

Budgeting for Disasters: Focusing on the Good Times

by

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Some ways of budgeting for disasters have the potential to increase welfare by increasing national savings, reducing exposure to risk and promoting mitigation prior to a loss. Those ways can also contribute to aggregate fiscal stability over the long term. The power of budgeting, however, can be misdirected to increase losses and lead to fiscal instability. This paper describes the potential for gain from alternative budgetary treatments of policies aimed at reducing the effects on consumption of random shocks to income and wealth. It identifies a critical difference between alternatives: budgetary recognition of expected costs of relief and recovery before the loss event. We classify those different methods as ex ante and ex post budgeting. We also consider some budgetary mechanisms that can promote effective recognition and constrain opportunistic behaviour by elected officials. Finally, this paper describes related budgetary practices in some OECD countries. Many have instituted policies consistent with ex ante budgeting, but we have insufficient information to determine their effectiveness.

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Disasters from natural, and other, causes are a recurring element of life. To varying degrees, households and governments anticipate and prepare for sudden adverse shocks to income and wealth. Interactions between public and private responses to the threat of disasters and between budgetary accounting and public decisions have implications for national policy and public budgeting. This paper explores those implications, identifies mechanisms that can affect the success of public and private attempts to reduce losses from disasters and compares the results with some current practices.

Its principal findings are:

- Government policy can increase long-term well-being in the face of disasters. Those gains, however, depend primarily on the effects of policy on public and private decisions before the disaster occurs.
- *Ex ante* budgetary policies can increase net benefits by providing fiscal incentives and legislative opportunities to increase national savings, reduce exposure to risk, and promote mitigation, before the loss event. This finding also implies that *ex post* budgetary policies can have the perverse effect of increasing welfare losses from disasters.
- Effective *ex ante* budgeting for disasters requires trade-offs of current consumption for saving and mitigation, and procedural safeguards against opportunistic efforts to divert disaster savings to other uses.
- Many countries appear to engage in *ex ante* budgeting for disasters, through support of insurance pools and the use of contingency funds. But we have insufficient information to determine the extent to which those practices allocate current resources rather than disclose intended uses of future resources.

This paper is organised as follows: first, we identify the responses of individuals and governments to the prospect of disaster events and interactive effects between public and private action. Those interactions can reduce national savings, risk avoidance and mitigation and thereby increase total losses from disasters. Second, we consider the potential for offsetting increases in social welfare from public budgeting for relief and recovery before a loss. Third, we discuss some obstacles to effective *ex ante* budgeting and outline some procedures for increasing its effectiveness. We close with a review of current international practices, first by presenting results of a survey of OECD countries and then by providing a more detailed examination of the budgeting practices in three countries (Japan, New Zealand and Turkey).

1. Disasters: Costs, private behaviour and public policy

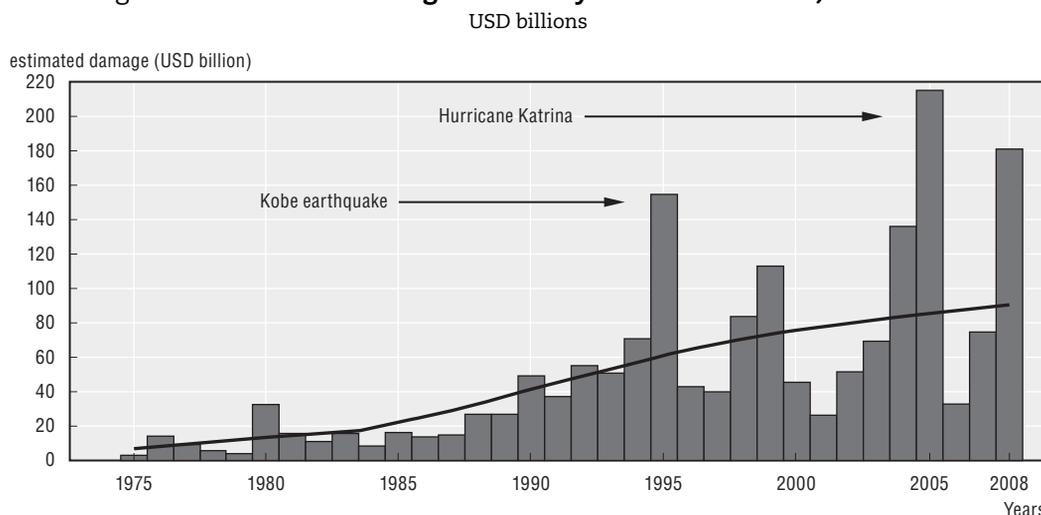
A disaster is a sudden event resulting in extensive damage or destruction. The consequence of a destructive event varies with its location. A large wildfire in a rural area might be viewed as an emergency, while a similar size wildfire in an urban area could be disastrous. The defining feature of a disaster is a loss of productive capacity that is sufficiently large in relation to the income and wealth of the affected country that it reduces consumption and welfare (Barro, 2006; Borensztein, Cavallo, and Valenzuela, 2008).

The harm is that people prefer more consumption to less, and temporal stability in consumption to feast or famine. Absent sufficient savings or access to credit, fluctuations in income and wealth translate into volatility in consumption.

A recent international report (United Nations, 2009) found that natural disasters are most destructive of living standards in small, poor countries.¹ Large, high-income countries are also exposed to low-frequency, significant losses of income and capital, but those are more likely to occur from economic disturbances such as the collapse of price bubbles and financial markets. In all countries, the size, timing and location of disasters are uncertain. Nonetheless, individuals and policy makers form expectations of loss events and act on those expectations. Currently, expected losses appear to be rising, especially from the effects of global warming and economic disturbances (Taleb, 2007; Heipertz and Nickel, 2008).

Losses from disasters are difficult to measure and compare across countries and time because the standard source, the International Disaster Database, measures only direct damage to property and infrastructure. This excludes the value of lives lost and the indirect costs of social disruption. It also does not relate the amount of loss to the wealth of the affected area. Estimated property losses for some recent notable disasters are USD 100 billion (in 1995 US dollars) for the Kobe earthquake and USD 105 billion for Hurricane Katrina in 2005. The Indian Ocean earthquake and tsunami in 2004 devastated island and shore communities in that region. Estimated property losses in Indonesia, one of the most heavily affected areas, were USD 4.5 billion. Figure 1 shows the rising trend in global property losses from disasters over the last two decades.

Figure 1. **Estimated damage caused by natural disasters, 1975-2008**



Source: EM-DAT (2009), "The OFDA/CRED International Disaster Database", Centre for Research on the Epidemiology of Disasters (CRED), Catholic University of Louvain, Brussels, www.emdat.be.

Disasters vary in cause, predictability and consequences. Disasters may be the result of a naturally occurring event or human action – either accidental or intentional. Some disastrous events are easier to predict than others; the approximate paths of hurricanes can be identified more precisely than the location of tornados. Disasters also vary in terms of the ability to mitigate their consequences. Although those variations are important to

the design of disaster policies, they are less relevant for budgeting. This paper does not attempt to assess specific policies for managing the risk of particular disasters. Rather it identifies the benefits of budgeting for relief and recovery policies during the good times, i.e. when income is high. While the paper focuses on natural disasters, the budgetary practices described here can be applied to other expenditures whose timing and amount are uncertain.

