MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HĪKINA WHAKATUTUKI

TRADING STANDARDS

19 March 2020

The Ministry of Business, Innovation and Employment (MBIE) is pleased to release the Cost Benefit Analysis (CBA) prepared by the New Zealand Institute of Economic Research (NZIER). The findings presented by NZIER in the following report provide invaluable insight which will help inform and shape the approaches that can be taken to improve product safety outcomes associated with the flammability of foam-filled furniture.

Under the Fair Trading Act, MBIE works to reduce significant risks and hazards that products may pose to New Zealanders. Part of this role is advising the Minister of Commerce and Consumer Affairs on product safety interventions to reduce the risk of injury.

In July 2019 the Minister of Commerce and Consumer Affairs introduced the *Product Safety Policy Statement Foam-filled furniture – Reducing the risk of fire-related harm from household furniture products* (the Policy Statement). The Policy Statement challenges the furniture industry to improve the fire safety of the foam-filled furniture being sold in New Zealand.

As part of the process, MBIE engaged NZIER to undertake an independent analysis of the costs and benefits of introducing a product safety standard for fire-retardant foam furniture.

Regulating for fire-retardant foam not a preferred option

The CBA shows that the costs of a product safety standard outweigh the benefits, and that these costs are likely to be passed on to consumers. It also shows that regulations of this type might have unintended consequences, by resulting in the introduction of potentially hazardous chemicals. The toxicity of fire retardants is an increasing concern internationally, with some jurisdictions moving away from requiring them.

Based on this evidence, MBIE does not recommend that a product safety standard for fire-retardant foam is introduced at this time.

The Policy Statement is a catalyst for innovation

While regulating for fire retardants is not a preferred option, the risks posed by furniture foam remain. In the immediate term, the most effective way to make furniture more fire-safe is to bring the furniture industry, MBIE and other stakeholders together to focus on a common goal – buying households more time to escape in the event of a fire.

The Policy Statement does not prescribe a particular means of making furniture more fire-safe. It provides the opportunity for innovation in areas such as materials, textiles and construction.

If the Policy Statement doesn't achieve the desired outcomes alone, there remain a range of regulatory options available under the Fair Trading Act. This includes mechanisms to enhance and support the adoption of the Policy Statement, and enable consumers to make more informed purchase decisions.

NZIER
NEW ZEALAND INSTITUTE OF ECONOMIC RESEARCH

Burning couches

A cost-benefit analysis on regulating for fire retardants in foam furniture

NZIER report to Ministry of Business, Innovation and Employment

26 SEPTEMBER 2019

About NZIER

NZIER is a specialist consulting firm that uses applied economic research and analysis to provide a wide range of strategic advice to clients in the public and private sectors throughout New Zealand and Australia and further afield.

NZIER is also known for its long-established Quarterly Survey of Business Opinion and Quarterly Predictions.

Our aim is to be the premier centre of applied economic research in New Zealand. We pride ourselves on our reputation for independence and delivering quality analysis in the right form and at the right time for our clients. We ensure quality through teamwork on individual projects, critical review at internal seminars and peer review at various stages through a project by a senior staff member otherwise not involved in the project.

Each year, NZIER devotes resources to undertake and make freely available economic research and thinking aimed at promoting a better understanding of New Zealand's important economic challenges.

NZIER was established in 1958.

Authorship

This paper was prepared at NZIER by Mieke Welvaert and Chris Nixon.

It was quality approved by Peter Clough.

The assistance of Peter Wilding from Fire and Emergency New Zealand as well as several foam manufacturers, foam furniture retailers and fire damage clean-up firms who wish to remain anonymous is gratefully acknowledged.

L13 Willeston House, 22–28 Willeston Street | PO Box 3479, Wellington 6140
Tel +64 4 472 1880 | econ@nzier.org.nz

Key points

The analysis assesses the costs and benefits of regulating for fire retardancy in foam furniture under a product safety regulation compared to a Product Safety Policy Statement (PSPS). The regulation will make fire retardants mandatory in all new furniture sold in New Zealand. In contrast, the PSPS is a non-mandatory guideline to encourage firms to introduce fire-retardant furniture voluntarily.

