

ONLINE APPENDIX FOR

Insurance as a Double-Edged Sword:

Quantitative Evidence from the 2011 Christchurch Earthquake

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Abstract: We examine the role of business interruption (BI) insurance in business recovery following the Christchurch earthquake in 2011. First, we ask whether BI insurance increases the likelihood of business survival in the immediate (3-6 months) aftermath of a disaster. We find only weak evidence that those firms that had incurred damage, but were covered by property and business interruption insurance, had higher likelihood of survival post-quake compared with those firms that did not have any insurance. For the medium-term (2-3 years) survival of firms, our results show a more explicit role for insurance. Firms with property and BI insurance experience increased productivity and improved performance following a catastrophe. Furthermore, those organisations that receive prompt and full payments of their claims have a better recovery than those that had protracted or inadequate claim payments (defined as less than 80% of their claim paid within 2.5 years). The latter group (inadequate payment) does worse than those organisations that had damage but no insurance coverage. Our analysis indicates the importance not only of adequate insurance coverage, but also of an insurance system that delivers prompt claim payments.

Appendix A: on the first survey

The first survey was sent to 309 organizations.¹ The organizations that were surveyed were mostly located, pre-quake, in the Central Business District (CBD) of Christchurch, and the Lyttleton Town Centre (the site of the region's main deep-sea port). There were 176 returned responses, but after eliminating non-valid responses, 140 were usable. Non-valid responses included duplicate responses, surveys with missing information for some of the key questions, and responses from central and local government entities. State-owned enterprises (SOE) are still included in the study, as they operate as for-profit organizations according to the State-Owned Enterprises Act in 1986 (Laking, 2012).

According to nationwide statistics, 90% of firms in New Zealand have fewer than five employees. Comparatively, the sample contains a smaller percentage of small firms – 55%. Moreover, the overall share of zero-employee businesses in New Zealand is 69% while the proportion in the survey sample is only 20%. The aggregate figures for New Zealand, however, may be misleading, as in many cases these very small firms (especially the ones with no employees) are inactive, or their operations are very small. So, while our sample is not representative in the strictest sense, it most likely reflects the size distribution of economically active firms better than the aggregate statistics.

Our core variable in this study is property-damage insurance, because of the nature of the damage (structural and non-structural damage due to the earthquake) and the availability of the insurance at the time of the earthquake. Property-damage insurance refers to insurance cover for any loss or damage arising to the insured properties caused by the insured perils. It includes coverage for property, furniture, fixture, fittings, building contents, assets, equipment, and machinery. The firms that had property damage insurance are thus in the treatment group and the firms that did not are in the control group.²

¹ A large share of participants in this short-term survey is the organizations that were in the pre-survey and agreed to participate in the ongoing studies of this survey series. The pre-survey was conducted in November 2010, about a month after the earthquake in September 2010. It was primarily constructed to observe the impact of the earthquake on organizations around Christchurch area. The participants were selected based on their industry sector. In the pre-survey, approximately 100 firms from 9 unique business sectors, categorized by the Canterbury Regional Economic Development Strategy (CREDS) 2005-2015, were sampled. A total of 879 firms were called to participate in this survey. The response rate was 43% with a returned response of 379 organizations.

² Organizations that indicated that they adopted property insurance coverage may have insured themselves with a commercial insurance policy, or, if they are sole traders or operate their business from home, they may be insured

The survey also includes data on business interruption insurance (BI). BI covers loss of revenue and/or increased cost of working as a result of damage to the insured properties. BI insurance is normally purchased together with property damage insurance; this is also the practice in New Zealand (ICNZ, 2013). Moreover, it will trigger only if the insured properties covered under the property damage insurance are damaged by the insured perils. If an insured property is not damaged due to the insured perils, the BI policy will not provide cover (ICNZ, 2013). Hence, all firms that had adopted business interruption coverage had also adopted property damage insurance.³

Of the 140 firms, 106 had property damage insurance at the time of the quake – 76% of the sample. More than half of the firms that had property damage insurance also had BI insurance. In our dataset, 69% of the firms with five or fewer employees (small-sized) had insurance. Medium-sized firms (employing between 6 and 49 people) had the highest proportion of insurance adoption (90%). 76% of the firms with greater than 50 employees were insured. Large firms may have their own captive insurance or be self-insured.⁴ We find only small differences in the average number of employees between the treated and the control groups. The firms with (without) insurance had an average number of employees of 56 (60) with the standard deviations of 154 (178).

