Migratory Responses to Natural Disasters

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Road Map

- "Shock and Roam: Migratory Responses to Natural Disasters"
  - *Economics Letters* (2016)
  - Haishan Yuan and Chuanqi Zhu
- "Trade to Aid: EU's Temporary Tariff Waivers for Flood-hit Pakistan"
  - *Journal of Development Economics* (2017)
  - Juyoung Cheong, Do Won Kwak, and Haishan Yuan

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Shock and roam: Migratory responses to natural disasters

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HIGHLIGHTS

- Use novel data on roaming cellphones to capture post-earthquake migratory responses.
- Higher emigration emerges within a few weeks after the Ludian earthquake.
- Quake-induced emigration peaks in about 14 weeks.

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ABSTRACT

Using novel data on roaming mobile phones and a synthetic control method, we find out-migration in the area affected by the 2014 Ludian earthquake in Southwest China. The induced emigration emerged within a few weeks after the earthquake and persisted for months. We find no evidence that the earthquake drew back migrants who, prior to the earthquake, had emigrated to Guangdong province, which is a manufacturing hub and the primary destination of rural migrant workers in China.

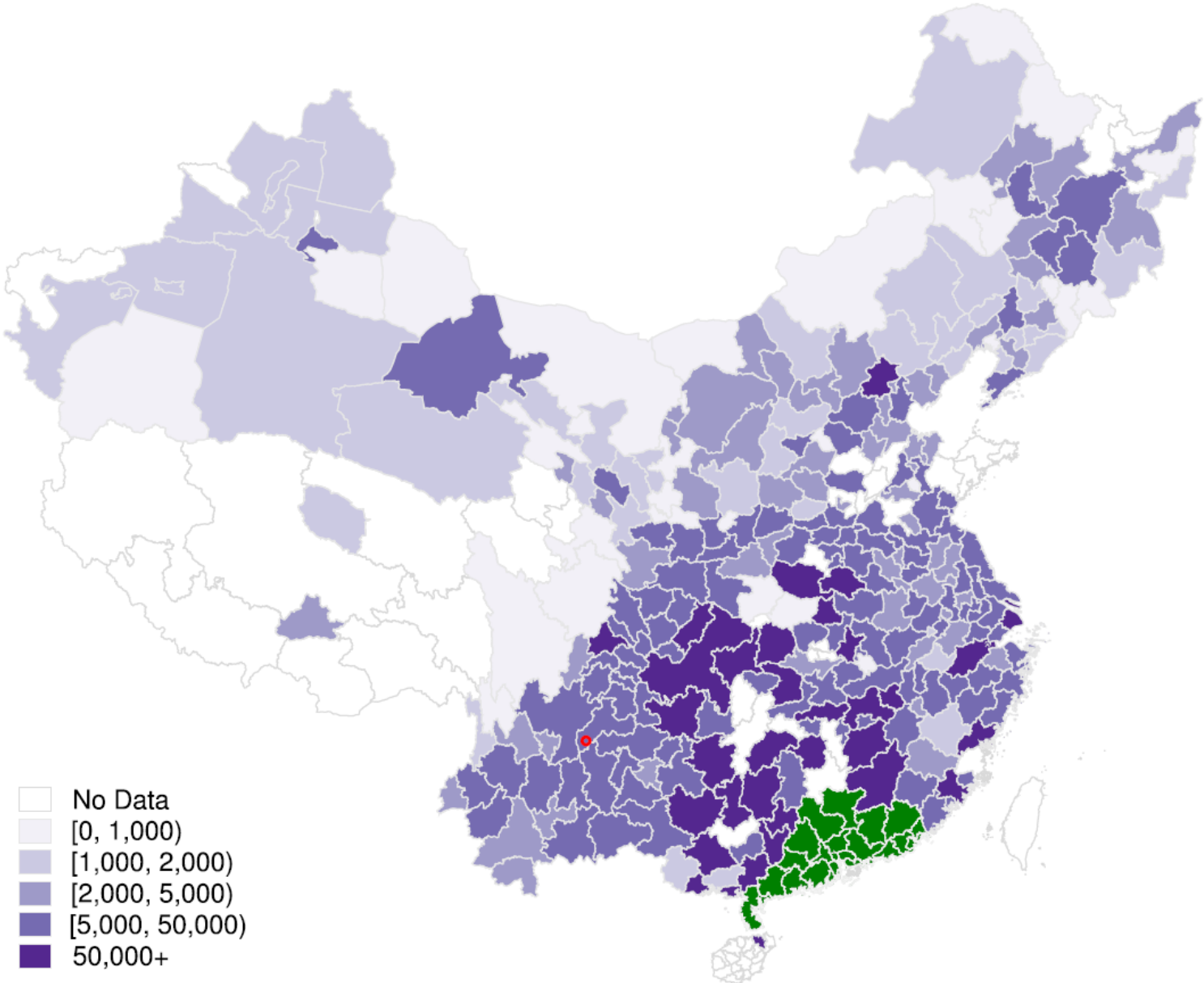
Research Question

- **What we investigated:**
  - How do natural disasters affect migration patterns?
  - Do disasters cause people to leave affected areas?
  - Do disasters cause previous migrants to return home?
- **Why it matters:**
  - Labor mobility is central to economic development
  - Migration is an important coping mechanism for negative economic shocks
  - Previous research shows mixed results on disaster-induced migration

