (which yields about 7 million observations per month), using the share of flights cancelled in April 2010 as well as the trading partners distance from Iceland as identifying variables.

While I find no effect of the eruption of the volcano in aggregate trade data (which may not be too surprising in view of the low share of air transportation in total trade), there are measurable effects observable in product-level trade. However, these effects turn out to be generally very short-lived.

2. Literature

The paper is directly related to various lines of research. For instance, a number of papers have recently examined different modes of transportation in international trade. Harrigan (2010) explores the patterns of US imports by air.

Another set of papers explores the effect of infrastructure on transportation costs. Examples include Limao and Venables (2001) who report that a deterioration of infrastructure from the median to the 75th percentile raises transport costs by 12 percentage points and reduces trade volumes by 28 percent.

The analysis of micro-level trade data also raises the issue of the quality of the data. The issue of (systematic) misrecording of international trade transactions has been recently highlighted, among others, in Fisman and Wei (2009).

Finally, the analysis is most closely related to work that explores other episodes of trade disruptions. Volpe Martincus and Blyde (2013) examine the effect of an earthquake that took place in Chile in 2010; they find that diminished (internal) transportation infrastructure had a significant negative impact on firms' (external) shipments. In contrast, Neiman and Swagel (2009) explore the post-9/11 changes in US visa policies, finding no effect on travel to the United States.

3. Background, Data, and Methodology

On 20 March 2010, the Eyjafjallajökull volcano in Iceland erupted. As a result of this eruption, the airspace in Europe was essentially closed from 14 April to 25 April 2010, leading to a disruption of more than 100,000 flights and about 10 million passenger journeys. As a compensation, about 5,000 additional flights were scheduled at the end of April. Figure 1 shows air traffic in Europe (by segment) before and during the April crisis.

The eruption of the volcano affected air travel all over Europe, but there have been geographic differences. Figure 2 graphs the estimated fraction of flights cancelled by country. Figure 3 shows that this fraction is strongly (negatively) related to the geographic distance from Iceland.

To analyze the effects of the disruption in air travel on international trade, I use highly disaggregated data from Eurostat. The data are at monthly frequency. The data cover shipments (value and quantity) from 27 member countries of the European Union (labelled reporter) to about 200 destination countries (labelled partner). In total, there are about 7 million observations per month.

In the empirical analysis, I apply a difference-in-differences specification. The regressions take the following general form:

$$(1) \quad \text{Trade}_{ijt} = \alpha + \beta \text{Affected}_{ijt} + T_t + \text{RP}_{ij} + \varepsilon_{ijt}$$

where Trade_{ijt} denotes shipments from i to j at time t , Affected is the variable of interest, an interaction term for trade with a partner at the time of the eruption, and T and RP are comprehensive sets of time and pair-wise fixed effects, respectively.

In the practical implementation of this framework, I experiment with various time windows, ranging from ± 1 month to ± 12 months, various measures of trade, and also various proxies for affectedness, including a country pair's minimum distance from Iceland and the pair's maximum fraction of flights cancelled.

3. Empirical Results

I begin by analyzing the pattern of month-on-month changes in import values. As shown in Figure 4, the European import value has fallen sizably in April 2010. However, this decline is by no means exceptional.

Figure 5 provides a scatter plot of the month-on-month change in trade by country against a country's share of flights cancelled. As before, the evidence for a strong trade effect of the eruption of the volcano is weak; there is no clear relationship identifiable.

In Figure 6, I explore the extensive margin of trade, measured here as the monthly number of country pairs. Again, the pattern of trade for European countries does not appear to be unusual in April 2010.

Finally, before turning to econometric evidence, I make use of the product level dimension of the trade data set. Figure 7 visually inspects trade at the two-digit product level; the graph plots the month-on-month change in trade for electrical machinery (chapter 85). As shown, for (some) individual product categories, measurable effects are observable.

4. Conclusion

In April 2010, the eruption of the Eyjafjallajökull volcano led to a week-long closure of European airspace. Some 100,000 flights were cancelled, and the journeys of 10 million passengers were grounded. This paper examines patterns of trade adjustment when transport networks are (temporarily) disrupted. Analyzing monthly trade of European countries at highly disaggregated product level, I empirically characterize the responsiveness of trade along the intensive and the extensive margin as well as the speed of trade adjustment.

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Figure 1

Figure 1. Traffic in Europe¹ before and during the April crisis.