1.1. Response of households to the threat of disasters

People anticipate adverse future shocks to economic well-being and take steps to avoid and reduce their effects (Morduch, 1995). Individual efforts to maintain living standards through bad times include decisions about the location and structure of housing, choice of occupation, income-sharing arrangements with family or voluntary associations and insurance. Mitigation and risk pooling is cost-effective to the point where the last unit of cost incurred pays for itself in lower expected losses or higher valued consumption opportunities.

Households also save and accumulate reserves to cushion the welfare loss from disasters. Pre-loss saving increases benefits by shifting consumption forward from good times, when the value of one more unit of consumption is relatively low, to bad times when it is higher. Evidence suggests that household saving is higher in countries with greater risk exposure and frequency of disasters (Skidmore, 2001).

Borrowing to be repaid in better times can also shift consumption through time to higher value uses. Many individuals are observed smoothing their consumption over a lifetime through variations in saving rates (Friedman, 1957; Hall, 1978; Modigliani, 1986). They may borrow, or “dissave”, to finance consumption early in their lives when their income is low, repay debt and save during their highest income years and draw down savings in their latter years. However, opportunities to borrow following disasters are often severely restricted (Borensztein, Cavallo, and Valenzuela, 2008). The loss of human and non-human capital reduces potential future income and the ability of survivors to obtain credit.

1.2. Public policy toward disasters

Government may be able to reduce the losses from disasters beyond the reductions achieved by private actions, if it is more able than individuals to assess and manage exposure to disaster risk. Specifically, if people tend to under-prepare for disasters (Sawada and Shimizutani, 2005), government can help by increasing national saving and adopting additional measures to reduce risks and losses before the event.

Policy success against disasters, however, requires government to act in advance of loss, rather than waiting until after it has occurred. By waiting, government loses the option to sustain consumption by saving pre-disaster production and income and by reducing losses from the event. After the loss, it can only provide assistance by redistribution from those who did not suffer the loss or by borrowing. In both cases, because of its power to tax, government may have an advantage over private reliance on altruism and private credit.

That potential advantage, however, comes at a cost. Redistribution after the loss requires that a smaller pie be shared than was available before the loss. And, by increasing borrowing, government is likely violating its goal for intergenerational equity – that is, by increasing the share of current costs to be financed by future taxpayers. For a large number

of countries (Anderson and Sheppard, 2009; Auerbach and Gale, 2009), increased borrowing in response to a disaster by governments with unsustainable fiscal policies increases the magnitude and pain of the necessary future policy adjustment.

The biggest disadvantage of *ex post* disaster policy and budgeting, however, is that the expectation by individuals and households of relief and recovery assistance reduces personal incentives to prepare for disasters. It can reduce precautionary saving, increase risky behaviour and reduce the gains from private mitigation. *Ex post* government policy and budgeting therefore can diminish private *ex ante* efforts to reduce the costs of disasters without replacing those efforts with effective public counter measures. This tendency is enhanced by the lack of timely fiscal incentives for the government to adopt costly mitigation before the loss event.

Post-disaster remorse is a rational reaction to the failures to finance the expected cost of relief and recovery during the good times and to adopt more risk-reduction measures. Accordingly, proposals for *ex ante* budgeting for relief and recovery are more likely to be considered in bad times than in good.

2. Potential gains from, and obstacles to, *ex ante* public budgeting

If, for whatever reason, individuals and households save too little, take on too much risk, or invest too little in mitigating expected losses, government could increase the long-term well-being of its constituents. It could do so by increasing taxes and reducing public consumption expenditures before the loss sufficient to finance its costs of relief and recovery. Doing so would increase national saving before the event. In recognising the costs of the loss *ex ante*, the government would also be able to recognise budget savings as an offset to the cost of expenditures for mitigation and other risk-reduction measures. Those savings would increase the fiscal incentives for government to augment under-investment in mitigation by households (Phaup and Torregrosa, 1999). Government would thus improve the allocation of the nation's resources and the well-being of its constituents.

Potential, of course, does not necessarily mean successful realisation. *Ex ante* public policy and budgeting is subject to numerous obstacles that can retard those gains. We identify the major impediments to effective public budgeting for disasters as: political incentives to defer recognition of costs until a disaster event occurs; moral hazard; time inconsistency of preferences of policy makers; and the ostensible impossibility of saving for disasters by government.

To simplify, we make several assumptions:

- Governments can obtain, process, and act on information about the risk of disasters and the benefits of mitigation more efficiently than individual households.
- The goal of government in addressing disasters is to smooth and increase consumption following disasters compared with the result that individuals and households could achieve acting alone and through private agreements.
- Democratic governments cannot refuse to respond to disasters with relief and recovery assistance; repeal of existing authorisation to provide assistance is not credible.
- The budget process controls public resource flows; that is, budgeting is effective.
- The target budget deficit is a binding fiscal constraint that is only relaxed following a disaster for the previously unbudgeted cost of relief and recovery.

2.1. Political incentives to defer recognition of costs

Elected officials face strong incentives to defer recognising the cost of its disaster policies until after the event. The use of scarce public resources for saving or spending on mitigation has a visible opportunity cost in current public consumption. Urgent, unmet needs are ever present. Decisions by elected policy makers to divert resources from those uses to the relief of harm from uncertain future threats can be seen as wasteful. In contrast, once a disaster occurs, officials are rewarded for responding quickly to the relief of victims.

Donahue and Joyce (2001) also point to the common practice of funding disaster relief and recovery through supplemental appropriations which are subject to fewer restrictions and restraints than regular appropriations as a source of fiscal incentive that favours post-event over pre-disaster action. Consistent with that observation, a recent UN report found that while countries are making progress in the use of (relatively low-cost) early warning systems for disasters, much less has been achieved in infrastructure planning (United Nations, 2009). One of the UN recommendations is that policy emphasis be shifted from disaster response to “pre-disaster mechanisms”.

2.2. Moral hazard

In the absence of insurance or other indemnification for loss, the incentives are strong for owners of assets to avoid risk and take action to mitigate its effects on value. For example, uninsured, risk-averse owners tend to avoid building on ocean fronts, in flood plains and on geological fault lines. They clear brush as a defence against wildfires. They save as a precaution against future loss. State and local governments avoid exposing roads, bridges, wastewater treatment plants and other infrastructure to natural hazards. They also budget and save for repair and replacement.

The availability of insurance or other forms of financial assistance weakens the incentives of asset owners to avoid loss. A national policy of assisting victims of natural disasters increases building of structures in areas known to be at risk. It diminishes the motive for individuals to save and purchase insurance. In this way government’s relief and recovery policies tend to crowd out and displace the efforts of others to reduce the cost of disasters. Government’s policies are thus subject to moral hazard, which increases the size of the loss, the cost of relief and recovery assistance, and is an overall offset to the social gain from government intervention. (For a case of an effective government disaster policy that appears to have been uncompromised by moral hazard, see Annex A1.)

