That Sinking Feeling: The Changing Price of

Disaster Risk Following an Earthquake (PowerPoint)

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That sinking feeling: the changing price of disaster risk following an earthquake

Levente Timar

13 February 2015, AARES Conference

Research team

- Levente Timar, Arthur Grimes, Richard Fabling
- Funded by the Natural Hazard Research Platform

Canterbury earthquakes

- M 7.1 in Sept 2010, M 6.3 in Feb 2011, M 6.3 in June 2011
- Among most severe natural disasters to strike NZ
- Damage in CBD
  - Brick and mortar buildings
  - Cordoned off for 2 years
- Residential damage
  - 90% of residential buildings damaged
  - 20,000 houses seriously affected, 6,000 beyond repair
  - Mostly due to liquefaction

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Liquefaction

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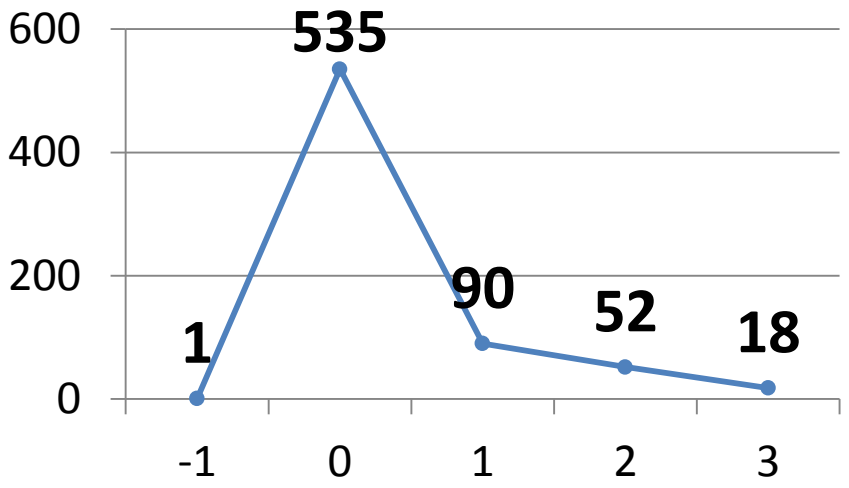
Liquefaction

- Hazard mapped by scientists prior to earthquakes
- Largely unknown to public
- Ignored or downplayed by institutions
- Sept 2010 earthquake: information shock
  - NZ Herald citations



Previous research

- Property markets internalize the perceived risks associated with natural hazards
- Discount changes with prevalence of hazard events
- Effect may only be temporary
  - Insurance take-up (Gallagher 2014)
  - Property prices (Bin & Landry 2013)