Regulating is more costly than the benefit it generates

The cost of this regulation is more than double the value of benefits it generates. Benefits offset only 41% of costs in the first 10 years and 46% of costs in the first 20 years of the regulation.

The main cost burden rests with consumers

Fire retardants make furniture more expensive. These added costs to the consumer make up 85% of all the costs associated with this regulation.

A regulation may not reduce fires as quickly as we assume

Low-income households are more likely to live in rental accommodation, which is overrepresented in fire statistics.

This cost-benefit analysis (CBA) does not account for the distribution of new foam furniture uptake.

If renting households mostly purchase second-hand furniture, we have overestimated the medium-term safety benefits from introducing fire retardants in foam furniture.

Some fire retardants are toxic, but the impacts are small

All countries that regulate for fire retardancy in furniture are reviewing their rules for health and environmental safety reasons.

We accounted for environmental and cancer-related health impacts in this CBA, but these impact costs are small. Fire retardancy technology is constantly improving and becoming safer. Given current technology and global policy on toxins, we have assumed that fire retardants used in furniture will be non-carcinogenic within 5 years. However, other health and environmental impacts are likely to persist.

Fire retardants may not be effective in reducing fires

Firms are most likely to respond to the regulation by putting fire-retardant additives in foam, which may not prevent or delay fires very effectively. Fire-retardant foam is often designed to pass a test involving a small ignition source, such as a cigarette, and can be ineffective if the ignition source is larger (Blum 2019). Other research also indicates that, once on fire, furniture treated with fire retardants produces more toxic smoke than untreated furniture (McKenna et al. 2017), and smoke is one of the main causes of fire-related deaths (Lilley, McNoe and Duncanson 2018).

Furthermore, only some fires begin on foam furniture. Foam furniture is not listed as a common first ignited material in research on house fires, suggesting that fewer than 3% of fires begin this way.

As fire retardants may not effectively prevent or delay fires on or involving furniture and given that fires beginning on foam furniture are uncommon, more generic solutions (such as smoke detectors and fire alarms) may be more effective in reducing risks to life and property from fires.

Regulations are expensive and may not be effective

Regulating for fire retardancy in foam furniture is expensive for consumers and the foam furniture industry. We also found that making furniture fire retardant may only prevent some fires, at best. Overall, a product safety regulation is more expensive than the potential benefits it creates.

Table 1 Costs and benefits

Present values for the first 10 years with a 6% discount rate, 2019 dollars

Cost or benefit component	Present value	% of costs	Comment
Costs			
Quantifiable costs			
Costs to consumers	$674,949,185	84.88%	15–20% product price increase
Industry compliance costs	$115,221,855	14.49%	
Regulation enforcement	$4,438,132	0.56%	
Environmental hazard costs	$375,922	0.05%	
Regulation development, implementation and stewardship	$140,612	0.02%	
Health hazard costs	$46,338	0.01%	Cancer risk only
Landfill disposal costs	$0	0.00%	
Non-quantifiable costs			
Trans-Tasman trade effects			Australian firms may discontinue supplying the New Zealand market or request that the Australian Government intervene in response to a mandatory requirement
Non-cancer health hazard costs			No values available for the cost of non-cancer health risks
Firefighter exposure risks			Suspected but not proven link between current fire retardants and negative health outcomes for firefighters
Distributional effects			Low-income households are the last to receive the benefit of fire-retardant foam furniture
Total costs	**$795,172,045**		

Cost or benefit component	Present value	% of costs	Comment
Benefits (costs avoided)			
Quantifiable benefits			
Costs avoided from not having a PSPS			
Costs to consumers	$231,411,149	71.03%	10% product price increase
Industry compliance costs	$32,408,627	9.95%	Only large firms
Regulation enforcement	$2,955,075	0.91%	
Environmental hazard costs	$224,491	0.07%	
Regulation implementation and stewardship	$61,424	0.02%	Minimal as almost in place
Health hazard costs	$0	0.00%	Cancer risk only
Landfill disposal costs	$0	0.00%	
Subtotal PSPS cost rise avoided	*$267,060,766*	*81.97%*	
Costs avoided from having a fire retardancy regulation			
Fire injuries	$31,232,199	9.59%	
Property damage	$24,084,339	7.39%	
Fire fatalities	$2,743,105	0.84%	
Fire emergency response team and equipment	$686,042	0.21%	
Subtotal fire damage costs avoided	*$58,745,686*	*18.03%*	
Non-quantifiable benefits			
None			No non-quantifiable benefits
Total benefits (costs avoided)	**$325,806,451**		
Summary results			
Benefit-cost ratio = 0.41			