Moral hazard is widely observed in various forms of risk pooling and insurance (Wildasin, 2008). It is not an argument against public relief and recovery assistance just as it is not an argument against commercial insurance. Rather, it should be countered by structuring indemnity agreements so that owners continue to have a financial interest in avoiding loss. Private insurance controls moral hazard by assignment of first loss to the insured (deductibles), capping benefits per claim, and levying risk-based premiums. Governments can use those and other techniques to manage moral hazard. They may, for example, specify conditions of eligibility for assistance based on location, type of construction, and owner-provided mitigation measures. A policy of lending for recovery also appears to be less subject to moral hazard than a grants programme (Sawada and Shimizutani, 2005).

Moral hazard need not be a bigger problem for government than for private insurers, except that owing to differences in objectives, addressing moral hazard is rarely a high priority for elected policy makers, especially if its consequences only become apparent after a loss event. As we suggest in the next section, *ex ante* budgeting can create opportunities and motivation for public officials to control moral hazard in a timely manner.

2.3. Time inconsistency

Rational voters may oppose the adoption of *ex ante* budgeting for disasters if they fear that budget policy toward disaster is subject to time inconsistency. That is, voters may believe that policy makers will adopt *ex ante* budgeting, raising taxes now to pay for future losses only to reverse policy subsequently and spend the revenues for other purposes. When disaster does occur, the cost of relief and recovery will have to be financed as if no taxes had already been paid for that purpose. Time inconsistency thus deprives a commitment to budget *ex ante* for disasters of the credibility necessary for public support.

Time inconsistency is one explanation for the widespread view among budget officials and technicians that even if the legislature succeeds in saving current budgetary resources for disasters, those funds will eventually be “raided” for other purposes that taxpayers would not support. This view is consistent with numerous instances where public funds designated for one purpose have been redirected to another.

Time inconsistency argues for mechanisms to restrain opportunistic behaviour by policy makers and to assure that funds for relief and recovery are spent only for that purpose. A number of means of financing disaster relief and recovery in advance of loss have that property. Successful examples include: the Belgium Standing Fund for aid to households, the Caribbean Catastrophic Risk Insurance Fund, the EU Solidarity Fund, the New Zealand Earthquake Commission Fund and the Japanese Earthquake Reinsurance Company. Those institutional arrangements have demonstrated their effectiveness in placing disaster reserves beyond the reach of those who would misuse them. Drafters of enabling legislation for effective *ex ante* budgeting must take care to tie policy makers’ hands with appropriately strong knots.

2.4. Impossibility of public saving for a single purpose

In addition to expenditures for relief and recovery, governments obligate themselves, politically if not contractually, to a wide variety of future payments. Those include public employee pensions, social insurance, debt service, and defence, among others. Ideally, each of these obligations in combination with the planned net transfer of resources between current and future taxpayers is used to establish an aggregate annual target for public saving. Given a binding target for net national saving, any attempt to change saving for a single programme will be offset in the budget process by changes elsewhere so the total level of saving is unaffected. Thus efforts to save for disasters independently of the overall saving target are futile.

Few countries give much evidence of having a public saving policy. One telling observation is that, in the cases known to us at least, aggregate net public saving is rarely reported or updated in the budget process. Nor are the key components, total consumption spending or net investment, routinely monitored and reported.

Nonetheless, any country that establishes an effective target for aggregate saving based on estimates of the requirements of intergenerational equity, current investment

spending and the cost of contingencies, including disasters, is budgeting *ex ante* for disasters and for other purposes. Recognition of those planned savings in the budget means that fiscal incentives are in place for the management of contingencies, including mitigation and risk reduction. Additional recognition and saving would be excessive and counterproductive.

Instead of a total net savings target or constraint, most countries measure and target a cash-basis deficit, which ignores the sacrifice of non-monetary assets, the consumption of durable assets and the increase in obligations other than net issuance of sovereign public debt. The budget deficit is also the principal, if soft, bottom line target for most OECD countries.

Given a cash-basis deficit target, budgeting for disasters by recognising current allocations of resources through outlays and the deficit, squeezes spending for other purposes and nudges revenues up. It therefore increases saving at the margin – relative to the baseline – and frees resources for investment in mitigation. With a deficit target, increasing the recognition of future costs *ex ante* can be effective in increasing saving and motivating risk reduction and mitigation.

A related objection to *ex ante* budgeting for disasters is that it would be preferable for a country to adopt a stable, sustainable fiscal policy than to budget for disasters. To be sure, a strong fiscal position gives governments flexibility in maintaining consumption following a disaster – by increasing international borrowing, for example. But *ex ante* budgeting is a complement to, rather than a substitute for, a policy of fiscal stability. It can assist countries in moving from unstable fiscal regimes to stable ones – and in maintaining a sustainable posture once reached.

2.5. Disclosure: An adoptable, but ineffective solution

Budgetary structures exist that are consistent with political incentives to defer allocating resources until after a disaster while giving the appearance of fiscal planning for adversity. Such an accounting system can be built around an on-budget reserve account or fund. The reserve fund is credited with an appropriation for an estimate of the annualised cost of relief and recovery assistance for disasters or other contingencies. Estimates can be developed from actual past spending for disaster relief and recovery (Cummins, Suher and Zanjani, 2007) or actuarial estimates. An advantage of this procedure is that it discloses information to the public and to policy makers about the expected cost of current policy.

However, this budgetary accounting procedure has a fatal disadvantage: it has no cost in terms of current budgetary resources. It does not force any reduction in consumption because the “reserving” does not consume current resources. The crediting of funds to the reserve account is purely an intra-governmental transaction. Outlays from the general fund to the reserve account are offset by the collection of the on-budget account. On consolidation of all budget accounts into the budget totals, net outlays and the deficit are unaffected. It is a budgetary free lunch.

The absence of recognition of current period costs for expected disasters also means that this approach fails to create fiscal incentives to address moral hazard or to adopt measures that reduce future outlays. It also provides political cover for time inconsistency of preferences by policy makers that would occur if, in establishing a reserve account for disasters, lawmakers decide to levy taxes to fund the account. As a consequence, the budget totals will show a new inflow of resources – higher receipts and a lower deficit. This

constitutes an easing of the budget constraint and an opportunity to increase current spending for other purposes. When disaster occurs, the government would have to borrow and levy future taxes to finance the cost of relief and recovery to the same extent as required by *ex post* budgeting.

This disclosure of expected future cost compares unfavourably with *ex post* budgeting because its opaque nature creates the appearance of increased saving to offset the effects of future adverse shocks. It is more likely to mislead constituents and policy makers about the burden of post-disaster assistance.²

3. Effective *ex ante* budgeting for disasters

To realise the potential gains from *ex ante* budgeting for disasters, the budget model needs to be modified to recognise and allocate current resources to future spending for relief and recovery. This requires accounting for the use of current resources in outlays and the deficit in order to motivate the indicated changes in spending and revenues. It also requires adopting procedures that restrict opportunistic behaviour by policy makers.

In some political settings, both of these changes can be carried out by simply moving the reserve account outside the budget, so that consolidation of the budget accounts into an aggregate total excludes the offsetting collections of the reserve fund. By this means, the outlay of budgetary resources to the reserve fund effectively recognises the use of current resources, crowds out other spending and makes their redirection to other purposes more visible.

In other cases where the credibility of a policy commitment tends to be low, it may be necessary to create greater separation between policy makers and reserve funds. This may be accomplished through commercial transactions to transfer the risk of the government's disaster losses to others, a government mandate that all property owners purchase private insurance or the creation of an independent government insurance entity. Each of the policies has advantages and disadvantages.