Photo: Reuters/Wong Campion

The 2014 Ludian Earthquake

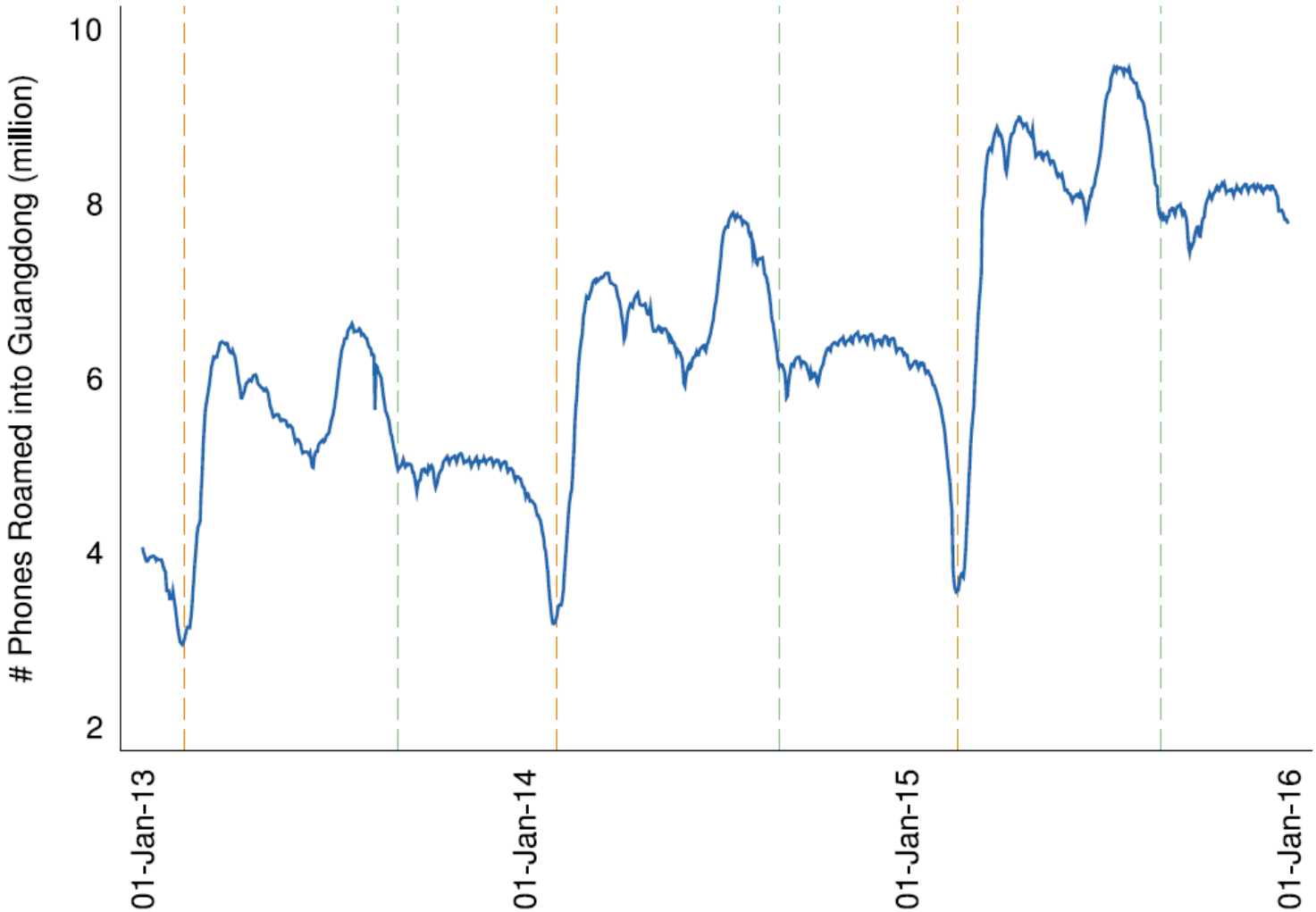
- **Event details:**
  - August 3, 2014
  - Magnitude 6.1
  - Struck Ludian county in Zhaotong prefecture, Yunnan province
- **Impact:**
  - 731 deaths
  - Estimated $5 billion in damages
  - Affected approximately 1.1 million people
  - Zhaotong: low-income area with population of 5 million


No Data
[0, 1,000)
[1,000, 2,000)
[2,000, 5,000)
[5,000, 50,000)
50,000+

Novel Data Source

- **Roaming mobile phone data:**
  - Daily numbers of China Mobile users roaming in Guangdong province
  - China Mobile: largest telecom company in China (62% market share)
  - Higher market share in rural areas
  - 1.23 billion mobile subscribers in China (0.91 per capita)
- **Advantages:**
  - High frequency data (daily)
  - Captures short-term migration flows
  - Complements traditional survey-based migration data

Seasonality



Synthetic Control Method

- Proposed by Abadie and Gardeazabal (2003) and Abadie et al. (2010)
- Constructs weighted sum of unaffected prefectures as (synthetic) control:

$$\hat{Y}_t = \sum_{j \in C} w_j Y_{jt}$$

- Weights calculated by minimizing mean squared prediction error:

$$\{w_j\}_{j \in C} = \arg \min_{\{w_j\}_{j \in C}} \left\{ \sum_{t=1}^{t=T_0} \left(Y_t^* - \sum_{j \in C} w_j Y_{jt} \right)^2 \right\}$$
$$\text{s. t. } \sum_{j \in C} w_j = 1 \text{ and } w_j \geq 0, \quad \forall j \in C$$

Data preparation

- Averaged daily numbers to weekly frequency
- Normalized by prefecture population
- Conducted permutation tests for statistical inference