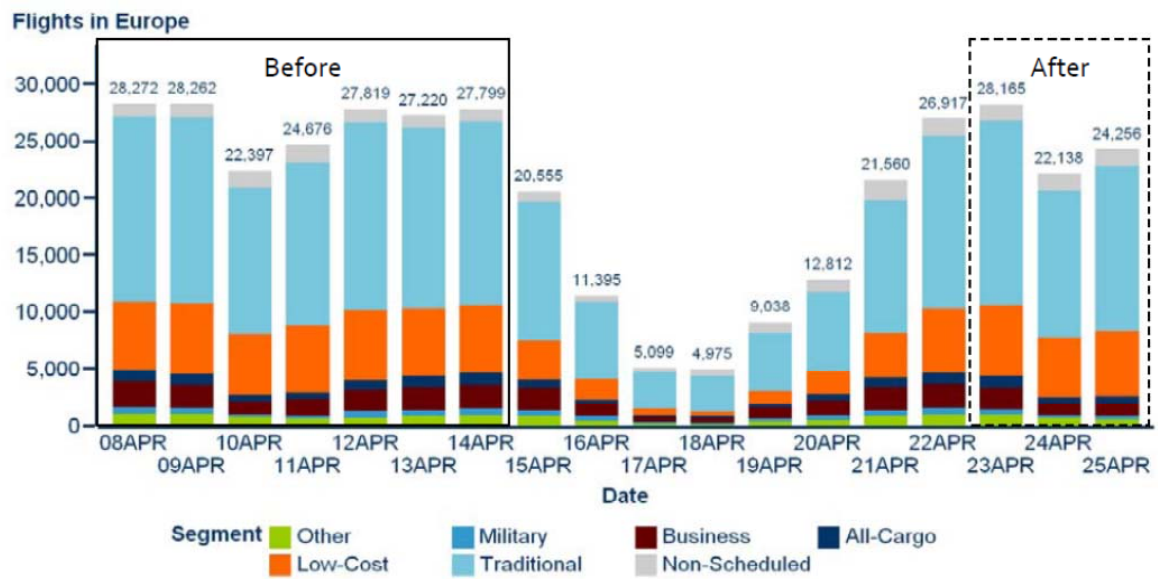


Figure 2

Figure 2. Estimated cancellations in April (one observation per State per day)