Source: NZIER

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1. Introduction

The Ministry of Business, Innovation and Employment (MBIE) is considering a product safety regulation for fire-retardant foam furniture under section 29 of the Fair Trading Act 1986. This regulation will require that all new foam furniture has adequate fire retardancy to withstand standard fire safety tests (such as the cigarette test and the match test).[1]

The task of this cost-benefit analysis (CBA) is to compare the regulation to an alternative: a Product Safety Policy Statement (PSPS). The PSPS is a statement to the foam furniture industry of MBIE's preference for fire retardancy in furniture. Under the PSPS, firms can introduce and claim fire retardancy in several ways – by meeting any other standard used overseas or by simply using materials with known fire-retardant properties in their furniture such as wool.

Both regulatory options have different known and potential outcomes (Table 2).

Table 2 Regulation option outcomes

Main outcomes from each regulatory option

Topic	Product safety regulation	Product Safety Policy Statement (PSPS)
Firm adoption	Mandatory for all firms	Optional, assume large firms will adopt to safeguard reputation and to avoid more stringent regulations
Options for fire-retardant treatments	Fire-retardant additives	Any material or construction that improves fire retardancy
Expected furniture price increases	15–20%	10%
Health hazard risk	Moderate	Low
Environmental risk	High but proportionate to uptake	High but proportionate to uptake
Fire prevention	Some foam furniture fires prevented	40% fewer foam furniture fires prevented than with the regulation

Source: Lilley, McNoe and Duncanson 2018, 54

We have drawn on New Zealand-based fire statistics and industry response data to determine safety benefits and consumer price impacts, respectively. We used international literature for determining the scale of health and environmental impacts as well as the distribution of fire injury costs.

We intend this analysis to provide policy makers with an indication of the likely costs and benefits to assist their decision around regulating for fire-retardant foam furniture.

[1] See for example https://www.kothea.com/documents/cigarette-match-test-BS5852-BS-5852-crib-5.pdf (New Zealand Wool Testing Authority Ltd 2019).

2. The current situation

The foam in furniture and mattresses is highly flammable and accelerates fires. However, upholstered furniture and mattresses are rarely the first ignited items in a house fire.

Nevertheless, some countries have put in place regulations that require fire retardancy in furniture.

MBIE is about to put a PSPS in place that will indicate to firms MBIE's preference for fire-retardant foam furniture.

Foam furniture is highly flammable

Almost all foam furniture and mattresses sold in New Zealand are made using flexible polyurethane foam (FPUF), which is highly flammable (Ministry of Business, Innovation and Employment 2018a).

According to Fire and Emergency New Zealand, a three-piece suite has the burning energy equivalent of 10 litres of fuel (Ministry of Business, Innovation and Employment 2018a). A burning sofa also releases gaseous fuel so quickly that it does not burn off before it spreads and ignites other parts of a dwelling (Ministry of Business, Innovation and Employment 2018a).

Burning foam furniture causes fires to spread very quickly throughout a house, increasing the risk of property damage, personal injury and death.

But foam furniture may not be a main source of house fires

Residential fire statistics do not register foam furniture as one of the most common first materials ignited in residential fires between 1986 and 2005 (Robins and Wade 2010). This research detailed in *0* indicates that foam furniture is the first ignited item in fewer than 3.2% of residential fires. We focus on first ignition as this is the main effect captured by scientific evidence. Fire retardants in furniture may prevent fires that begin elsewhere but evidence of that impact on safety is limited (see *Appendix B* for discussion).

Nevertheless, this same research does list furnishings, upholstery and mattresses among the most common first ignited materials in residential fires *causing injury or death* (Robins and Wade 2010). Polyurethane (such as in furnishings, upholstery and mattresses) is the first ignited material in 4.8% of fires that cause injuries and 7.3% of fires that cause deaths (see *Appendix A*).