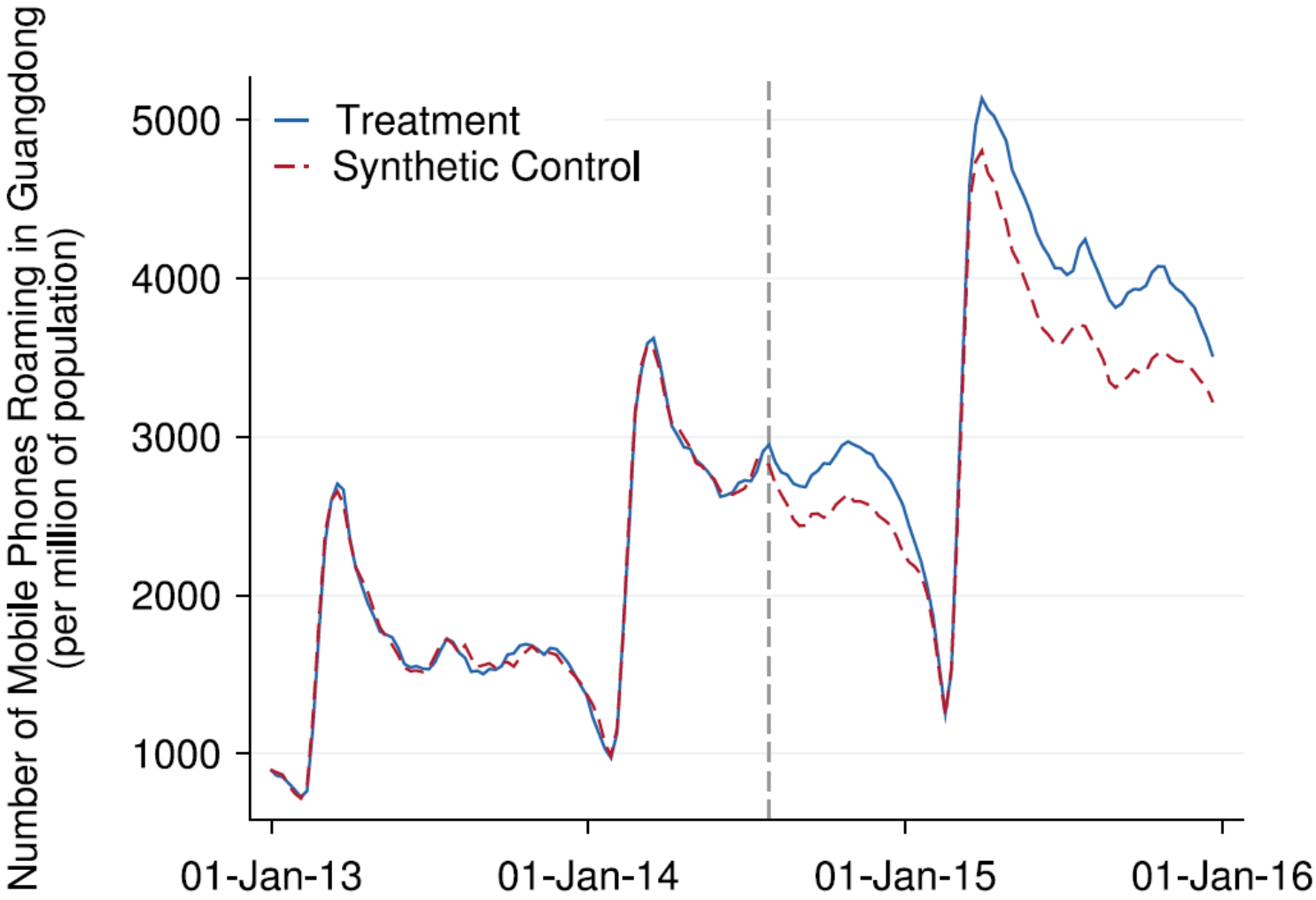
Migration Patterns to Guangdong

- **Guangdong context:**
  - Manufacturing hub
  - Primary destination for rural migrant workers
  - 52 million migrant workers (20% of country's total)
- **Seasonal patterns observed:**
  - Lowest point: right before Chinese New Year
  - Sharp increase after Chinese New Year
  - Peak: 1.5 months after Chinese New Year
  - Second wave during summer
  - Decline at start of school year (September 1)