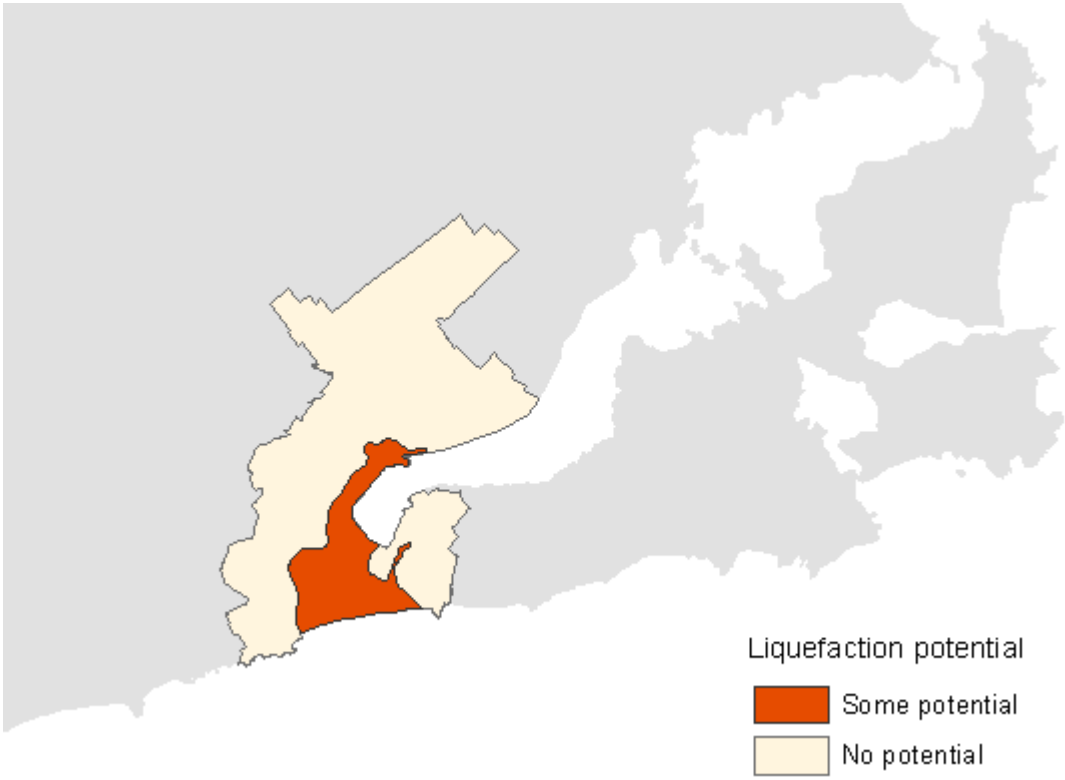
Study design

- Compare pre- and post-earthquake sales of residential properties not directly affected by the earthquakes
- Differentiate across risk types and risk potential

		Seismicity	
		Dunedin City (low)	Hutt City (high)
Risk type	Construction (known)	X	X
	Liquefaction (unknown)	X	✓