Other places regulate for fire-safe foam furniture

In response to the role of foam furniture in fires, the state of California adopted standards for fire retardants in 1975 (Hill 2014). Both the United Kingdom and Ireland adopted fire safety regulations for furniture and furnishings in 1988 (UK Secretary of State 1988).

These regulations may not be effective and may cause harm

Both California and the UK are re-evaluating their stance on fire retardants in furniture.

In 2013, the State of California revised its testing of fire retardants because the previous standard meant that only fire retardants with harmful health and/or environmental impacts met the original testing requirements (Watt 2013).

Late last year, California Governor Jerry Brown signed a Bill restricting the quantity of flame-retardant additives in mattresses and upholstered furniture from 1 January 2020 (California legislative information 2018)

In July 2019, the UK House of Commons Environmental Audit Committee provided some analysis on the UK's fire safety regulations for foam furniture noting:

- a lack of robust data on how effective fire retardants are at reducing fires
- research that the presence of fire retardants has "an adverse effect on the smoke toxicity" once a fire is burning (House of Commons Environmental Audit Committee 2019, 26)
- that "in order to meet the requirements, manufacturers use significant quantities of potentially harmful Flame Retardant chemicals (FRs) to make covers fire resistant to the required standard" (House of Commons Environmental Audit Committee 2019, 27).

As countries with fire retardancy standards are rethinking their regulations on the grounds of health and environmental impacts, we have designed our CBA to incorporate the potential health and environmental impacts of any regulation (see *4 Costs and benefits*). We have also run scenarios on the effectiveness of either a product safety regulation or a PSPS compared to a state of no regulation (see *4.5 Results*).

New Zealand doesn't regulate fire retardancy in furniture but is about to get a PSPS

New Zealand does not yet have any regulations around fire retardants in furniture. However, MBIE has put together a PSPS to signal to the foam furniture industry its preference for fire retardants. This is a 'light-handed' regulation – a move to see how the industry might respond without putting any hard and fast rules in place at additional expense to the government.

Under a PSPS, we think that 60% of the industry will sell fire-retardant foam furniture

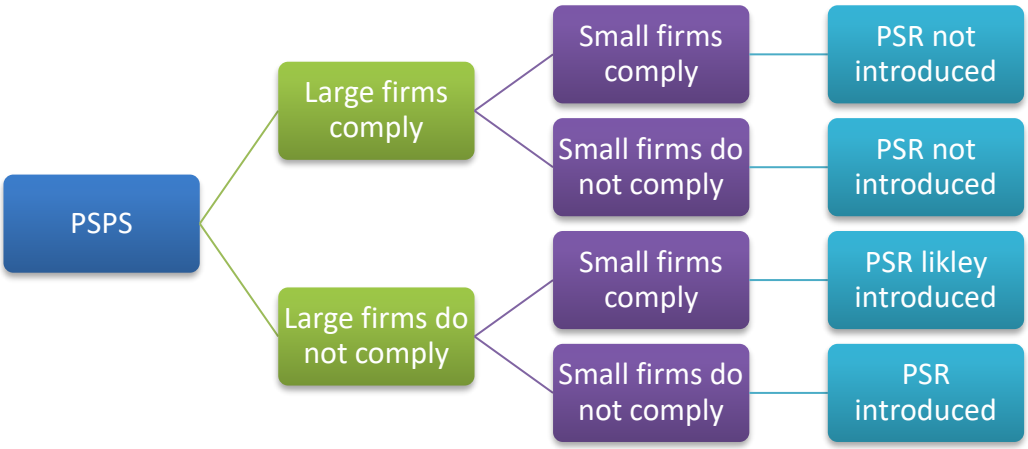
The PSPS is more than just a wish list. A PSPS carries the threat of a mandatory regulation if the furniture industry doesn't introduce fire retardancy in their foam furniture and mattress offering. As a result, although a PSPS is not mandatory, we still expect large firms in the industry to comply with the PSPS.

Using employee count as a proxy for market share, we estimated that large firms make up 60% of the foam furniture manufacturing, retail and wholesale industry.