3.1. Commercial transactions

Ex ante budgeting for disasters can be facilitated if governments can use market transactions to recognise the costs of relief and recovery policies. For example, governments can purchase parametric insurance from consortia of private commercial insurers and reinsurers. This form of insurance pays benefits conditional on the occurrence of specified events, such as the landfall of a hurricane or the occurrence of an earthquake of specified strength. It thereby avoids the high transaction costs of settling a large number of individual claims (Hofman and Brukoff, 2006). The World Bank's Caribbean Initiative offers this option to countries in that region.

Government purchases of insurance have several budgetary advantages and at least one major disadvantage. First, payments force recognition of resource outflows prior to the loss event. The transfer of the funds to an insurer puts the moneys beyond the reach of officials who might otherwise divert fund balances. Second, the contractual assumption of risk gives incentives to the insurer to save and prudently invest premiums. Third, the risk assessment performed by government in determining the amount of insurance to be purchased can focus attention on the cost savings that could be realised through investment in mitigation.

A disadvantage of the use of commercial transaction is that it leaves the government, especially for large countries, with counterparty risk. A disaster may be sufficiently widespread that insurers are unable to fully honour their contracts. In those cases, some benefits of increased pre-disaster saving and investment could still be realised, but the value of the insurance would be less than anticipated.³

3.2. Mandated purchase of insurance

Governments can address moral hazard and time inconsistency by mandating that property owners purchase insurance coverage from approved private insurers. Mandated individual purchases have higher administrative costs than parametric insurance, however, and that cost will have to be paid by the insured in higher premiums. Further, counterparty risk is shifted initially to property owners and ultimately back to the government, who may be expected to provide assistance to the beneficiaries of failed insurance companies.

One way the government can manage its indirect counterparty risk is to sell reinsurance for high-end losses to the insurance companies. This approach provides reliable coverage for all-size events to property owners and leaves the risk of less insurable, more extreme events with the government. However, the management of the cost of reinsurance by government through risk-adjusted premiums, capital requirements and other forms of regulation presents a substantial analytical challenge to governments.

3.3. Government-provided insurance

Many considerations, including incomplete markets, counterparty risks and difficulties of achieving effective regulation, can persuade government to offer explicit insurance to property owners. In those cases where government is retaining the risk of disasters, care must be taken in the budgetary accounting to achieve budgetary and economic results similar to those of market transactions. For example, the budget should treat the insurance reserve fund as if it were outside the government. One way to do so is to create an independent, governmental authority to perform the insurance function. The New Zealand Earthquake Commission is one model of this approach. Good results have also been obtained with less formal arrangements through the use of contingency funds by state and local governments (Hou and Duncombe, 2008; Rodriquez-Tejedo, 2008) and below-the-line credit financing accounts (Lucas and Phaup, 2008).

A disadvantage of government provision of insurance is that the control of its cost can be severely weakened by political pressure for low premiums, zero deductibles, no caps on coverage and opposition to the use of risk-based pricing. If, for example, insurance rates and terms are set in legislation, government insurance can become so deeply subsidised as to be an *ex post* grant programme in disguise. In that case, nominal insurance could have welfare effects much like those of *ex post* budgeting. Thus if government chooses to provide insurance directly, it should do so through an insurance entity with substantial discretion and incentive to set contract terms to control costs.

3.4. Why governments might choose not to budget for disasters

Even though *ex ante* budgeting for disasters has the potential to increase welfare compared with *ex post* budgeting, policy makers might prefer the latter for a variety of reasons. As noted, incentives for elected officials to push for *ex ante* change are weak, except perhaps in the aftermath of a major disaster event or in countries that are at high

risk. Also, constituents may be suspicious of proposals for higher taxes now to “save” for an uncertain event.

In addition, for developed countries, the losses from natural disasters are small relative to national income, rarely exceeding 2% of gross domestic product (GDP) (Heipertz and Nickel, 2008). They also pale in comparison with the welfare losses from major economic recessions (Hochrainer, 2009). Natural disasters also pose a modest threat to fiscal stability compared with the looming burden of social insurance policies in many countries with ageing populations and rapidly rising healthcare costs. Less-developed countries may also be concerned that budgeting for disasters might diminish the willingness of the international community to provide recovery assistance (Bobba and Powell, 2006; cited in Borensztein, Cavallo and Valenzuela, 2008).

Some countries might also opt for policies that constitute a “middle way” between *ex ante* and *ex post* budgeting. For example, a country might adopt a surtax to become effective immediately with the occurrence of the loss event. Specifically, the estimated cost of relief and recovery assistance could be converted into a specified income tax surcharge or an adjustment of the value-added tax (VAT) rate. By this means, policy makers could plan for post-disaster assistance without the necessity of putting the funding beyond their own reach. Of course such a policy also foregoes the possibility of increased pre-disaster savings and fiscal incentives for mitigation.

For all countries, it is a judgment call as to whether the potential gains from *ex ante* budgeting are worth the potential downside. Thus it is difficult to predict how countries will choose to budget for disasters. Next we examine how some OECD countries actually approach budgeting for those risks.

4. International practices

To determine how national governments actually budget for disasters, we surveyed OECD countries and followed up with a more detailed examination of budgeting practices in three countries that exhibit elements of *ex ante* budgeting. In general, countries appear to practice *ex ante* budgeting, or a close substitute for it, through policies that increase the availability of insurance, and by maintaining contingency funds. They most commonly provide insurance directly or indirectly through reinsurance and guarantees of private insurance commitments.

4.1. Survey of OECD countries

An electronic survey was sent to officials of the 30 OECD member countries in late March 2009 and again in early June 2009; 15 countries responded. Respondents were asked about their countries’ disaster policies and how the national government budgets for those policies. To understand how policy varies with natural disaster risks, respondents were asked to rate their country’s risk for several types of natural disasters. The responses are reported in Table 1. Most countries face multiple hazards. Eleven countries reported medium or high risk for two or more natural hazards. Most commonly, respondents perceive their countries to be at medium or high risk for flood (80%), wildfires (53%) and blizzards (40%). Among the 15 respondent countries, Japan is most at risk for natural hazards; the respondent noted that they were at high risk for six of the seven hazards.

Table 1. **Country self-perception of risk for natural hazards, 2009**

	No risk	Low risk	Medium risk	High risk
Earthquake	3	7	2	3
Hurricane/typhoon	6	4	2	3
Tsunami	7	6	1	1
Volcanic eruption	10	3	1	1
Wildfires	0	7	5	3
Flood	0	3	6	6
Blizzard	3	6	3	3

4.1.1. Post-disaster response

Governments provide relief and recovery assistance. As the *Samaritan's Dilemma* suggests, it is difficult for countries to avoid providing *ex post* relief and recovery services even at the cost of moral hazard (OECD, 2008). The types of services provided vary by country. Grants are more common than loans. According to respondents, 80% of governments provided cash grants to individuals and business, but only 40% provided loans. Likewise, 73% provided grants to lower levels of governments and 27% offered loans. Some 53% reduce taxes for disaster victims. Japan, for example, reduces or exempts victims of disasters from income and residential taxes.

