Regressivity in Public Natural Hazard Insurance: a Quantitative Analysis of the New Zealand Case

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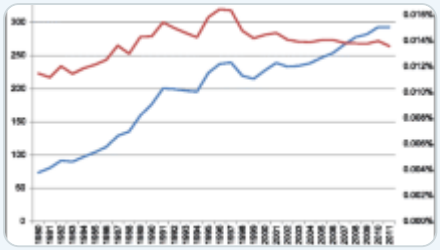
Abstract

Natural hazard insurance is almost always provided by the public sector (directly, or indirectly through public-private partnerships). Given this dominant role of the public sector in hazard insurance, and the importance of shocks in economic dynamics, it is surprising that equity issues have not faced more scrutiny with respect to the design of hazard insurance. The nature of the regressivity we quantify has not been previously identified. We provide a detailed quantification of the degree of regressivity of the New Zealand earthquake insurance program – a system that was designed with an egalitarian purpose. We measure this regressivity as it manifested in the half a million insurance claims that resulted from the Canterbury earthquakes of 2011. We suggest how this regressivity can be

remedied with modifications to the programs' structure, and point to how other insurance schemes internationally are likely to also be regressive.



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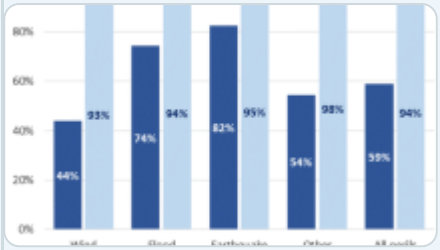

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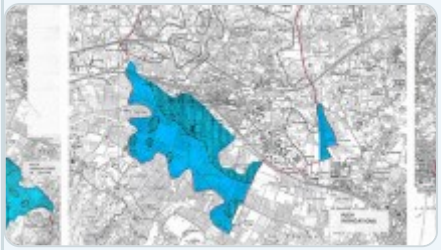

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Notes

1. Natural hazard insurance is also known as catastrophe insurance, disaster insurance, or natural disaster insurance, depending on the context. We use natural hazard insurance for specificity.

2. Belgium, France, Japan, New Zealand, Spain, Switzerland, Turkey, UK, and the USA to name only a few. Section 6 discusses these international programs in more detail.

3. Paudel (2012) provides nine recommendations for designing such PPP schemes. His recommendations include: mandatory participation; adequate enforcement to ensure compliance; public responsibility for the extreme risk (the catastrophic end) of the insured risk, private sector administering of policies; public provision of subsidies through, for example, tax exemptions; public investment in risk mitigation; a (publicly provided) detailed assessment and mapping of risk; and the provision of financial incentives for policyholders to take risk mitigation measures.

4. Kunreuther (2015) suggests that to address issues of equity and fairness, homeowners who cannot afford insurance could be given vouchers tied to

loans for investing in loss reduction measures, but this kind of voucher program is yet to be implemented anywhere.

5. The three highest cost earthquakes in the Canterbury sequence are among the top 10 costliest earthquakes for 1980–2015 (by insured losses). Relative to damages, these events were at least twice as well insured as any of the others on the list.

6. *For a 'semi-random' sample of 8000 houses for which we have complete data on all houses (those homes that are in the Residential Red Zone), more than 98% of homes were insured.*

7. Ability to pay is generally measured by annual income. There is no agreed upon standard to determine what vertical differentiation in tax liabilities is most fair (Joint Committee on Taxation 2015).

8. Slitor (1948) used this type of definition to propose a measure of progression: dt(x)/ dx = [m(x) -t(X)]/x; where t(x) is the average tax rate at the income level x and m(x) is the marginal tax rate at that level of income.

9. Kakwani (1977), however, pointed out that by doubling the tax rates at all income levels, the tax progressivity would mechanically increase when using the Musgrave-Thin ratio. This is problematic because progressivity (or regressivity) is supposed to measure the deviation of a tax system from proportionality. Kakwani proposes to use the Gini index only to measure the distributional effects of taxation, and presents an alternative measure using the Lorenz Curve to create a measure that accounts for both the distributional and proportional elements of a tax system.

10. Poterba (1991a), Lyon and Schwab (1991), Bento et al. (2009), and Borren and Sutton (1992).

11. Wier et al. (2005), and Poterba (1991b).

12. In an ‘actuarially fair’ program, the two should be roughly equal.

13. Since the homeowners’ policies in NZ are always ‘all perils’, and there are few disclosure requirments regarding premium prices, we do not know what is the earthquake-peril component of the overall premium that homeowners pay to their private insurers.

14. Part of the motivation for this was the slow rates of repair following the 1931 and 1942 events (NZ Treasury 2015). In the years that followed NZ was hit by a number of disasters including an earthquake triggered tsunami in 1944, an earthquake in 1968 and a major landslip in 1979. The Earthquake Commission Act of 1993 redesigned the scheme. A major development was the phase-out of cover for commercial properties. It also amalgamated the War Damage and Earthquake Fund and the Disaster and Landslip Fund as the Natural Disaster Fund. This is the fund EQC draws from to pay out on claims.