We assumed that all large firms in this industry would comply with the PSPS for two main reasons:

- Large firms have a built-in capability to adopt fire retardancy treatments and ensure that these treatments meet requirements.
- If large firms do not comply, mandatory fire retardancy standards will be introduced (see Figure 1), and these standards are more expensive for firms to implement than those under the PSPS.

Figure 1 Response options for furniture industry firms



Source: NZIER

MBIE offers several avenues for industry to meet the PSPS...

The PSPS provides flexibility around how the furniture industry can comply. Foam furniture complies if it meets or includes:

- the California standard
- the UK standard
- natural fire-resistant fibres
- fire-retardant interliners
- fire-retardant treatments.

...but we've assumed that all fire retardancy measures are equal

We have assumed that furniture items that meet any of the fire retardancy criteria under the PSPS will be as fire retardant as furniture that meets only the UK standard used under the product safety regulation.

Firms are more likely to take up the California standard under a PSPS. Firms can easily adopt a standard that already exists. Of the two standards, firms have identified the California standard as a cheaper option requiring less of a price increase than the UK standard (Ministry of Business, Innovation and Employment 2019b).

Both UK and California standards have advantages and disadvantages.

The UK regulations have the most stringent tests, and only furniture with fire-retardant additives in the interior foam pass testing – as opposed to interliners or naturally fire-retardant surfaces such as leather.

However, several pieces of research point out that fire-retardant additives in foam may not reduce fires. The Centre for Fire and Hazard Science found that "we are unlikely to ever have robust data showing how effective flame retardants are in suppressing ignition" (McKenna et al. 2017, 19). Dr Arlene Blum finds that "once the fabric is

burning, the flame is large and the flame retardant chemicals in foam can only delay ignition for a few seconds" (Blum 2019).

In contrast, legacy furniture made of natural fibres takes about 10 times as long to burn compared to untreated foam furniture (Underwriter Laboratories 2013). However, naturally fire-retardant materials such as leather and wool make furniture much more expensive than treated alternatives. We assume that customers who can already afford this type of furniture already purchase it, meaning that demand in this category does not change.

3. Proposed changes

MBIE wants to understand the costs and benefits of introducing a product safety regulation under section 29 of the Fair Trading Act 1986 (Ministry of Business, Innovation and Employment 2019a). We have assumed that these regulations will be almost a direct copy of the UK regulations.

New Zealand will most likely adopt UK regulations

Of the two options, the UK regulations fit best with other legislation and current testing capability within New Zealand and will be easier to adopt.

If New Zealand were to regulate fire retardancy in furniture, we would most likely adopt a regulation that already exists. We know of two other fire retardancy regulations in the world: California's Technical Bulletin 117-2013 and the UK and Ireland's Furniture and Furnishings (Fire) (Safety) Regulations 1988.

Adopting California's regulations will be more difficult because it is about to have two-parts – the original requiring fire retardancy and the new law restricting chemical flame retardants in interior foam. In contrast, the UK has one regulation, making it easier to adopt in New Zealand.

In addition, New Zealand's testing centres already perform fire retardancy testing that meets the UK standards (New Zealand Wool Testing Authority Ltd 2019). In contrast, New Zealand does not have the testing capability for measuring the amount of fire-retardant chemicals used in foam, meaning that we would have to develop this capability to enforce California's fire retardancy regulations.

UK regulations require fire tests for foam furniture and mattresses

The UK Furniture and Furnishings (Fire) (Safety) Regulations 1988 require that:

- all upholstered furniture (except mattresses, bed bases, pillows and cushions) must pass the cigarette test (outlined in BS 5852)
- all furniture with a cover (except mattresses, bed bases, pillows and cushions) must pass the match test (outlined in BS 5852)
- all filling material in furniture (including mattresses and bed bases) must pass the relevant ignitability test (outlined in BS 6807).

  (UK Secretary of State 1988)

All furniture sold must also have appropriate display and permanent labelling indicating that the furniture item is fire resistant.

This regulation only covers furniture "which is ordinarily intended for private use in a dwelling" so does not cover furniture for commercial uses (UK Secretary of State 1988).