All 15 countries report using supplemental appropriations to fund disaster relief and recovery costs in excess of the amounts budgeted. However, 80% of respondents noted that these relief and recovery costs only appear in the budget after the disaster has occurred. The other 20% recognise costs for disasters in advance of loss, but only in Austria are remaining funds available for later use. In Norway, budgeted relief and recovery funds expire or “revert back” to treasury.

4.1.2. Mitigating disasters

The responding OECD countries take measures to mitigate the effects of disasters. Countries invest in research and development, early warning systems, land conservation policies, regulation enforcement, response communication systems, and training of emergency responders. Depending on the type of activity, 60-93% of respondents report budgeting for these activities in each budget cycle (Table 2). Lower levels of government are responsible for conducting and budgeting for these activities in 27-46% of the countries.

Table 2. **Budgeting for mitigation activities in 15 OECD countries, 2009**

	Each budget cycle	In capital budget	Lower level of government responsible	Activity not in budget
Research and development	12	3	4	0
Early warning systems	10	2	4	1
Regulation enforcement	9	0	6	2
Land conservation	11	3	6	0
Response communications systems	11	2	5	2
Training and exercising	14	1	7	1

4.1.3. Ex ante budgeting through insurance

National governments also reduce the consumption losses from disasters through support of insurance pools. Seven of the 15 countries are involved in the provisions of

property and casualty insurance (Table 3). Five national governments provide insurance directly. Spain provides reinsurance for disasters, Japan provides a state guarantee of private insurance obligations and France provides both. No country mandates the purchase of disaster insurance for all residential structures, but Switzerland mandates it in some cantons, and Turkey mandates purchase for residences within municipal boundaries. Three countries require private insurers to offer disaster coverage. Finally, Hungary and Spain provide subsidies to reduce the price of insurance premiums.

Table 3. **Disaster insurance policies in selected OECD countries, 2009**

	France	Hungary	Japan	Norway	Spain	Switzerland	Turkey
Government mandates private insurers provide coverage for natural disasters	No	Yes	No	Yes	No	Yes	No
Government mandates purchases of insurance	No	No	No	No	No	Yes, in some cantons	Yes, in municipalities
Government provides insurance	Yes	No	No	Yes	Yes	Yes	Yes
Government provides reinsurance or guarantee	Yes	No	Yes	No	Yes	No	No
Government provides subsidies to reduce the price of insurance	No	Yes	No	No	Yes	No	No

OECD countries offering insurance do not appear to aggressively address moral hazard. Adopting mandatory deductibles and capping coverage below 100% of the value of at-risk properties leaves owners with some risk and encourages mitigation. Only Switzerland mandates deductibles; France, Japan and Spain cap the amount of insurance coverage. Finally, only Japan and Turkey have insurance premiums that are adjusted based on the proximity to the hazard, building materials used for construction or the ability to withstand hazards.

4.1.4. *Ex ante budgeting through contingency funds*

Contingency funds can also be used to budget *ex ante* for disasters. Contingencies are a broader category than natural disasters and include all events that impose substantial costs on the government but whose occurrence is difficult to predict (e.g. terror events, war, economic crises, epidemics, nuclear accidents). Contingency funds can be especially useful in increasing government savings, but depending on the budgetary accounting may only provide weak incentives for mitigation of specific hazards. Four of the 15 respondents reported budgeting for general contingencies without specifying the nature of the contingency. Spain maintains a contingency fund for terror events.

4.2. A closer look at *ex ante* budgeting in three countries

Three countries that appear to engage in some form of *ex ante* budgeting for earthquakes and other natural disasters are Japan, New Zealand and Turkey.

4.2.1. *Budgeting for disasters in Japan*

Japan is at risk for many natural hazards. It also appears to actively promote mitigation and *ex ante* saving for disasters. Japan covers only 0.25% of the Earth's land area, but has a much larger share of earthquakes and active volcanoes. From 1996 to 2005, 20% of the earthquakes reaching a magnitude of 6.0 or higher had an epicentre in Japan. Likewise, 7% of the active volcanoes in the world are located in Japan. Additionally, Japan's topology and weather conditions result in typhoons, heavy snow and torrential rains.

Between 1995 and 2005, natural disasters left 7 665 dead or missing. Although more than 6 400 of those deaths occurred during the 1995 Kobe earthquake, on average 118.3 people were killed or missing each year from 1996-2005 from natural disasters (Director-General for Disaster Management, n.d.). Japan has a two-part disaster policy to address these threats: mitigation and insurance. Both are structured to promote *ex ante* saving, and limit moral hazard.

4.2.1.1. The national government's role in disaster management. Recognising that natural disasters are an inevitable aspect of life in Japan, the national government budgets for activities to mitigate, prepare for, respond to and recover from disasters. On average, from 1995 to 2004, the government's budget included JPY 4.5 trillion (USD 49.9 billion) each year for disaster management. This represents approximately 5% of the general fund in the national budget. The budget for disaster management is divided into four fields: scientific technology research; disaster prevention and preparedness; national land conservation; and disaster recovery and rehabilitation. In most years, the largest amount of funds are spent on land conservation; however, in years with a higher disaster toll, the proportion of spending shifts towards recovery and rehabilitation, showing flexibility in the use of budgeted amounts (Director-General for Disaster Management, n.d.).

National land conservation projects consume an average of 48.7% of the national disaster budget each year. These funds are used for projects such as soil erosion control, river containment, and soil and coastline conservation. The smallest portion (1.3%) is dedicated to science and technology research, such as earthquake early warning systems.

Almost one-quarter of the disaster management budget (23.6%) each year is allocated for prevention and preparedness. Activities such as enhancing communication systems, encouraging information sharing, building disaster management bases to centralise the government's response, preparing evacuation plans and conducting disaster reduction drills and exercises all contribute to reducing the consequences of a disaster (Director-General for Disaster Management, n.d.).

Finally, the remaining quarter of the budget (26.4%) is dedicated to recovery and rehabilitation when disaster strikes. Recovery efforts are aimed at rebuilding the lives of those affected as quickly as possible. In 1998, as a response to the 1995 Kobe earthquake, the Act on Support for Livelihood Recovery for Disaster Victims was enacted. The act allowed up to JPY 1 million (USD 11 097) per household for purchasing household goods and belongings, when a natural disaster causes severe damage to victims' homes and if the victim has difficulty regaining self-sufficiency. In 2004, the act was revised and expanded to allow assistance to stabilise living conditions. For example, the government may provide up to JPY 2 million for tearing down damaged houses. Disaster recovery and rehabilitation efforts also include making loans available to victims and reducing taxes (Director-General for Disaster Management, n.d.).

The contingency reserve fund of the national budget can be used for any purpose, but is used mostly for disaster relief. Normally, the contingency reserve fund is JPY 350 billion, although this varies from year to year. In FY 2004, JPY 33 billion was spent on disaster relief, with JPY 77 billion for other general purposes. However, in FY 2006 nothing was spent on disaster relief and recovery, and JPY 30 billion was spent for other general fund purposes. In both years, the remaining funds were unspent (Tanaka, 2009).