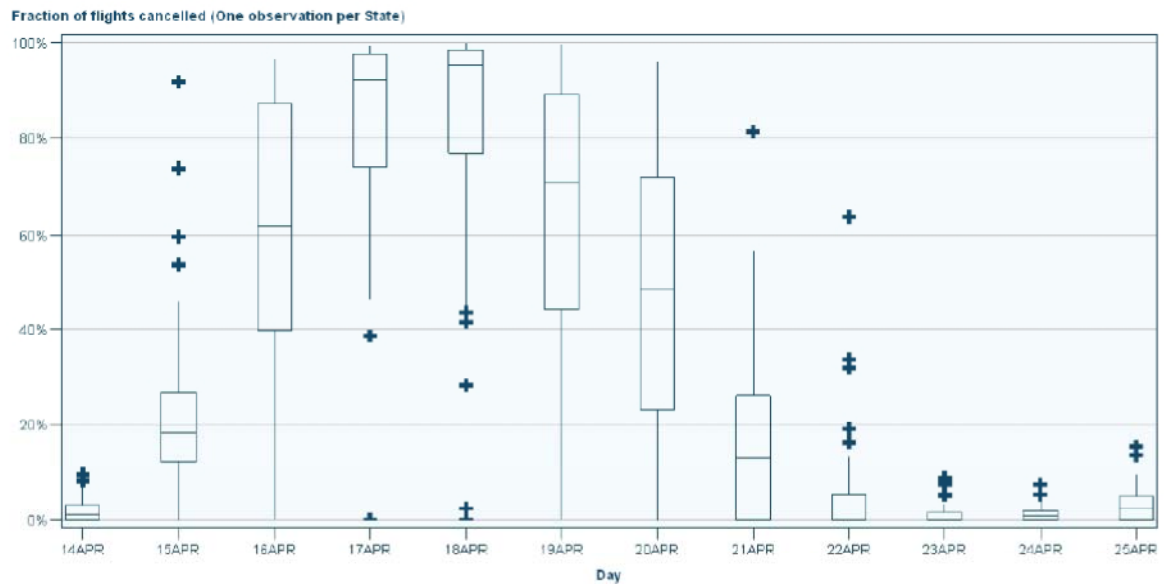


Figure 3

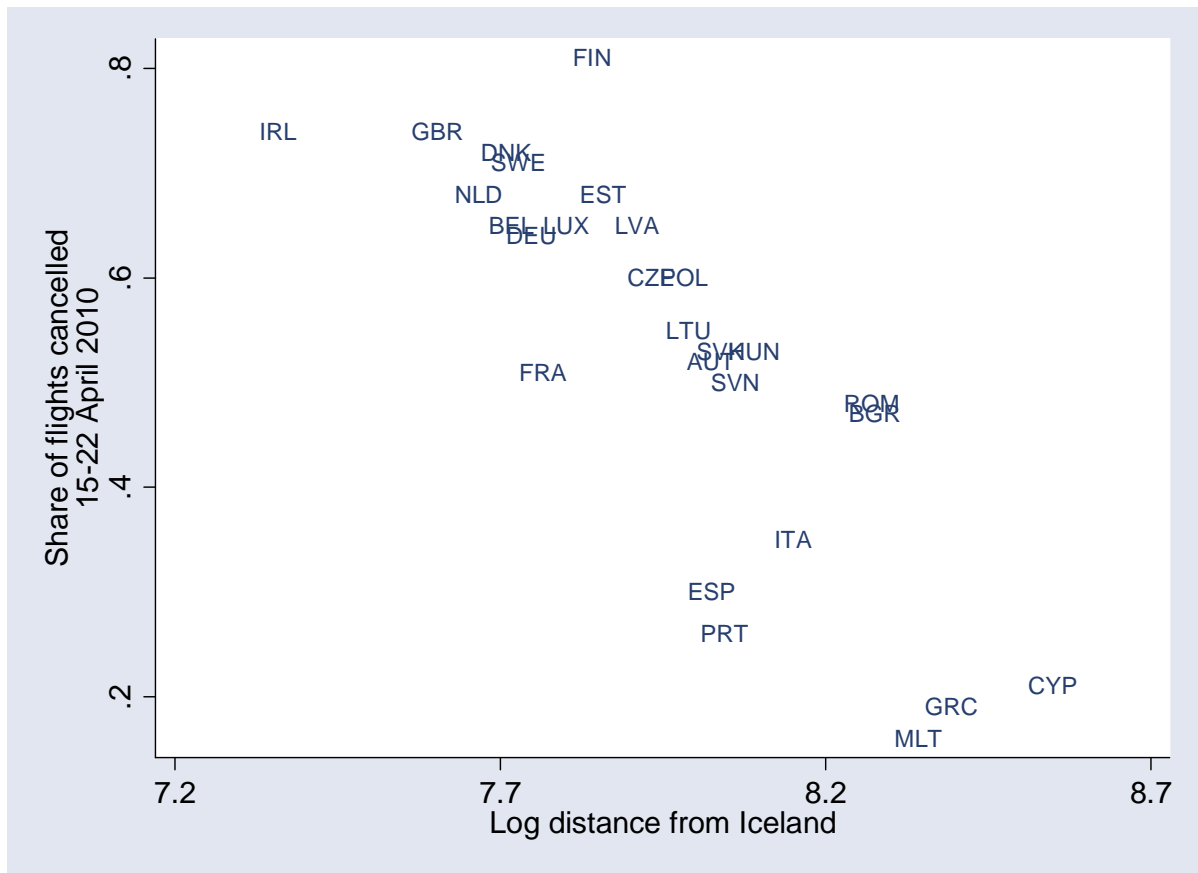