This means introducing fire-retardant additives in foam

Firms have few avenues to ensure their foam furniture passes the UK standard tests. To pass, firms almost always need to add fire retardants to the foam within furniture – interliners that protect the foam from catching fire are insufficient to pass because the foam itself must be flame retardant. IKEA has a policy to avoid flame retardants in its products where possible, but needs to use "flame retardant chemicals" to pass UK

legal requirements for fire retardancy (IKEA 2017, 1). Any other measures, such as the inherently fire-resistant batting IKEA uses in its mattresses in the US, do not pass the requirements of the UK tests.

New Zealand regulations will have fewer compliance constraints

The CBA assumes that New Zealand will adopt the UK regulations, with two exceptions:

- The regulations will not apply to second-hand furniture.
- The regulations will exclude some of the record-keeping compliance rules.

New Zealand has a large second-hand furniture market. Requiring that second-hand furniture sales comply with the standards could lead to mass dumping or black-market furniture sales and will penalise those that can't afford the fire-retardant options for seeking these avenues to have furniture.

The UK requires all furniture retailers, wholesalers and manufacturers to keep detailed records of foam furniture sales. This places a hefty compliance burden on the industry. As a result, we have assumed that the regulations will not include the same degree of sales recording.

We discussed these changes with industry

We contacted several organisations within the foam furniture industry to discuss their responses to mandatory fire retardants in foam furniture. Their responses helped us make the following conclusions:

- Large firms have systems in place to adopt rule changes easily, whereas small firms do not have these systems.
- Large firms have systems in place to control for quality and ensure imported products meet standards.
- With these systems in place, large firms sometimes adopt product improvements even when the state doesn't require the change.
- Not all health and environmentally risk-free fire retardants listed in the US EPA review are practical for use in mainstream foam furniture, for example:
  - expanded graphite makes foam hard and therefore unappealing for mainstream home furniture
  - melamine alone does not provide enough fire retardancy to pass the UK tests.
- Australian-owned firms make up a significant share of foam furniture retailers in New Zealand.

4. Costs and benefits

We have used a cost-benefit framework to evaluate the value of a product safety regulation for fire-retardant furniture in New Zealand.

CBA is a long-established technique designed to assess the economic efficiency of a proposed project or policy change. Efficiency is broadly about maximising outputs obtained from available inputs, and in economics, we have three broad types of efficiency:

- **Technical efficiency**
  The most cost-effective way of providing a given service: for example, in reducing the risk of fire-related harm and property damage, are working smoke alarms or fire-retardant furniture more effective, and less costly, at reducing that risk.
- **Allocative efficiency**
  How easy it is for resources to move to their most productive uses: for example, costs to consumers for achieving fire retardancy in foam furniture are less (and close to marginal cost) under a PSPS than under a UK-type regulation.
- **Dynamic efficiency**
  How innovation affects activities over time: for example, the flexibility of the PSPS in principal allows firms to find least cost options for achieving fire retardant furniture suited to their situation (see *5 Qualitative assessment of regulatory options*), whereas regulations that are more rigid give firms a narrower scope to find least cost ways of achieving fire retardancy and elevate compliance over innovation.

What may be technically efficient in achieving compliance may not be allocatively or dynamically efficient. An ideal regulation is one that is technically efficient in reducing risks of harm without unduly distorting resource allocation or impeding innovation in going about it.

This CBA proceeds by comparing effects and outcomes associated with introducing the product safety regulation against what would have occurred under a counterfactual, without the proposed change. This counterfactual can be described as a projection of the soon-to-be status quo of the PSPS – a 'light-handed' regulation – into the future as supply and demand conditions change.