4.2.1.2. Earthquake insurance for households. While some other hazards are insured by private companies, the national government intervened in the earthquake insurance market after the 1964 Niigata earthquake by requiring insurers to offer earthquake coverage and by providing reinsurance. Initiated in 1966, the insurance system has undergone many revisions. As of October 2007, the system allows individuals to purchase earthquake insurance for buildings used as residences, and household property when they purchase fire insurance for their homes. Damages from fire destruction, flooding, or landslips caused directly or indirectly by an earthquake, volcanic eruption, or resulting tsunami are covered. Purchasing insurance is not compulsory, but insurance companies are obligated to offer earthquake insurance. In 2008, 23-27% of households had purchased earthquake insurance in areas at risk for major earthquakes (Non-Life Insurance Rating Organization of Japan, 2008; Japanese Earthquake Reinsurance Company, Ltd., 2008).

Risk-adjusted premiums are set to cover expected costs. Earthquake insurance rates are composed of three parts: a basic rate, a risk discount rate, and a long-term adjustment. The basic rate is based on whether the structure is wooden or non-wooden and the class of the location of the residence with higher rates in more earthquake-prone areas. Discount rates range from 10-30%, depending on the location of the building relative to a seismically isolated area, the degree to which the building is earthquake resistant, and if the building was constructed after 1 June 1981. Finally, the long-term adjustment allows for the reduction of rates when insurance is purchased for periods of two to five years (Non-Life Insurance Rating Organization of Japan, 2008). Longer term insurance contracts encourage owners to invest in mitigation because they enable owners to receive the present value of premium savings (for up to five years) from mitigation at the same time that households are incurring the cost of mitigation (Kunreuther, 2006). These varying rates and discounts allow for insurance premiums to be based on risk and vulnerability.

Earthquake insurance is subject to several legislated ceilings and limits that reduce moral hazard while assuring a basic level of protection to all insured property owners. The Earthquake Insurance Law limits coverage to JPY 50 million for residential buildings and JPY 10 million for household property. Those who build more expensive homes in at-risk areas have to do so without the benefit of government insurance. To reduce the liability of insurance companies and the government, a total payment limit per earthquake has been enacted. As of April 2008, the limit was set at JPY 5.5 trillion. If insured damages of a single earthquake were to exceed this limit, claims are to be reduced and paid proportionally (Non-Life Insurance Rating Organization of Japan, 2008).

4.2.1.3. The Japanese Earthquake Reinsurance Company. In 1952, a proposal to provide households with earthquake insurance failed when the government was unable to provide reinsurance. In 1966, the Japanese Earthquake Reinsurance Company (JER) was established to ensure that in the event of a catastrophic earthquake, insurance claims would be paid. The JER is a privately owned company started with JPY 1 billion contributed by 20 Japanese non-life insurance companies.

The relationship between non-life insurance companies, the JER, and the government is complex. Residential homeowners purchase earthquake insurance from non-life insurance companies, who are responsible for collecting the premiums and passing most on to the JER. The JER also shares a portion of the premiums with the government. When a claim is filed, the policy holder is initially paid by the non-life insurance company, which then claims the full amount in a reinsurance claim to the JER. Depending on the total amount of claims for a

single earthquake, the cost is shared in varying proportions by JER, the non-life insurance companies and the government. On payable claims of up to JPY 110 billion, the JER has 100% of the liability. If the total liability from an earthquake is between JPY 110 billion and JPY 1 018.6 billion, the JER pays the first JPY 110 billion, but then the government and the non-life insurance companies split the remaining costs evenly. If the total of claims reaches JPY 1 730 billion, then the JER contributes an additional JPY 355.7 billion, and the government pays the rest. As claims increase towards the maximum allowed liability for a single earthquake (JPY 5.5 trillion), the responsibility shifts from the JER to the government. The maximum liability for the JER is JPY 560.0 billion, for the non-life insurance companies it is JPY 548.5 billion yen, and government's maximum liability is JPY 4 391.5 billion. In other words, a catastrophic earthquake could result in the national government absorbing up to 80% of the costs (Japanese Earthquake Reinsurance Company, Ltd., 2008).

As of March 2008, the JER's total assets were JPY 955.9 billion. The JER invests these assets in liquid bonds with high credit ratings. Approximately 47% of the securities are government bonds, 25% are foreign securities, and an additional 20% are corporate.

The government saves its portion of the premiums in the Earthquake Reinsurance Special Account. Japan utilises special accounts to operate particular projects and manage specific funds separate from the general fund budget. As of 2008, the Earthquake Reinsurance Special Account held JPY 1.1 trillion (Ministry of Finance, 2008).

In 2007, the JER paid JPY 12 370 million in insurance claims. The largest payment of earthquake insurance claims, since earthquake insurance was established, occurred in 1995 after the Kobe earthquake. At that time, JPY 78 346 million were paid on 65 427 earthquake insurance policies. Although the amount of claims paid would not currently exceed the JPY 110 billion in which the JER maintains 100% liability, the reinsurance scheme in 1995 was different. Under the 1995 reinsurance scheme, the JER paid JPY 40 000 million, the non-life insurance companies paid JPY 32 173 million and the government paid JPY 6 173 million.

4.2.2. Budgeting for disasters in New Zealand

Lying at the southwest end of the Pacific Ring of Fire, New Zealand is particularly susceptible to earthquakes and volcanic eruptions. Each year, 14 000 earthquakes are recorded in the New Zealand region, though only 100-150 are felt by the population. The 1855 Wairarapa earthquake is the most significant earthquake in New Zealand's history, measuring 8.1 on the Richter scale. Between 1855 and 2007, 15 earthquakes of magnitude 7.0 or higher were recorded, including the magnitude 6.8 quake that shook Gisborne on 20 December 2007. Research suggests that there is an 11% chance of a magnitude 7.5 earthquake along the Wellington fault line occurring sometime in the next 50 years. A quake of this size would affect approximately 150 000 people and would result in between NZD 5.9 billion and NZD 8.9 billion in insured losses. Likewise, a string of active volcanoes threatens the islands. In the last 150 years, volcanic activity has resulted in 337 deaths. In 2007, Mount Ruapehu erupted, but an early warning system and structural barriers prevented casualties. New Zealand has also fallen victim to tsunamis, landslides, cyclones, heavy snowfalls, and frequent flooding (Consorcio de Compensacion de Seguros, 2008). New Zealand's approach to disaster planning and budgeting consists primarily of insurance provided under the auspices of the Earthquake Commission.

4.2.2.1. Earthquake Commission. In 1945, the New Zealand government established the Earthquake Commission (EQC), formerly the Earthquake and War Damage Commission, to

provide insurance for earthquake and war damage to purchasers of fire insurance. Over time, coverage for other natural disasters was added, but coverage for war damage was discontinued (Earthquake Commission, 2009a). The EQC is an independent Crown entity; as such it is owned by the government and managed by a board of seven commissioners who report directly to the Ministry of Finance. Crown entities are subject to public sector finance and reporting rules (Earthquake Commission, 2009b; OECD, 2008). The receipts of the EQC are available only to pay insurance claims or other business-related expenses. They are not available to finance government spending for other purposes.⁴

Insurance covers damage to residential dwellings, most personal property, and the land immediately surrounding the dwelling. The coverage insures against damage from earthquakes; tsunami; natural landslip; hydrothermal activity; volcanic eruption; in the case of residential land, flood or storm; or fire caused by any of these natural disasters (Earthquake Commission, 2008a). Beginning in 1997, the Earthquake Commission stopped providing insurance to non-residential property, but most insurance companies operating in New Zealand offer disaster coverage for non-residential properties and their contents (Consortio de Compensacion de Seguros, 2008).

