Natural disasters and individual economic performance: Evidence from the Slave Lake wildfire

Philippe Kabore, Nicholas Rivers,
and Catherine Deri Armstrong

University of Ottawa

pkabo048@uottawa.ca

Version: April 2021

Motivation - 1

- The second biggest disaster in Canada at the time. The 2011 Slake Lake wildfire.

- It is emblematic of the type of disaster climate change may entail;

Motivation - 2

International Disaster Database (EM-DAT), Climate Research Unit (CRU), NASA, Earth Exchange Global Daily Downscaled (NEX-GDDP), and IMF staff calculations.

Figure: Frequency of wildfire disasters under a scenario of continued increase in greenhouse gas emissions

4. Disasters Caused by Wildfires
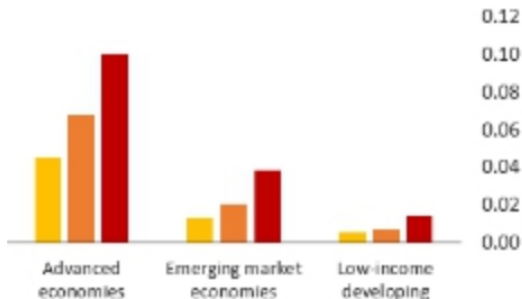
Literature review

Closest studies to this paper are two studies analyzing the impact of Hurricane Katrina on individuals income and wage. They find a positive effect on incomes and wage in the medium- and long-term.

- Deryigina et al (2018)

- Groen et al (2020)

Research questions

What is the short- and long-term economic effect of the 2011
wildfire on individuals?

Research contribution

- This study contributes to the literature by showing the effects of wildfires on individuals' outcomes.

- This is among the rare paper that analyze the economic effect of natural disasters in Canada.

Areas affected by the disaster

Map showing the areas affected by the wildfire,

Figure: Areas affected by the 2011 Slave Lake wildfire (Edmonton Journal)

Longitudinal Administrative Data (LAD)

1. Individuals data. LAD represents a randomly selected 20% sample of all tax filers and their family in the annual T1 family.[1]

2. Information in LAD: incomes: total income, employment income, self-employment income, government transfers. social characteristics: gender, age, marital status. geographical characteristics: 6 digit postal code; census-subdivision; and province.

3. Period of study 2004–2018: 7 years before and after the disaster.

---

[1]Every year, LAD is augmented with a 20% sample of new tax filers which makes it a representative sample of tax filers in Canada.

Control group selection

Causal identification relies on the assumption that the 2011 Slave Lake wildfire is exogenous and unanticipated by the population.

1. First we keep cities of similar as Slave Lake (5-10,000 individuals in 2010)

2. We then restrict the control group to those between 100-200km radius from Slave Lake.

3. Apply matching based on incomes and industry before the event, age, and gender.

List of control groups

Figure: Treatment and control group
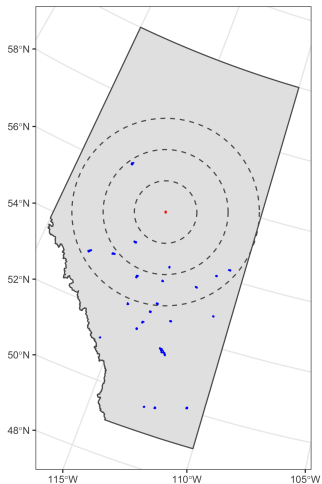
Summary Statistics

Variables	control group mean	sd	treatment group mean	sd	t-test(prob)
total income	42540	36130	41216	36556	0.174
employment income	39634	36104	38651	36212	0.305
self-employment income	281	4741	287	4045	0.96
rental income	59	1016	19	442	0.07
government transfer	1753	3792	1726	3962	0.788
employment insurance	412	1779	364	1570	0.357
age	36	12	36	12	0.355
female	0.53	0.49	0.54	0.49	0.775
migrate	0.09	0.29	0.12	0.32	0.076
total individual	2,069		577		
total observation	9,330		3,126		

Table: Summary statistics 2004-2010

Estimation

$$y_{imt} = \theta D_{mt} + \gamma_i + \omega_t + \epsilon_{imt} \qquad (1)$$

$$y_{imt} = \sum_{j=2004, j \neq 2010}^{2018} \theta_j D_m^j + \gamma_i + \omega_t + \epsilon_{imt} \qquad (2)$$

Incomes and employment status - Simple DID

Table: Effect of disaster on individuals incomes

	employment income	self-employment income	rental income	government transfers
treatment	-3,546**	-146.7	-130.4**	556.6***
	(1,551)	(276.2)	(59.8)	(201)
Observations	24,747	24,747	24,747	24,747
R-squared	0.67	0.61	0.38	0.55
Individual FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Table: Effect of disaster on extensive margins

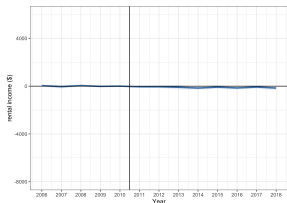|	employee	self employee	employment insurance	low income group
treatment	-0.03***	-0.003	0.004	0.02*
	(0.01)	(0.009)	(0.01)	(0.01)
Observations	24,747	24,747	24,747	24,747
R-squared	0.56	0.54	0.34	0.5
Individual FE	YES	YES	YES	YES
Year FE	YES	YES	YES	YES

Income - Event-Study Analysis

Event-Study with matching
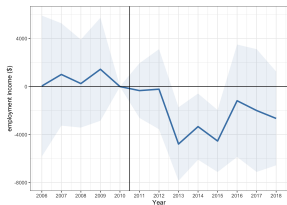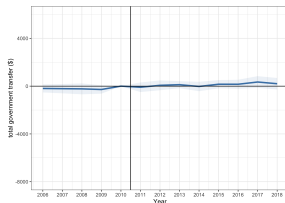

(a) Employment income.

(b) Self-employment.

(c) Rental income.

(d) Total government

Migration as a way for adaptation

Table: Effect of migrating on incomes

	total income	employment income	self-employment income	rental income	government transfer
treatment	-5,312**	-3,084	-338.1	-259.9**	965.2**
	(2,303)	(1,965)	(334.0)	(107.5)	(423.4)
treatment X migration	2,065	-1,112	309.5	247.9**	-688.4
	(2,938)	(3,009)	(352.2)	(120.7)	(809.5)
Observations	24,747	24,747	24,747	24,747	24,747
R-squared	0.669	0.674	0.615	0.389	0.555
Individual FE	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES

Robustness checks

Towns 100-300km radius (5K-10K)	population	Towns 100-200km radius (5K-50K)	population
Slave Lake	6782	Slave Lake	6782
Bonnyville	6216	Spruce Grove	26171
St. Paul	5405	Fort Saskatchewan	19051
Vegreville	5717	Stony Plain	15051
Drayton Valley	7118	Peace River	6729
Ponoka	6778	Whitecourt	9605
Devon	6578	Morinville	8569
Peace River	6729		
Edson	8475		
Whitecourt	9605		
Hinton	9640		
Morinville	8569		

Conclusion

We find individuals exposed to the wildfire experience a reduction
in employment income and an increase in government transfers.
This is explained by losses of jobs.

- Individuals working in agriculture and forestry sectors and oil,
  gas and mining sector were the most affected by incomes
  losses and job losses;
- We find no evidence that migration helps adapt against the
  negative effect of the disaster.

THANK YOU