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Labor Market Impacts and Responses

The Economic Consequences of a Marine Environmental Disaster

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Abstract

This paper examines labor market impacts of a large-scale marine environmental crisis caused by toxic chemical contamination in Vietnam’s central coast in 2016. Combining labor force surveys with satellite data on fishing-boat detection, we find negative and heterogeneous impacts on fishery incomes and employment, and uncover interesting coping patterns. Satellite data suggests that upstream fishers traveled to safe fishing grounds, thus bore a lower income damage. Downstream fishers, instead, endured severe impact and were more likely to substitute fishery hours to working secondary jobs. We also find evidence on an impact recovery to both fishing intensity and fishery income, and a positive labor-market spillover to freshwater fishery.

Introduction

- Since the 1990s, the number of documented large-scale industrial disasters have increased by nearly fivefold. The types of industrial disasters that nations experience include gas leaks, oil spills, nuclear explosions, and chemical contamination
- However, existing studies on the effects of man-made environmental disasters in developing countries, due to capacity and budget constraints, and sometimes political sensitivities, are rare.
- April 2016, mass fish deaths detected along the central coast of Vietnam. This happens because Formosa steel plant discharged toxic chemicals.
- What is the impact of the disaster on local fishermen? And how do they cope with it?

Figure 1: The map of Vietnam

Data

- **Satellite data:** detection of night-time light emitted from fishing boats
 - NOAA & NASA
 - monthly, from 04/2012 to 05/2018

Figure 2: VIIRS Night-light Boat Detection: Raw-data Plots

Figure 3: Comparison of Fishing Intensity: Using VIIRS Boat Detection Data

- **Labor Force Surveys (LFS)**
 - General Statistics Office (GSO): 2016
 - income, employment status, work hours

Figure 4: Comparison of Income Trends: Using LFS 2015-16

Econometrics model

- Use Diff-in-diff specifications.
- With Labor Force Survey (LFS)

$$y_{im} = \alpha_0 + \alpha_1(treat_i \times post_m) + \sigma_i + \theta_m + \varepsilon_{im}$$

- outcome: wage, total income, workload and extra job
- individual and month fixed-effects
- clustered at district level

- With Nightlight Data

$$y_{cpmy} = \beta_1(treat_c \times post_{my}) + \gamma_c + \lambda_{my} + \pi_{pm} + \epsilon_{cpmy}$$

- outcome: fishing density
- grid-specific, month-by-year and province-by-month fixed-effects

Results

Figure 5: Fishing Density Province-by-province Treatment Effects

Table 1: Impact on Fishery Income				
	Income (main job)	Total income	Income (main job)	Total income
[Panel A] Geographic control group				
(HaTinh & QBinh)	-0.251***	-0.259***	-0.413***	-0.427***
× post	(0.079)	(0.079)	(0.067)	(0.068)
(QuangTri & Hue)	-0.439***	-0.421***	-0.536***	-0.516***
× post	(0.136)	(0.135)	(0.056)	(0.056)
Observations	2,477	2,477	872	872
[Panel B] Industry control group				
(HaTinh & QBinh)	-0.276***	-0.279***	-0.438***	-0.448***
× post	(0.060)	(0.058)	(0.063)	(0.067)
(QuangTri & Hue)	-0.429***	-0.400***	-0.574***	-0.546***
× post	(0.095)	(0.092)	(0.028)	(0.029)
Observations	7,991	7,991	2,090	2,090
Individual FE	No	No	Yes	Yes

S.E in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Table 2: Labor-Market Responses: Workload and Having Secondary Jobs

	Weekly workload	Having extra Jobs
[Panel A] Geographic control group		
(HaTinh & QBinh)	1.227	-0.122
× post	(1.917)	(0.093)
(QuangTri & Hue)	-28.825***	0.138***
× post	(1.085)	(0.020)
Observations	872	872
[Panel B] Industry control group		
(HaTinh & QBinh)	1.720*	-0.114
× post	(1.015)	(0.091)
(QuangTri & Hue)	-29.562***	0.141***
× post	(0.674)	(0.017)
Observations	2,090	2,090
Month FE	Yes	Yes
Individual FE	Yes	Yes

S.E. in parentheses, *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Conclusions

- The disaster has a massive negative impact on fishermen’s employment and income.
- Effect is heterogeneous by location.
- Heterogeneous coping activities.
- Requires attention when designing compensation policies.

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