Residents purchase insurance for natural hazards automatically when they buy coverage for fire. At that time, the fire insurance companies set aside a portion of the premiums for natural disaster coverage, which is passed on to the EQC. Insurance is provided on a replacement value basis, but there is a cap on allowed coverage: residences may be insured for up to NZD 100 000 plus the goods and services tax (GST); and, personal property up to NZD 20 000 plus GST. The EQC will pay either the value of the damaged land at the time of the natural disaster, or the repair costs of such, whichever is less expensive. Property owners may also purchase “top-up” coverage, which insures the residence or property above the EQC’s limits, from private insurers (Earthquake Commission, 2008a).

Insurance premiums paid to the EQC are assessed at a flat rate of five cents for every NZD 100 insured. As a result of the cap in coverage, the maximum cost of the insurance is NZD 50 plus GST for coverage on residences, and NZD 10 plus GST for coverage on personal property. The coverage for land is included at no cost to the insured. Although the primary method of obtaining insurance for these natural hazards is through insurance companies, insurance can be purchased directly through the EQC, though there is a surcharge for purchasing insurance in this manner (Earthquake Commission, 2008a). The EQC is obligated by the Earthquake Commission Act of 1993 to accept exposure to risk for natural catastrophes. As a result, the premium level “does not differentiate between risk types, nor is it adjusted in response to the level of claims expected or incurred” (Earthquake Commission, 2008b). In other words, the EQC does not use insurance premiums to provide incentives for mitigation.

Claims are typically handled directly between the insured and the EQC. For claims involving a home and household contents, there is a NZD 200 deductible (or excess) on claims of less than NZD 20 000. On claims of more than this amount, the deductible is an amount equal to 1% of the total claim. For claims involving household contents only, the deductible is NZD 200 regardless of the amount of the claim. Finally, the deductible on land claims is 10% of the total claim with a minimum of NZD 500 and a maximum of NZD 5 000 (Earthquake Commission, 2008a). In FY 2007/08, the EQC incurred 9 459 claims at a cost of NZD 46 363 000; however, these rates are above the five-year average of 3 812 claims totalling NZD 23 300 000 (Earthquake Commission, 2008b).

Premiums are collected and set aside in the “Natural Disaster Fund”. As of 30 June 2008, there was NZD 5.5 billion in the fund, with a goal of building and maintaining the fund to NZD 7 billion (Earthquake Commission, 2008b). Prior to 2001, the fund was invested in fixed interest securities, such as government stock. In late 2001, the EQC began investing in international securities to ensure that its assets were held outside of the area affected by the type of natural disaster it insures against. Investment in global equities is limited to 27-33% of the EQC’s portfolio. The remaining assets are held in New Zealand government stock and cash (Earthquake Commission, 2009c).

The EQC reduces its risk by purchasing reinsurance from multiple international reinsurers. The reinsurance contract pays off when the costs of a natural disaster exceed NZD 1.5 billion and provides coverage up to NZD 4 billion. If another disaster occurs within the remaining three-year contractual agreement that costs more than NZD 3.5 billion, another reinsurance contract pays up to NZD 1 billion (Consortio de Compensacion de Seguros, 2008).

Losses from a major urban catastrophe may not be covered by the combination of assets in the Natural Disaster Fund and the reinsurance contracts. To prepare for this type of extreme event, the Earthquake Commission Act 1993 requires the state to provide an unlimited guarantee if the fund and the reinsurance programmes are exhausted. The Minister of Finance may meet the deficiency of funds by providing either a grant or a loan to the EQC. The form of the guarantee is left to the discretion of the government. In exchange for this guarantee, the EQC is required to pay fees to the government as determined by the Minister of Finance. For FY 2008, the underwriting fee totaled NZD 10 million (Earthquake Commission, 2008b; Consortio de Compensacion de Seguros, 2008).

4.2.3. Budgeting for disasters in Turkey

Two-thirds of the damages from natural disasters in Turkey are due to earthquakes, but the country also suffers from landslides, floods, and avalanches (Consortio de Compensacion de Seguros, 2008). Some 96% of Turkish territory is susceptible to seismic activity and 98% of the population lives within that area (Consortio de Compensacion de Seguros, 2008; OECD, 2008). According to the United States Geological Survey, between 1939 and 2004, there were 25 earthquakes in Turkey of magnitude 6.0 or higher on the Richter scale, resulting in more than 72 500 fatalities (US Geological Survey, 2009). On 17 August 1999, Turkey experienced its largest earthquake in the previous fifty years (magnitude 7.6). Just three months later, a magnitude 7.1 aftershock struck the same area. These two quakes cost thousands their lives and placed a large financial burden on Turkey’s government and economy (Consortio de Compensacion de Seguros, 2008; OECD, 2008).

Prior to 27 September 2000, the Turkish government was obligated to extend credit and construct housing for the public in the event of an earthquake and only 5% for residences had earthquake insurance coverage. As a result of the 1999 earthquakes, the Turkish government made earthquake insurance compulsory. Established by the Turkish government in co-operation with the World Bank, the Turkish Catastrophe Insurance Pool (TCIP) administers this insurance (OECD, 2008). Initial capital for TCIP was provided through a contingent loan facility from the World Bank (Consortio de Compensacion de Seguros, 2008).

TCIP is a legal public entity whose seven-member management board is made up of academics and public and private officials. TCIP minimises costs by contracting out most

of its operations. Leading Turkish reinsurance companies hold the contract for the operational management of TCIP (OECD, 2008). The TCIP is supervised by the Under Secretary of the Treasury, who is also responsible for auditing TCIP's accounts (Yazici, n.d.). TCIP cedes a significant portion of its risk to international reinsurance markets and intends to do so until sufficient resources are accumulated (OECD, 2008).

Although TCIP was originally designed to cover multiple hazards, to date they only provide policies that cover earthquakes and fires, explosions or landslides following earthquakes (Yazici, n.d.). Earthquake insurance is compulsory for all residential buildings within municipal boundaries. Owners of residential buildings in small villages that are outside municipal boundaries and industrial and commercial buildings may voluntarily purchase earthquake insurance. Only the residential building itself is covered from losses due to earthquake, but insurance companies may voluntarily offer separate coverage for contents (Yazici, n.d.). To enforce the compulsory insurance scheme, homeowners must show a copy of their insurance policy to the land registry office each time they wish to set up an account for public utility services (OECD, 2008). However, penetration remains low; in 2007, only 20% were insured (Aktas, 2008).

As of February 2007, the maximum compulsory coverage was TRY 110 000. This limit is adjusted annually according to changes in the construction price index. Additional coverage may be purchased from private insurance companies if the value of the residence is above this limit (Consortio de Compensacion de Seguros, 2008; OECD, 2008).