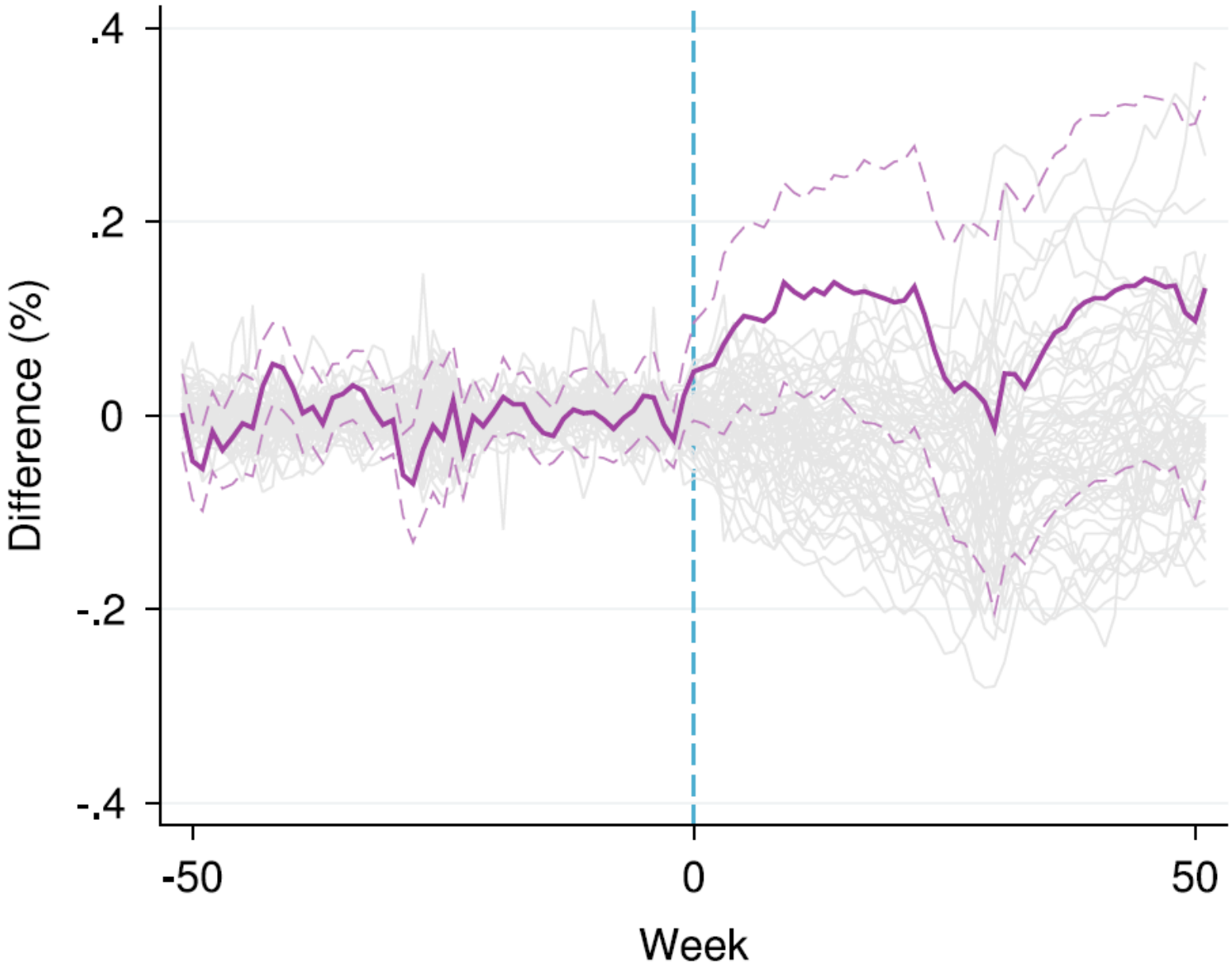
Post-Earthquake Migration Results

- **Key findings:**
  - Gap between Zhaotong and synthetic control emerged immediately after earthquake
  - Gap widened over time until months before Chinese New Year
  - Peak difference: 14 weeks after earthquake
  - At peak: $\sim$1,900 more Zhaotong phones roaming daily in Guangdong
  - Statistically significant at 5% level for 4 months after earthquake
- **Magnitude:**
  - Estimated 14,000 residents (1.3% of affected population) moved to Guangdong

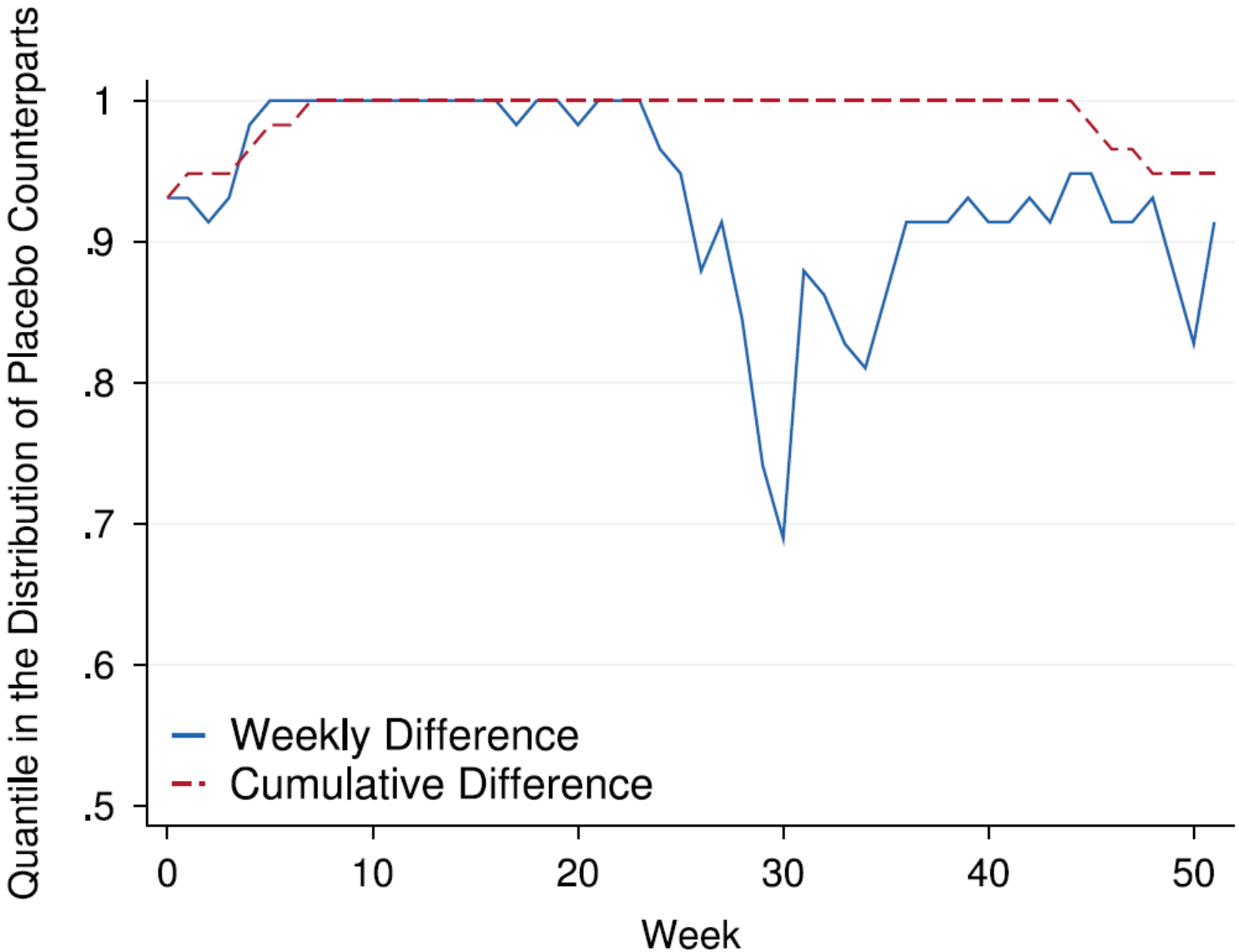
Shock and Roam



Treatment-Control Differences



Randomization Inference



Phone Switching Behavior

- **Survey on SIM card switching:**
  - 30% switch within one week
  - 19% switch in 1-2 weeks
  - 19% switch in 3-4 weeks
  - 23% switch in 1-2 months
  - 8.5% take more than 2 months
- **Conversion rate:**
  - One migrant increases daily roaming phones by 25
  - Used to estimate total migration numbers