- Permanent vs transient impact

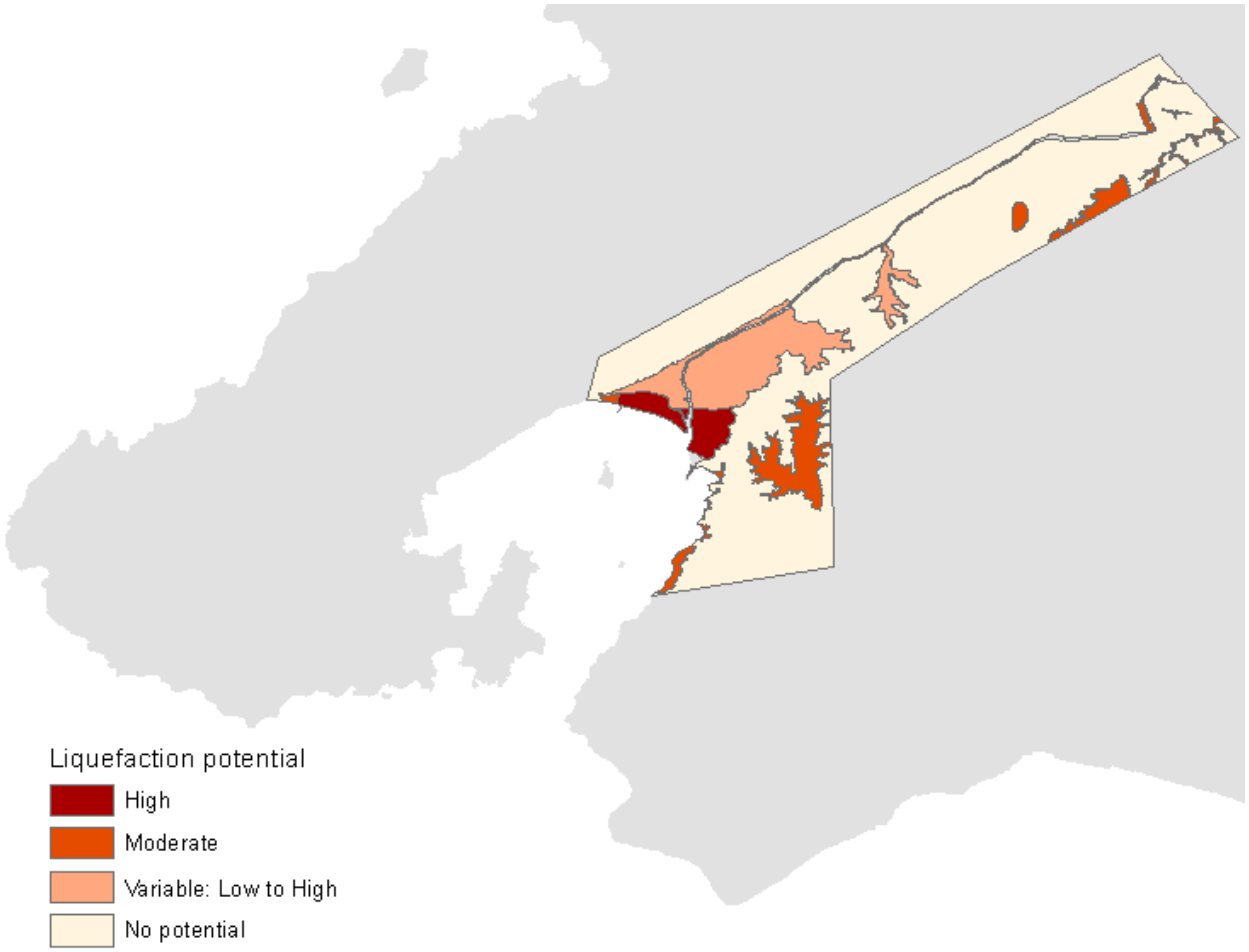
Dunedin City



Return periods

- MM7
  350 yrs
- MM9
  13,000 yrs

Hutt City



Return periods

- MM7
  30 yrs
- MM9
  400 yrs

Models

- Hedonic model

$$\log(P_{it}) = \bar{\alpha} + \mu_t + \beta X_{it} + \gamma Z_{it} + \delta Z_{it} d^{EQ} + \varepsilon_{it}$$

- Repeat sales model

$$\log(P_{it}) = \bar{\alpha} + \alpha_i + \mu_t + \beta X_{it} + \gamma Z_{it} + \delta Z_{it} d^{EQ} + \varepsilon_{it}$$

  - Control for all unchanging house characteristics
  - Parameters on (unchanging) house attributes unidentified
  - Nested models to facilitate comparison

Models

- Hedonic model

House attributes — Post-EQ indicator

$$\log(P_{it}) = \bar{\alpha} + \mu_t + \beta X_{it} + \gamma Z_{it} + \delta Z_{it} d^{EQ} + \varepsilon_{it}$$

Seismic risk variables

- Repeat sales model

House fixed effect

$$\log(P_{it}) = \bar{\alpha} + \alpha_i + \mu_t + \beta X_{it} + \gamma Z_{it} + \delta Z_{it} d^{EQ} + \varepsilon_{it}$$

  - Control for all unchanging house characteristics
  - Parameters on (unchanging) house attributes unidentified
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Data

- Residential property sales classified by liquefaction potential zone from QVNZ
- Sample
  - house has a sale record in the post-EQ period
  - at least another sale record from before the EQ (1990-)
- Sale price, house and location attributes (size, age, structure, quality, etc.)