Policies are purchased through private insurance companies who are then required to pay the entire monthly premium to TCIP. Premium prices vary between 0.04% to 0.55% depending on the amount of seismic risk, the type of construction, and the total area of the building. The minimum premium amount on a TCIP policy is TRY 30. At the time a claim is made, a 2% deductible must be paid by the policy holder (Yazici, n.d.). From its establishment in September 2000 through 31 July 2006, TCIP has paid TRY 17 145 643 in earthquake claims (TCIP, n.d.).

TCIP revenues are kept in segregated accounts and are managed by an operational manager who follows the Investment Guidelines of the Board of Directors. The goal is to invest the TCIP funds in diversified instruments (Yazici, n.d.).

5. Summing up

To budget is to prospectively choose a particular allocation of available resources from among various alternatives. *Ex post* budgeting for disasters recognises the liquidation of an obligation after it has been incurred; it is more closely related to financial reporting than budgeting. Some of the costs of disasters must be deferred until after the event, such as adjusting the *ex ante* estimate of cost for the timing and severity of loss. But the obligation of resources occurs in the good times before a particular loss event, when people adjust their behaviour in response to public policy toward disasters.

Ex ante recognition of the allocation decision creates procedural opportunities to save for the expected cost of relief and recovery and to recognise budgetary savings for measures that reduce losses through mitigation and offsets to moral hazard. Budgetary credit cannot be given for reducing an unrecognised cost. But if the expected cost of current policy is recognised in either a cost estimate or, for previously-enacted policies, in the budget baseline, credit can be awarded for actions expected to mitigate losses, such as flood control, or the adoption of building codes or risk-based pricing for insurance.

Recognition of costs and potential cost savings requires budget analysts to estimate those costs and savings, and formalises the process of distinguishing high- and low-value alternatives. This added analytical effort required by *ex ante* recognition of contingent costs is not free. But as government policies become more complex than writing checks for purchases of goods and services and transfer payments, the task of the budget technician necessarily becomes more analytical.

Ex ante budgeting can also be useful in limiting the relief responses to a level consistent with a considered decision. When disasters occur, the impulse is to provide assistance first and consider costs later. In general, public policies for addressing catastrophes are presumed to be more consistent with long-term objectives if they are established in advance of the loss event.

In sum, it is possible for governments to realise the benefits of *ex ante* budgeting for disasters. Many countries appear to do so by directly offering insurance; others by supporting private insurance through reinsurance or guarantees. Still others attempt to increase national savings through general contingency funds. Some 67% (10 of 15) responding OECD countries use one or more of these methods of accumulating resources and encouraging mitigation. However, additional analysis is required to confirm that current resources are effectively allocated to contingency funds and insurance programmes before a disaster event.

Notes

1. A number of studies of natural disasters, especially their effects on developing countries, prepared recently for the Global Facility on Disaster Reduction and Recovery (a World Bank consortium) are available at www.GFDRR.org.
2. In a discussion of the budgetary control of long-term commitments for mandatory programmes, Alan Auerbach notes the ongoing increase in “future implicit liabilities with only limited impact on short-term budget measures. As economies evolve, a narrow perspective with respect to liabilities and commitments is an increasingly serious shortcoming” (Auerbach, 2008).
3. Catastrophe, or “cat”, bonds can be used to shift the cost of contingent losses to others in exchange for premiums and structured to avoid counterparty risk (Hofman and Brukoff, 2006). However, markets for these securities are still somewhat thin, resulting in pricing that seems unattractive to many governments.
4. The EQC invests much of its assets in New Zealand government securities. However, from the government’s perspective, issues of these securities are treated as borrowing from the public and not as a source of government revenue.

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ANNEX A1

An Ancient, Familiar Case of Effective Government Policy for Disaster

The possibility of reduced suffering through public and private action in anticipation of unpredictable shocks to wealth, income, and consumption is highly intuitive. The timeless story of Joseph, the Pharaoh, and the seven-year Egyptian famine illustrates some potential gains and pitfalls of public policy aimed at muting the costs of natural disasters.¹

The thread of the narrative is that Joseph – son of the patriarch, Jacob – is sold, not without provocation, as a slave by his jealous brothers to a caravan of traders passing through Canaan. In Egypt, Joseph exhibits a divinely inspired ability to interpret dreams. Eventually, the Pharaoh calls on Joseph to interpret his troubling dream in which seven healthy, fattened cows are consumed by seven skinny ones. Joseph reveals that the dream foretells seven years of abundant harvests followed by seven years of famine. The Pharaoh authorises Joseph to collect 20% of the grain crop in the good years and to save it for the bad years. When the seven years of poor harvests arrive, the grain saved during the good years when the consumption value of additional units was low, enables people to enjoy the higher marginal benefits of consumption.

A significant, though perhaps less remembered, detail of the story is that once the famine begins, Joseph does not simply distribute grain to the needy. Instead, he offers it for sale, apparently at market prices to Egyptians and others for cash, herds and, eventually, for land. Thus, the Pharaoh's wealth is increased during the famine with the high price of grain. The favourable reception given to Joseph's interpretation of the dream and his plan of action suggests that the Pharaoh and his advisers understood the potential gain to the governing authority from the anticipated famine.

Even though the Pharaoh benefited from Joseph's interpretation and policy, so did the Egyptian populace. Absent the forced saving conducted by Joseph for the Pharaoh, grain would have been more scarce and its relative price higher. The decline in consumption during the famine would have been greater.²

Joseph's policy also avoided the adverse effects of moral hazard. Given the frequency of agricultural famines in ancient times, it is likely that people engaged in precautionary saving, mitigation, and income smoothing in anticipation of such events.³ Pharaoh's 20% tax reduced disposable income, which likely reduced private saving as well as consumption. But the incentive for households to save and to continue other ameliorating practices would have remained strong, especially because it would have been clear that Pharaoh's stockpiles of grain would be poor substitutes for saving and other preparations

by individual households. In fact, if the Pharaoh's policy was correctly interpreted as a credible 14-year forecast of grain prices, private accumulation of grain stocks would likely have increased. By contrast, if the Pharaoh had announced that grain would be distributed at no charge during the lean years, the incentive to plan and prepare for bad times would have been weakened. Lower national saving prior to a disaster translates into larger declines in national consumption after the shock.

Joseph's plan was self-financing. It consisted of an in-kind, 20% tax on grain harvests. Modern-day budget analysts might have scored it as producing cash-basis equivalent tax revenues and cash outlays. It is likely that there were unrecorded additional costs for transportation and storage. But, given the authority of the Pharaoh, those may also have been self-financing.

The narrative is silent on policies that might have mitigated the harm from the famine, such as increased investment in irrigation. But by taking a long position in grain, the governing authority had little incentive to adopt measures that would have moderated the rise in its price. There is also no suggestion that the onset of famine and suffering caused the Pharaoh to adopt relief measures that were more generous than the original plan.

Notes

1. *Genesis*, Chapters 41-45. A more succinct account is found in the *Koran*. The story has been popularised in the musical comedy by Tim Rice (lyrics) and Andrew Lloyd Webber (score), "Joseph and the Amazing Technicolor Dream Coat".
2. Hamermesh (2002) estimates that the harvest was likely 65% less than its normal yield during the famine years.
3. The literature on the social institutions used to smooth income and consumption in low-income, agricultural economies is extensive. For an accessible summary, see Morduch, 1995.