Return Migration Analysis

- **Return migration findings:**
  - No evidence of increased return migration
  - Analyzed Guangdong-registered phones roaming in Zhaotong
  - Synthetic control traces earthquake-hit prefecture closely
  - Only 11% more Guangdong phones around Chinese New Year (not statistically significant)
- **Implication:**
  - Earthquake did not draw back substantial numbers of migrant workers

Comparison with Previous Research

- **Our findings vs. previous studies:**
  - Consistent with Gröger and Zylberberg (2016): households in Vietnam sent members to work in cities after typhoon
  - Contrasts with Tse (2012): migration rates decreased after disasters in Indonesia
  - Contrasts with Halliday (2006): earthquakes in El Salvador reduced household members in North America
- **Comparable magnitude:**
  - Our estimate: 1.3% of affected population
  - Gröger and Zylberberg: 6.5 percentage points higher household-level migration

Contributions to Literature

- **Methodological contributions:**
  - First to use mobile phone data to track post-disaster migration in China
  - Captures both emigration and return migration flows
  - Reveals timing of post-disaster migration responses
  - Documents seasonal patterns of internal migration in China
- **Machine-generated data advantages:**
  - Complements conventional measures
  - Captures households that move entirely (missed in follow-up surveys)
  - High-frequency observations

Limitations and Considerations

- **Potential limitations:**
  - Captures only short-term migration flows, not migrant stock
  - May include temporary migrants seeking asylum with friends/family
  - Economic migrants vs. asylum seekers not distinguished
  - Regional differences in mobile phone usage
- **Methodological considerations:**
  - Synthetic control vs. difference-in-differences approaches
  - Aggregate gross migratory responses vs. relative treatment intensity

Implications

- **Economic implications:**
  - Post-disaster economic circumstances prevail over family support needs
  - Natural disasters can accelerate existing migration patterns
  - Timing of disasters may affect subsequent migratory responses
  - Migration serves as an important coping mechanism
- **Policy relevance:**
  - Disaster response planning should consider migration effects
  - Economic opportunities in destination areas important for recovery

Conclusion

- **Key takeaways:**
  - Natural disasters can induce significant out-migration
  - Migration emerges quickly and peaks within months
  - No evidence of increased return migration
  - Economic factors appear to dominate family considerations
  - Novel data sources can provide new insights on migration patterns
- **Future research directions:**
  - Long-term effects on migration patterns
  - Impacts on source and destination economies
  - Comparative studies across different types of disasters

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Trade to aid: EU's temporary tariff waivers for flood-hit Pakistan

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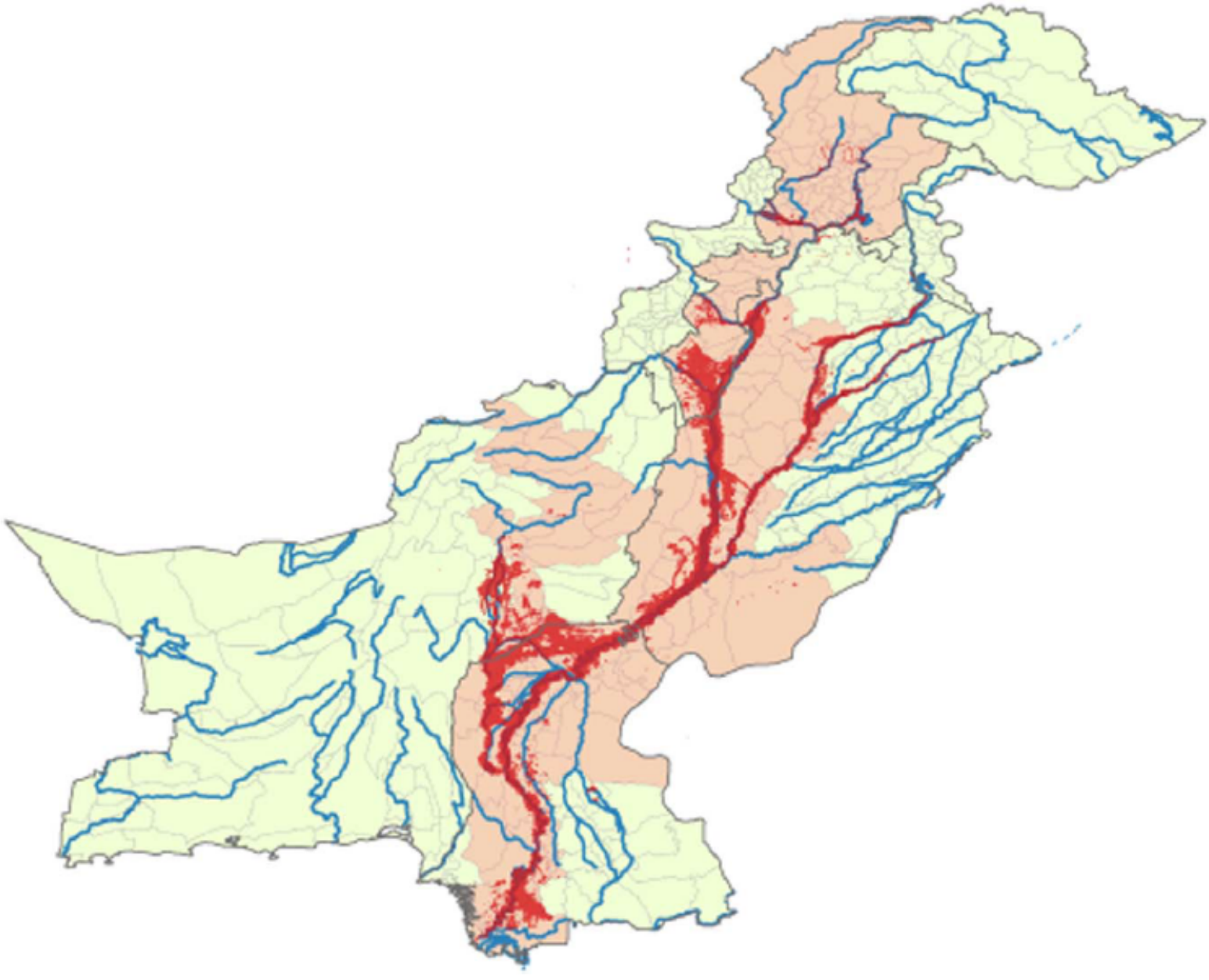
ABSTRACT