Figure 4

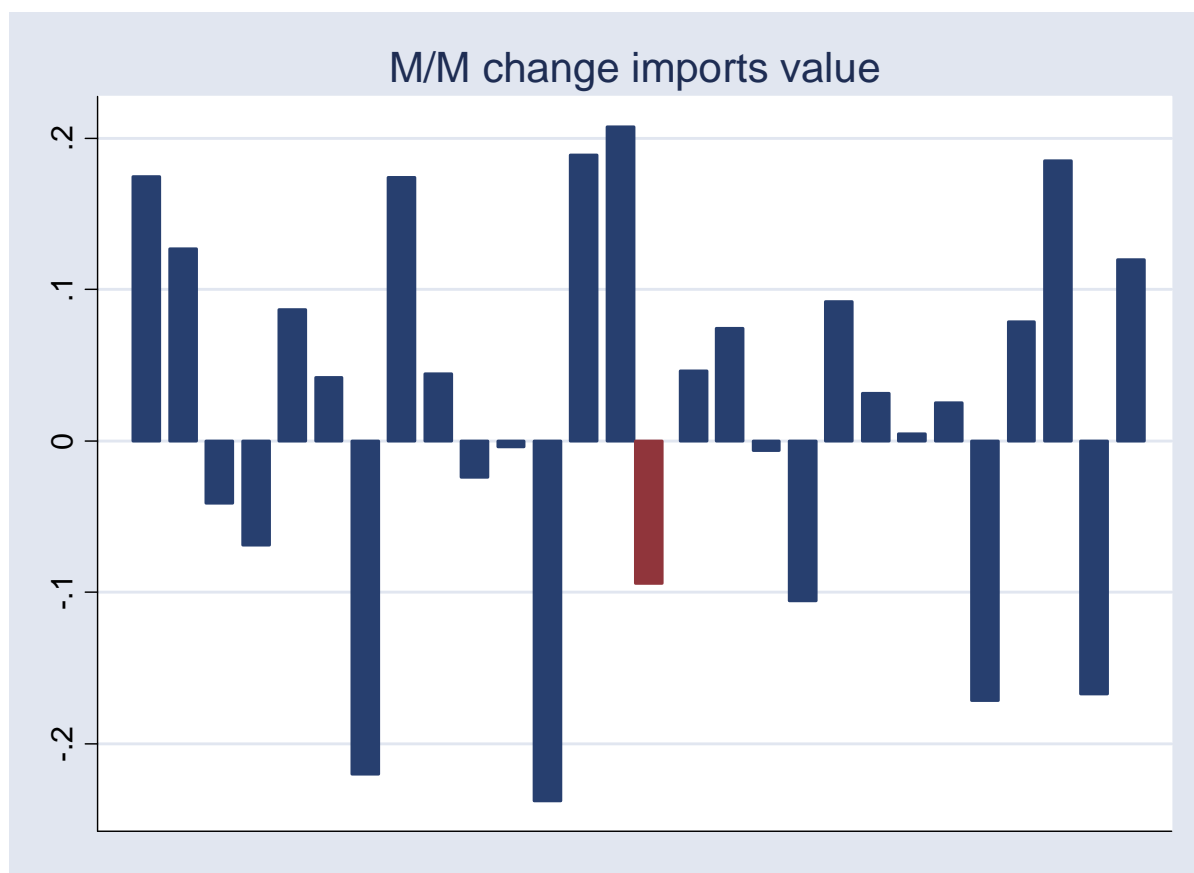


Figure 5