There were about 30 firms from each ownership structure—sole proprietorship, partnership, and limited liability organizations. Roughly the same proportion of firms with each ownership structure had insurance. With regard to the distribution of the location of business, the majority

under a residential insurance policy. Prior to the quake, there was a significant difference between the residential insurance and the commercial insurance coverage in New Zealand. While properties insured under commercial insurance were covered on a *sum-insured basis*, properties insured under the residential insurance contract were covered on a *replacement basis* (which, in principle, means that there was no limit on the amount insured). This difference *ex post* became important as the replacement-basis arrangements led to significant and on-going delays in claim settlement following the earthquakes. This distinction, however, appears not had been perceived as important before or immediately after the earthquake—i.e. before these delays started to be noticed—so we do not think they mar our estimation strategy.

³ In some cases, policyholders could have purchased an extension under business interruption insurance to cover any loss or damage to their suppliers and/or customers. In this case, the insured could make a claim to their BI policy even if the firm's insured properties were not damaged. This type of insurance is called "*Contingent Business Interruption*". We have no information of whether the surveyed firms had this extension covered in their policy. However, a private conversation with the Insurance Council of New Zealand on the 1st of April 2014 suggested that the availability of contingent BI coverage in New Zealand is limited.

⁴ Captive insurance company is established to provide insurance coverage for its owner (the parent companies) and its subsidiaries. Large (and multinational) organizations tend to have their own captive insurance companies as one of their subsidiaries. The majority of Fortune 500 companies in the U.S. own captive companies (NAIC, 2014).

of the firms were located in the Lyttleton Town Centre, which is where the earthquake was centered – 82% of these firms had insurance. Fifteen firms were located in the Central Business District (CBD) area – 67% of them had insurance.

Appendix Table 2 shows the impact of the earthquake in various areas. A total of 15 organizations have permanently closed after the earthquake. From our data, 16 firms were still closed at the time that this survey was conducted; though these firms might re-open again. This variable is our primary focus in the analysis of the first survey. From the data, 73% of the firms that had permanently closed also had insurance. In addition, 77 firms reported a decrease in revenue – 78% of these firms had insurance. We would have preferred to have the actual revenue of the firms before and after the earthquake to examine the impact of the earthquake on the change in revenue. Nevertheless, 76 firms had reported their estimated percentage change in revenue as shown in Appendix Table 3. The revenue was reduced by 25% on average for those who had insurance and 47% for those who had no insurance.

Almost all firms reported that they experienced structural damage following the earthquake. Of all these firms, 71 firms reported that their businesses were disrupted by structural damage – 79% of them had insurance. Similar numbers of firms had experienced non-structural damage that included damage to furniture, fixtures, fittings, equipment, machinery, inventory, and motor vehicles – 82% of them had insurance.

In addition to the damage from the 2011 earthquake, we also have data regarding the 2010 earthquake. Almost all the firms reported that they were affected by the earthquake in 2010 and 54 firms also reported that their revenue had decreased after the 2010 quake. Although the 2010 earthquake had a more minor impact on businesses than the 2011 one, the firms that might have survived had they experienced only one earthquake might not be able to survive after the latter series of earthquakes. On average, nonetheless, the firms that had insurance seem to experience less negative impact on their revenue after both earthquakes.

Three survey questions focus on the firms' recovery plans; i.e. whether they plan to recover through insurance, to recover using the organization's cash flow, or plan to use the wage subsidy available from the National Government. The majority of the firms reported that they plan to recover through their organization's cash flow. Interestingly, only 45 firms reported that they plan to recover through insurance even though more than twice as many firms reported that they

had insurance. The survey was implemented fairly soon after the earthquake, so it might be the case that respondents were focusing on the more-immediate source of funding available (though at that point in time it was not yet apparent that it will take several years for most claims to be processed). About 40 firms expect to also receive a wage subsidy from the government – 85% of them had insurance.

Appendix B: on the second survey

The insurance section in the questionnaire asked firms if they planned to finance their recovery through insurance, what type of insurance they had at the time of the earthquake, whether they had submitted claims, whether they believed their insurance coverage was adequate, and what proportion of their claim was already paid out.

This survey was undertaken in 2013.⁵ Participants were required to have had one or more premises located in the districts that experienced serious physical damage by the 2011 earthquake: Christchurch city, Selwyn, and Waimakariri districts. Firms were sampled from 19 different sectors.⁶ The questionnaire was sent to 2,176 unique organizations; response rate was approximately 25%. After removing non-valid and incomplete responses, the sample we used included 461 participant firms.⁷ About one-half of the sample firms employ less than 10 people, with most of these organizations employing between 1 to 5 people. 432 observed firms were insured with property damage insurance; 288 (67%) were insured with both property damage and business interruption insurance; and 375 observations had all three types of insurance. Just 1% of our survey respondents were no longer in operation, so the survey results reported here do not adequately represent ceased businesses.