15. Recall the building cover from EQC is capped at NZ$ 100,000 per dwelling. Nguyen and Noy (2018) show that this is, comparatively, a very low premium.

16. Some other areas closer to the epicenter were with wealthier homeowners (especially the Port Hills area that was later red-zoned). The Red Zone area, however, is not part of our analysis. We also note that this earthquake occurred on a previously unknown fault, so no area-specific advanced preparedness could have occurred.

17. On September 4th, 2010, Canterbury was hit by a magnitude 7.1 earthquake. This was followed by a series of aftershocks, the most devastating of which was a 6.3 earthquake on February 22nd, 2011, which took 185 lives.

18. A meshblock is the smallest unit for which Statistics New Zealand collects data, with boundaries related to population. Censuses are conducted every 5 years. The 2011 census was postponed to 2013 because of the earthquakes.

19. The top income is censored at $100,000. In 2006, there were 0.03% of meshblocks where the Med HH Income top censored at $100,000, and in 2001 0.01%.

20. Due to the nature of the available data, we could not identify whether a single homeowner owned multiple properties. Given this missing indicator of the particularly wealthy, our results are likely to be conservative. The identification based on a proxy for wealth (the value of the home) is potentially more informative than the distinction based on average income (per meshblock). The latter suffers, potentially, from the Ecologicial Fallacy (Robinson 1950) – that the statistical correlation between two variables when they are grouped might be different from the statistical correlation of the individual members of these groups. Furthermore, although the property valuation spoke somewhat directly to the wealth of the homeowner, the census income data related to the residents of these meshblocks rather than the homeowners. Thus, for example, a “slum lord” who owned a number of cheaper properties in low socioeconomic areas could not be identified cleary. However, these are unlikely to be very important considerations as the majority of houses were owner occupied (67% of the 2006 Census stated occupied private dwellings were owner occupied).

21. We estimate this with heteroscedastic and cluster robust standard errors (Cameron and Miller 2015). We also performed this analysis at the claim level (rather than summing all claims for a single property). The results were very similar, and are available upon request.

22. we should note here that quantile coefficients tell us about effects on the distribution, not on individuals.

23. One possible reason for the differences across countries is the degree of implicit insurance, in the form of post-disaster assistance, that citizens expect their government to provide (often based on past experiences). See for example Goeschl and Managi (2018).

24. Whether or not it is desirable is outside of the scope of this paper, as answer this question requires also an examination of various unintended consequences of having disaster insurance (see Onuma et al. 2017a; b). Suffice for us to observe that the international community has decided that more insurance is desirable in its Sendai Framework for Disaster Risk Reduction (the UN General Assembly's international agreement signed in 2015).

References

ABI (2011) Association of British Insurers responds to Government update on the future of flood insurance. http://www.abi.org.uk/Media/ABI_Media_Statements/ABI_Media_Statements_2011. Accessed 21 Nov 2018

Ben-Shahar O, Logue KD (2015) Under the weather: government insurance and the regulation of climate risks

Bento AM, Goulder LH, Jacobsen MR, Von Haefen RH (2009) Distributional and efficiency impacts of increased US gasoline taxes. Am Econ Rev 99(3):667–699

Bin O, Bishop JA, Kousky C (2012) Redistributional effects of the national flood insurance program. Public Finance Review 40(3):360–380

Article Google Scholar

Borren P, Sutton M (1992) Are increases in cigarette taxation regressive? Health Econ 1(4):245–253

Article Google Scholar

Cameron AC, Miller DL (2015) A practitioner's guide to cluster-robust inference. J Hum Resour 50(2):317–372

Article Google Scholar

CCS (2008) Natural natural hazard insurance cover. A diversity of systems. Consorcio de Compensacion de Seguros, Madrid

Google Scholar

Davey J (2015) Flood Re: risk classification and 'Distortion of the Market.' In: Hjalmarsson, J (ed) Future Directions of Consumer Flood Insurance in the UK - Reflections upon the creation of Flood Re. University of Southampton, pp 26–33

Davis L, Knittel C (2016) Are Fuel Economy Standards Regressive? (no. w22925). National Bureau of Economic Research

Goeschl T, Managi S (2018) Public in-kind relief and private self-insurance. *Economics of Disasters and Climate Change* (forthcoming). https://doi.org/10.1007/s41885-018-0031-8

Henderson A (2010) 'Insurance - natural hazard insurance', Te Ara - the encyclopedia of New Zealand. http://www.TeAra.govt.nz/en/insurance/page-4.