In this paper, we study the effectiveness of the first large-scale unilateral trade concessions as foreign aid for disaster relief, i.e., EU tariff waivers on goods heavily exported by Pakistan, which was severely hit by the 2010 floods. Using a triple-difference approach and a synthetic control approach, we find that the tariff waivers substantially increased Pakistan's exports to the EU. The export hike occurred within a few months after the waivers became effective, and did not significantly depress exports by competing countries. While the export boost brought greater employment opportunities in the tariff-waived industries, we find little evidence that the greater labor demands from trade were particularly beneficial to the areas most affected by the floods. Our findings suggest that trade policy may complement traditional means of foreign aid—but trade concessions alone may be inadequate, as the areas most affected by natural disasters may be poorly targeted.

2010 Pakistan Floods

- Worst in modern history
- Cover roughly one-fifth of Pakistan's total land area, submerging about 11,000 villages
- Affecting 20 million people
- Destroyed over 1.7 million homes
- $9.5 billion+ in damages
- $\approx$ 2,000 deaths



EU's Response

- Temporary tariff waivers on 75 products (textiles, leather goods).
  - Textiles
  - Clothing
  - Leather goods
- Aimed to aid post-disaster recovery through trade concessions.
- The waived products accounted for approximately 25% of Pakistan's annual exports to the EU.
- Average tariff reduction: 9.5%, weighted by trade volume.

Trade Impacts of Tariff Waivers

- **Key Findings:**
  - 45% increase in Pakistan's exports of tariff-waived goods to the EU.
  - Boost occurred within two months of implementation.
  - No significant trade diversion effects for competing countries.
- **Contribution to GDP:**
  - Export increase accounted for 0.3% of Pakistan's GDP in 2012.

Labor Market Outcomes

- **Employment Growth in Textile Industries:**
  - Benefited women and low-education workers.
  - Earnings increased in textile-concentrated areas.
- **Limited Benefits for Flood-Affected Regions:**
  - Textile industries were not located in the most flood-affected areas.

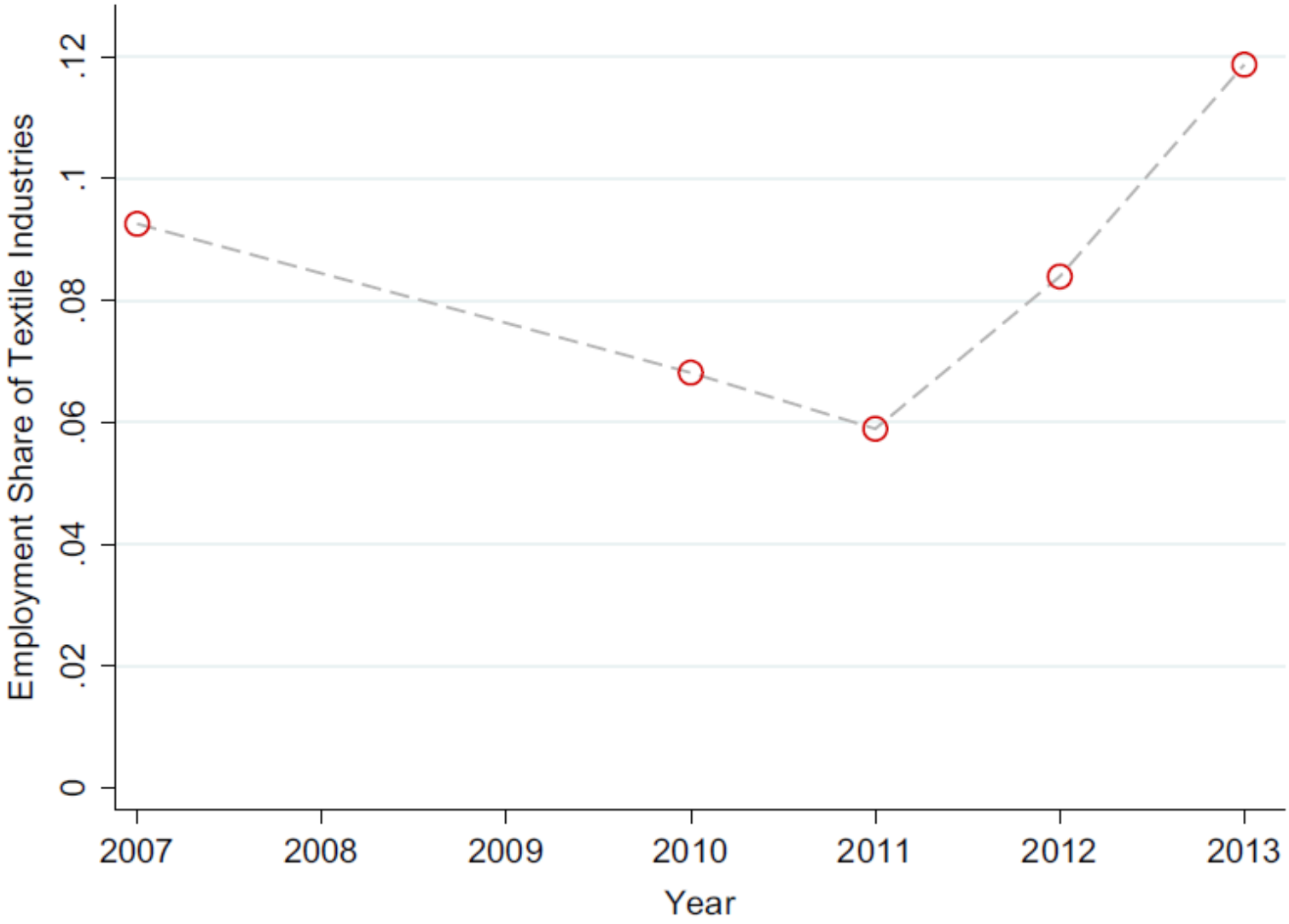


Fig. 8. Employment share of textile, garment & leather industries.