Only 70% of the insured firms had filed an earthquake-related claim. Notably, only half of the sample believed their insurance was/is adequate. Of those that had submitted a claim, nearly 45% had received almost full payout (defined as >80%) on their submitted claims. However, only 38% of the total sample of insured firms had received almost full payout by the time of the survey and also believed that their coverage was adequate.

⁵ See Brown et al. (2014) for detailed description of the survey.

⁶ Sectors were defined according to the Australian and New Zealand Standard Industrial Classification (ANZSIC).

⁷ Responses were considered non-valid in cases of duplicates responses from the same firm, surveys with missing information for some of the key questions, and responses from public sector.

Appendix Table 1. Number of insured vs uninsured firms by firm characteristics

Definition	Had insurance		No insurance	
	Obs.	%	Obs.	%
Organizational ownership structure				
Sole proprietorship	34	77.3%	10	22.7%
Partnership/JV partner	30	85.7%	5	14.3%
Limited Liability	30	69.8%	13	30.2%
Location before the earthquake				
CBD	10	66.7%	5	33.3%
Lyttleton	29	82.9%	6	17.1%
Kaiapoi	8	72.7%	3	27.3%
Business Sector				
Retail trade	27	75.0%	9	25.0%
Wholesale trade	6	100.0%	0	0.0%
Manufacturing	9	75.0%	3	25.0%
Construction	3	75.0%	1	25.0%
Transportation and Warehousing	3	50.0%	3	50.0%
Fast-moving consumer goods (FMCG)	17	85.0%	3	15.0%
Lifeline utilities	13	81.3%	3	18.8%
Ownership of Properties				
Own	33	86.8%	5	13.2%
Rent	73	71.6%	29	28.4%
For-profit organizations				
For-profit	96	78.7%	26	21.3%
Not-for-profit	10	55.6%	8	44.4%
Positive Return on Investment (ROI) in the past five years				
Positive ROI	43	86.0%	7	14.0%
Risk Management Practice				
Risk management officers	83	76.9%	25	23.1%
Written BCM	30	71.4%	12	28.6%
Had practiced emergency response	33	73.3%	12	26.7%

Appendix Table 2. Number of insured vs uninsured firms by the impact of the earthquake

Definition	Had insurance		No insurance	
	Obs.	%	Obs.	%
Business Closure				
Permanently closed	11	73.3%	4	26.7%
Temporarily closed	56	75.7%	18	24.3%
Ongoing closing	13	81.3%	3	18.8%
The change in revenue after the earthquake				
Decreased	52	77.6%	15	22.4%
Increased	31	91.2%	3	8.8%
Unchanged	22	68.8%	10	31.3%
Structural and non-structural damage				
Structural damage	81	78.6%	22	21.4%
Non-structural damage	77	81.1%	18	18.9%
Disrupted by structural damage	56	78.9%	15	21.1%
Disrupted by non-structural damage	56	82.4%	12	17.6%
Affected by the 2010 earthquake				
Affected by the 2010 earthquake	91	76.5%	28	23.5%
Revenue decreased	43	79.6%	11	20.4%
Financial Recovery Plan				
Plan to recover through insurance	45	100%	N/A	
Plan to recover through organization's cash flow	76	78.4%	21	21.6%
Expected to receive wage subsidy	35	85.4%	6	14.6%

Appendix Table 3. Average percentage change in revenue after the 2010-2011 earthquakes

Description	Insured			Uninsured		
	Obs. %	Mean (SD)	Min, Max	Obs. %	Mean (SD)	Min, Max
Percentage change in revenue	76 85.4%	-25.13 (45.84)	-100%, 100%	13 14.6%	-47.62 (38.33)	-100%, 5%
Percentage change in revenue after the first EQ	61 84.7%	-12.84 (25.77)	-100%, 25%	11 15.3%	-24.28 (23.24)	-60%, 20%

Appendix Table 4. ANOVA Table between firms with/without business interruption insurance

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
yprof	Between Groups	.667	1	.667	3.150	.077
	Within Groups	91.000	430	.212		
	Total	91.667	431			
yprod	Between Groups	2.241	1	2.241	9.111	.003
	Within Groups	105.757	430	.246		
	Total	107.998	431			
ybeto	Between Groups	.510	1	.510	2.100	.148
	Within Groups	104.490	430	.243		
	Total	105.000	431			

Appendix Table 5. ANOVA Table between firms with/without adequate insurance claim payment

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
yprof	Between Groups	.600	1	.600	2.834	.093
	Within Groups	91.066	430	.212		
	Total	91.667	431			
yprod	Between Groups	.012	1	.012	.049	.824
	Within Groups	107.985	430	.251		
	Total	107.998	431			
ybeto	Between Groups	.164	1	.164	.674	.412
	Within Groups	104.836	430	.244		
	Total	105.000	431			