Accessed 8 June 2019

Howard J (2016) Socioeconomic effects of the National Flood Insurance Program. Springer

Johnson W (2006) Are public subsidies to higher education regressive? Education 1(3):288–315

Google Scholar

Joint Committee on Taxation (2015) *Fairness and Tax Policy* (JCX-48–15)

Kahn ME, Kerry Smith V (2017) The affordability goal and prices in the National Flood Insurance Program. NBER Working Paper No 24120

Kakwani NC (1977) Measurement of tax progressivity: an international comparison. Economic Journal 87(345):71–80

Article Google Scholar

Karim A, Noy I (2016) Poverty and natural disasters: a regression meta-analysis. Review of Economics and Institutions 7(2). https://doi.org/10.5202/rei.v7i2.222

Kousky C (2011) Managing natural catastrophe risk: state insurance programs in the United States. Rev Environ Econ Policy 5(1):153–171

Kunreuther H (2015) The role of insurance in reducing losses from extreme events: the need for public–private partnerships. Geneva Papers on Risk and Insurance: Issues and Practice 40(4):741–762

Article Google Scholar

Kunreuther H, Pauly M (2009) Insuring Against Catastrophes. In: Diebold FX, Doherty NJ, Herring RJ (eds) The known, the unknown and the unknowable in financial risk management. Princeton University Press, Princeton

Google Scholar

Lindley S, O'Neill J, Kandeh J, Lawson N, Christian R, O'Neill M (2011) Climate change, justice and vulnerability. Joseph Rowntree Foundation, York

Google Scholar

Linnerooth-Bayer J, Surminski S, Bouwer L, Noy I, Mechler R (2018) Insurance as a response to loss and damage? In: Mechler et al (eds) loss and damage from climate change: concepts, methods and policy options. Springer, Cham, pp 483–515

Lyon AB, Schwab RM (1991) Consumption taxes in a life-cycle framework: are sin taxes regressive? National Bureau of Economic Research No. w3932

Marshall D (2017) The California Earthquake Authority. Discussion paper for Resources for the Future – Disaster Risk Financing

McAneney J, Crompton R, McAneney D, Musulin R, Walker G, Pielke Jr, R (2013) Market-based mechanisms for climate change adaptation: assessing the potential for and limits to insurance and market based mechanisms for encouraging climate change adaptation, National Climate Change Adaptation Research Facility, Gold Coast, 99 pp

Musgrave R, Thin T (1948) Income tax progression, 1929-48. J Polit Econ 56(6):498–514

Article Google Scholar

Nguyen C, Noy I (2018) Insuring earthquakes: how would the Californian and Japanese insurance programs have fared after the 2011 New Zealand earthquake? Disasters (forthcoming)

NZ Treasury (2015) New Zealand's Future Natural Hazard Insurance Scheme: Proposed Changes to the Earthquake Commission Act 1993. Kaitohutohu Kaupapa Rawa the New Zealand Treasury

NZNSEE (1993) Changes to natural hazard insurance in New Zealand. Bulletin NZ National Society for Earthquake Engineering 26(4):437–444

Google Scholar

O'Neill J, O'Neill M (2012) Social justice and the future of flood insurance

Google Scholar

Onuma H, Shin KJ, Managi S (2017a) Reduction of future disaster damages by learning from disaster experiences. Nat Hazards 87(3):1435–1452

Article Google Scholar

Onuma H, Shin LJ, Managi S (2017b) Household preparedness for natural disasters - impact of disaster experience and implication for future disaster risks in Japan. International Journal of Disaster Risk Reduction 21:148–158

Article Google Scholar

Owen S, Noy I (2017) The unfortunate Regressivity of public natural Hazard insurance: a quantitative analysis of a New Zealand case. CESifo Working Paper Series 6540

Paudel Y (2012) A comparative study of public—private natural hazard insurance systems: lessons from current practices. Geneva Papers on Risk and Insurance:

Issues and Practice 37(2):257–285

Article Google Scholar

Poterba JM (1991a) Is the gasoline tax regressive? Tax policy and the economy 5:145–164

Article Google Scholar

Poterba JM (1991b) Tax policy to combat global warming: on designing a carbon tax. In: Dornbusch R, Poterba JM (eds) Global warming: economic policy responses. MIT Press, Cambridge, pp 71–98

Google Scholar

Robinson WS (1950) Ecological correlations and the behavior of individuals. Am Sociol Rev 15(3):351–357

Article Google Scholar

Schwarze R, Schwindt M, Weck-Hannemann H, Raschky P, Zahn F, Wagner GG (2011) Natural hazard insurance in Europe: tailored responses to climate change are needed. Environmental Policy and Governance 21(1):14–30

Article Google Scholar

Slitor RE (1948) The measurement of progressivity and built-in flexibility. Q J Econ 62(2):309–313

Article Google Scholar

Surminski S (2017) Fit for purpose and fit for the future? An evaluation of the UK's new flood reinsurance pool. Resources for the Future. Discussion paper

Thumim J, Fahmy E, White V (2011) The distribution of UK household CO2

emissions: interim report. Joseph Rowntree Foundation, York

Google Scholar

Wier M, Birr-Pedersen K, Jacobsen HK, Klok J (2005) Are CO 2 taxes regressive? Evidence from the Danish experience. Ecol Econ 52(2):239–251

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