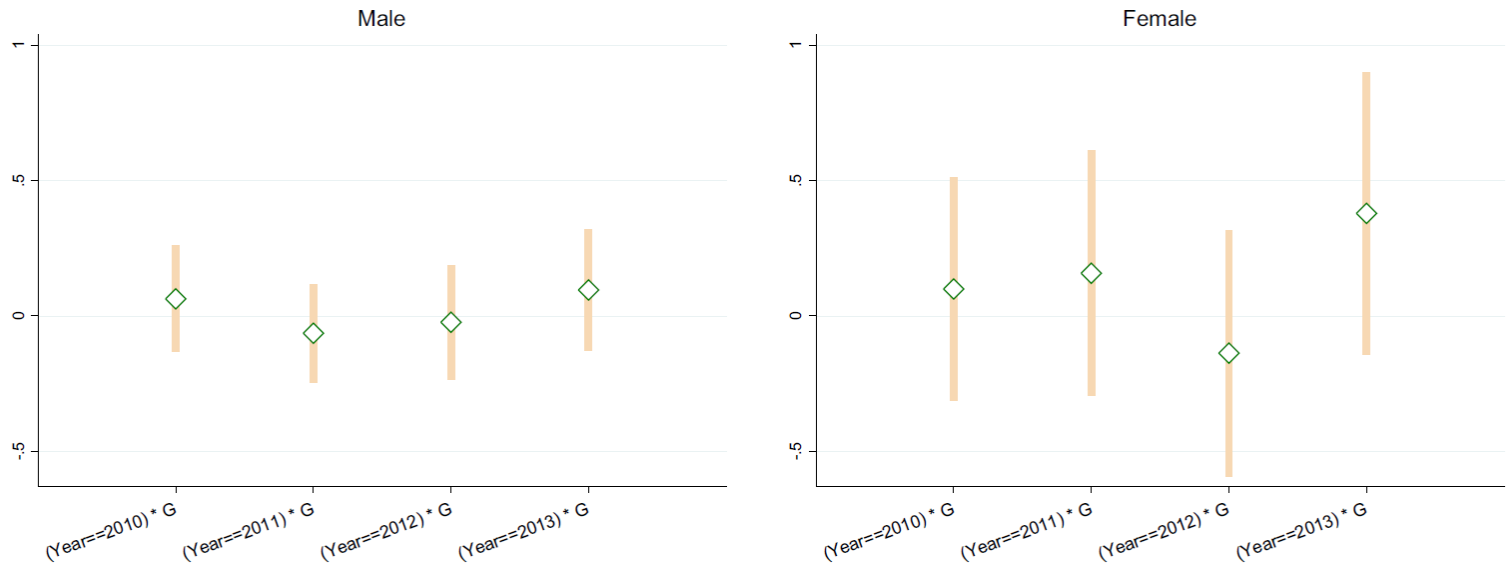


Fig. 7. Employment by gender in areas with textile, garment & leather industries.Notes: The graphs above plot the coefficient estimates of the specification given by Eq. (8). The dependent variable is an indicator variable equal to one if the individual is a paid employee and zero otherwise. The sample includes 377,212 working-age individuals in the labor force from PSLM waves 2007 and 2010–2013. Both subplots above contain the estimates of γ_t, which are the interaction terms between the local employment share of textile industries and indicator variables for year. The left subplot plots γ_t from the male sample; the right subplot plots γ_t from the female sample. The bars indicated 95% confidence intervals. Standard errors are clustered at the district-urbanity level. The control variables include individual characteristics, district-urbanity fixed effects, and year fixed effects.