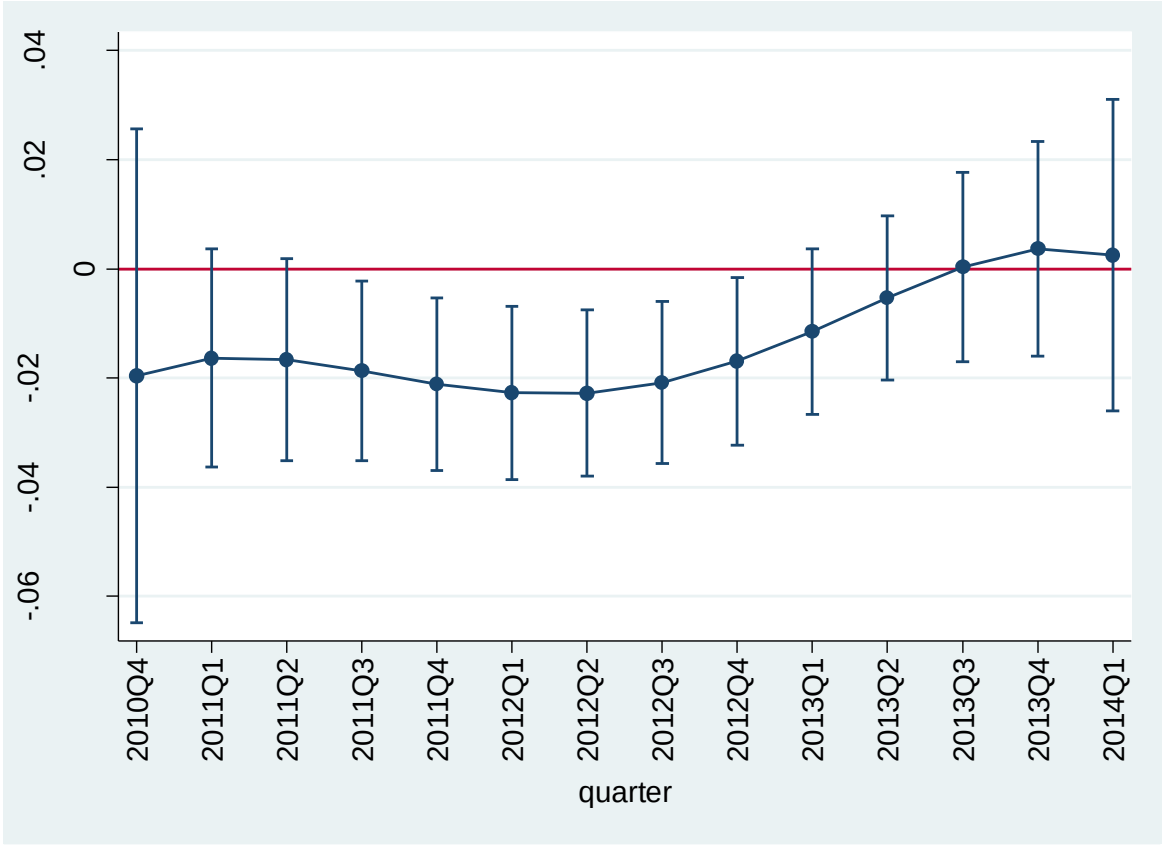
Estimation results

Repeat sales model, risk variables

	Dunedin City	Hutt City
Quarter	YES	YES
House fixed effect	YES	YES
Construction x Post EQ		
Brick	**-0.0267**	**0.0045**
Other	**-0.0163**	**0.0061**
Weatherboard	**(base)**	**(base)**
Liquefaction x Post EQ	**0.0430**	**-0.0138****
Observations	5,009	12,688
Houses	1,392	4,076

** significant at 5%

Time-varying liquefaction risk premium
Hutt City



- Estimated marginal impact & 90% CI
- Average magnitude of 1.4%
- Around 2% for about 2 years
- Fully dissipates within three years

Conclusion

- Consistent with hypotheses

		Seismicity	
		Dunedin City (low)	Hutt City (high)
Risk type	Construction (known)	X	X
	Liquefaction (unknown)	X	✓

- Consistent with previous research on effects of uncertain and infrequently observed events

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Conclusion

- Why does the risk premium disappear?
  - Cognitive dissonance
  - Rational response (expectations around insurance)
- Policy implications
  - Greater prominence for risk advice in risky areas
  - Risk-differentiated insurance premia
- Ignorance is bliss?