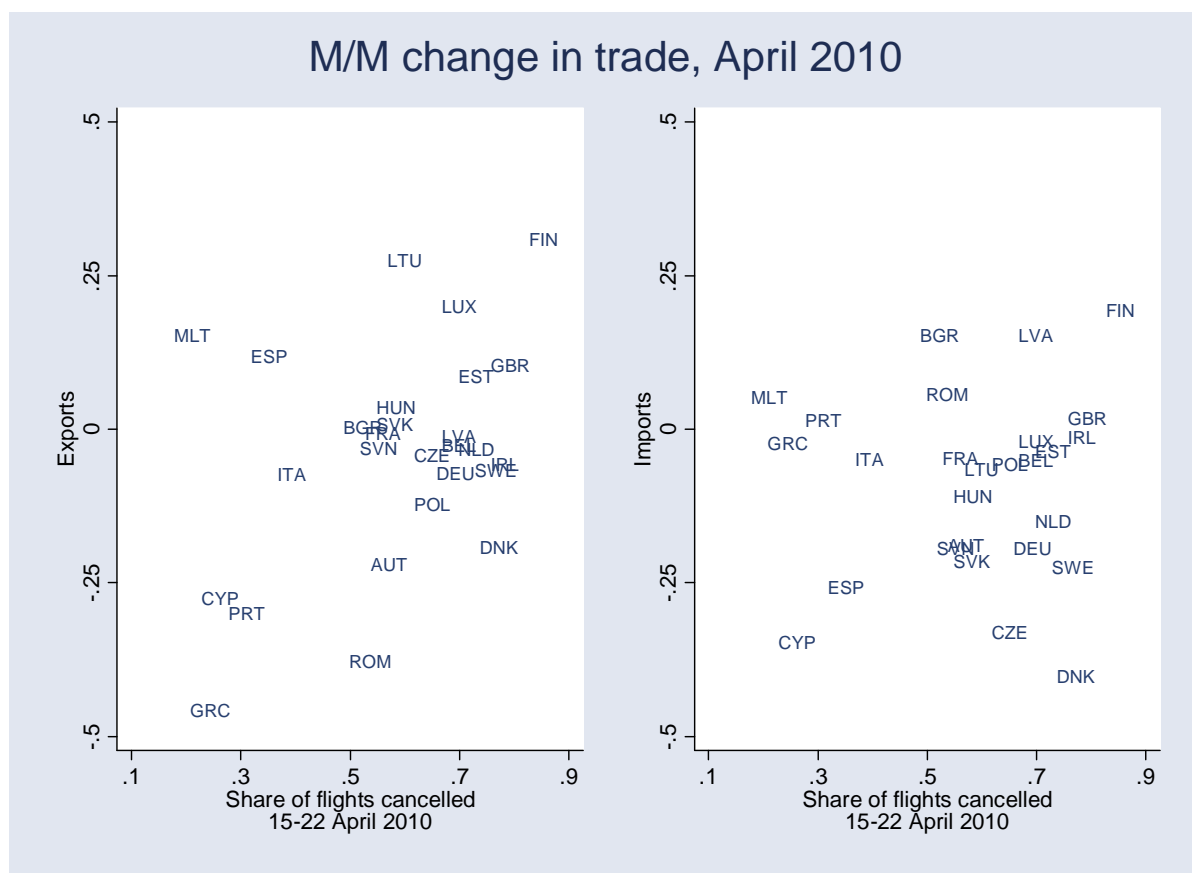


Figure 6

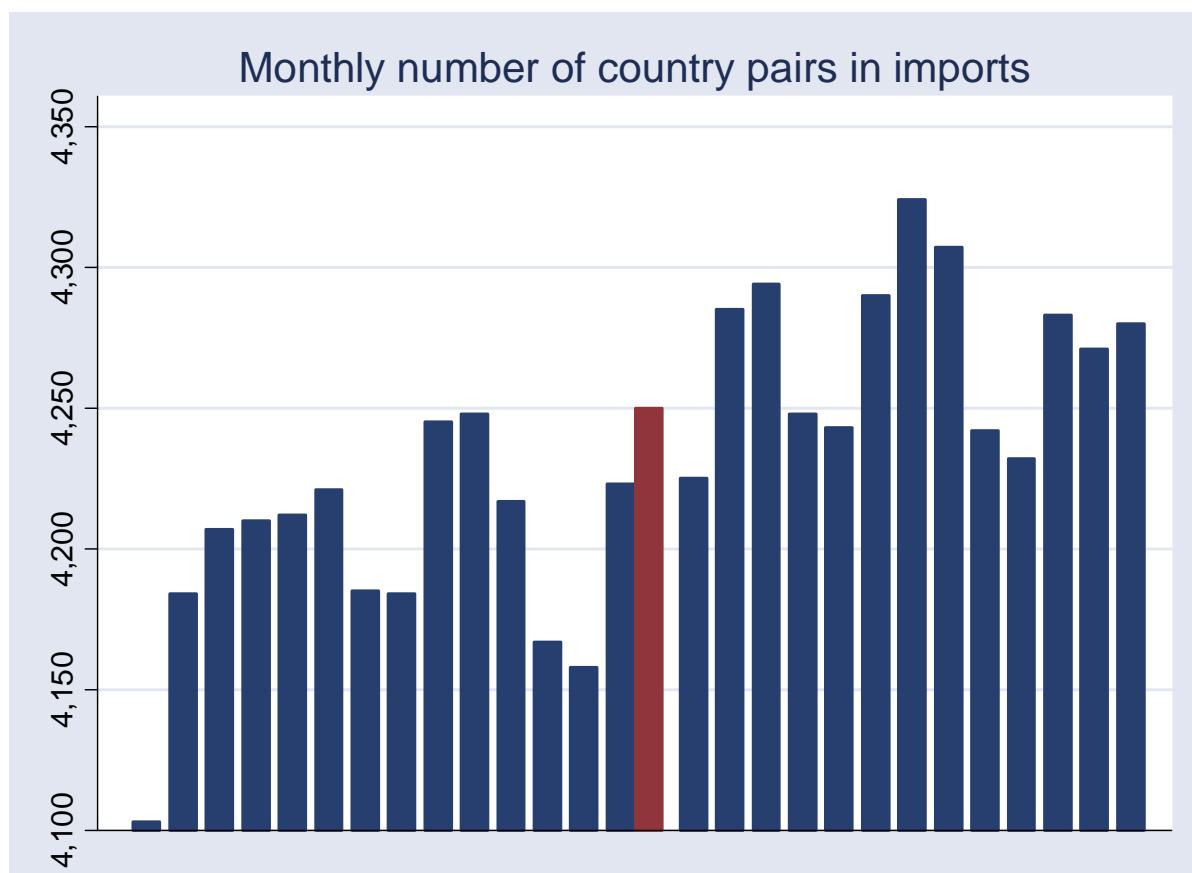


Figure 7