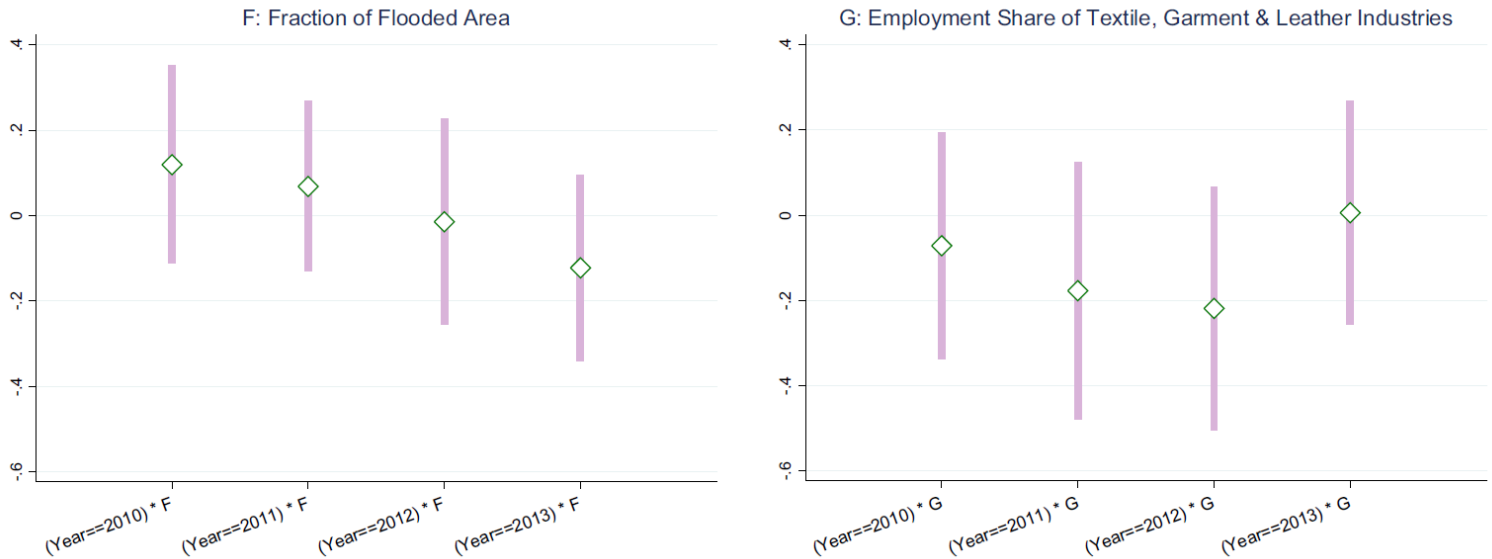


Fig. 6. Household earnings in flooded areas and areas with textile, garment & leather industries.Notes: The graphs above plot the coefficient estimates of the specification given by Eq. (8). The dependent variable is the log value of household earnings in the last year. The sample includes 198,961 households in PSLM waves 2007 and 2010–2013. The left subplot above contains the estimates of δ_t, which are the interaction terms between the fraction of flood-affected population and the indicator variables for year; The right subplot above contains the estimates of γ_t, which are the interaction terms between the local employment share of textile industries and the indicator variables for year. The bars indicated 95% confidence intervals. Standard errors are clustered at the district-urbanity level. The control variables include household characteristics, district-urbanity fixed effects, and year fixed effects.

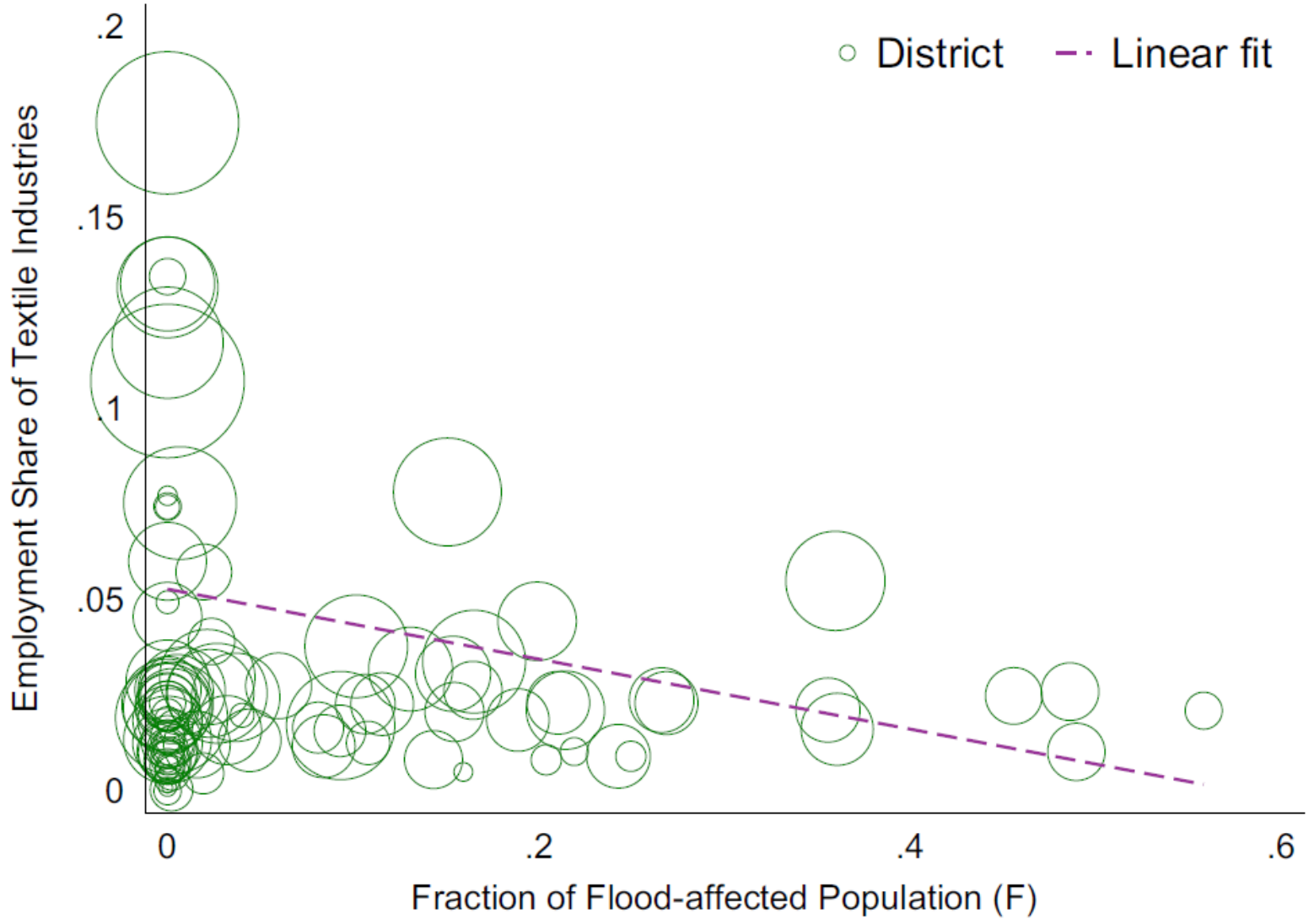


Fig. 5. Floods severity and employment share of textile, garment & leather industries.Notes: Each bubble is a district, whose population as of 2010 is indicated by the size of the bubble. The y-axis represents the employment share of textile industries. The x-axis represents the flood severity defined by Eq. (7).

Migratory Responses

- **Internal Migration:**
  - Minimal relocation from flood-affected areas to textile hubs.
  - Age dependency ratios in flood-affected areas remained stable.
- **Remittances:**
  - Increased in 2010 and 2011 but not in 2013.
  - No evidence of significant remittance flows from textile workers to flood-affected households.

Challenges in Targeting Flood-Affected Areas

- **Key Issues:**
  - Textile industries' geographic concentration limited benefits to flood-affected regions.
  - Slower earnings growth in flood-affected households compared to textile-concentrated areas.
- **Implications:**
  - Trade concessions alone may not adequately address disaster recovery needs.

Conclusion

- **Summary:**
  - EU's tariff waivers effectively boosted exports and created labor market opportunities.
  - Limited impact on flood-affected households due to geographic and structural constraints.
- **Policy Implications:**
  - Trade policy can complement traditional aid but requires better targeting mechanisms.