4.1. The counterfactual

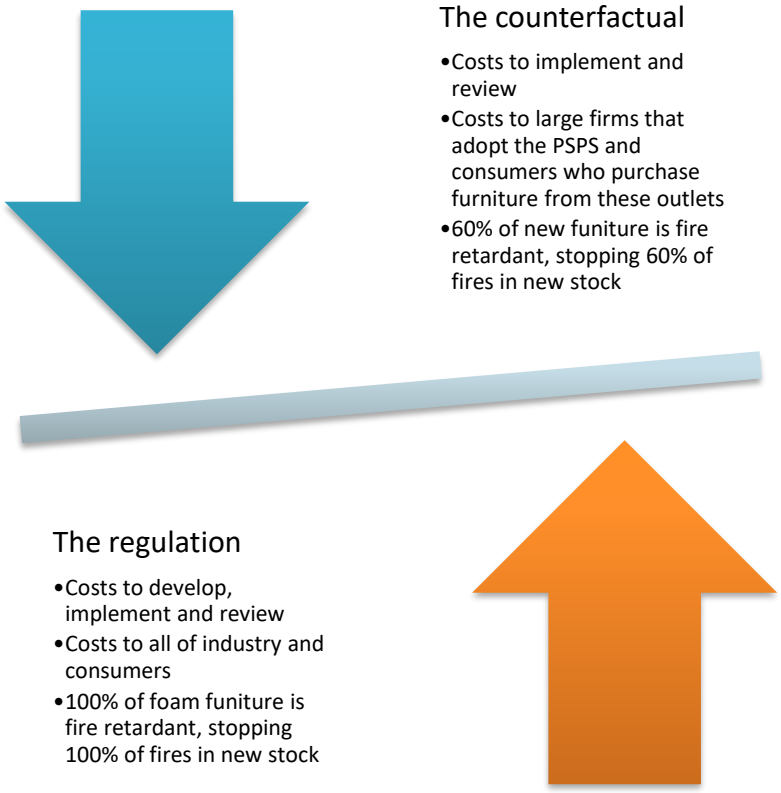
We measure the impacts of the product safety regulation against a case where the regulation doesn't take place (the counterfactual). Against this counterfactual, this CBA assesses whether the product safety regulation is a better option for reducing fires on foam furniture.

In our counterfactual, the soon-to-be-implemented PSPS goes ahead. We know how much this will cost the government to implement, review and enforce, and we also have estimates on how much the PSPS will affect product prices and add to the

industry's compliance costs (see *4.3.1 Quantifiable benefits*). These factors are replaced by and therefore subtract from the costs of implementing a regulation.

Our counterfactual also means that we are comparing a product safety regulation to a situation where some furniture in the market is fire retardant – stopping some fires. We assume that 60% of the market, by market share, sells fire-retardant furniture in our counterfactual. This means that 60% of fires and associated property damage, fatality and injury costs that we counted in our historical data already do not occur in our counterfactual. Any benefit of the regulation is the *extra benefit* of requiring the remaining 40% of the market to sell only fire-retardant foam furniture.

Figure 2 The counterfactual subtracts from the regulation



Source: NZIER

4.2. Costs

Introducing and carrying out a product safety regulation will cost almost $0.8bn over the first 10 years (Table 3) and $1.2bn over the first 20 years. Cost will continue to increase over time, as the main cost component – the cost to the consumer for more expensive couches – is ongoing.

We used a 6% discount rate to calculate present values in our central scenario. This comes from Treasury's recommendations as a guide on which discount rate to use for CBA (The Treasury 2018).

Table 3 Costs over the first 10 years

Present values with a 6% discount rate, 2019 dollars

Cost	Present value	% of costs	Comment
Quantifiable costs			
Costs to consumers	$674,949,185	84.88%	
Industry compliance costs	$115,221,855	14.49%	
Regulation enforcement	$4,438,132	0.56%	
Environmental hazard costs	$375,922	0.05%	
Regulation development, implementation and stewardship	$140,612	0.02%	
Health hazard costs	$46,338	0.01%	
Landfill disposal costs	$0	0.00%	
Non-quantifiable costs			
Trans-Tasman trade effects			Australian firms may discontinue supplying the New Zealand market or request that the Australian Government intervene in response to a mandatory requirement
Non-cancer health hazard costs			No values available for the cost of non-cancer health risks
Firefighter exposure risks			Suspected but not proven link between current fire retardants and negative health outcomes for firefighters
Distributional effects			Low-income households are the last to receive the benefit of fire-retardant foam furniture
Total costs	**$795,172,045**		

Source: NZIER

4.2.1. Quantifiable costs

The biggest quantifiable cost of the product safety regulation is the cost to consumers, who must pay more for fire-retardant furniture. This cost is orders of magnitude bigger than any other cost we measured and makes up 85% of all costs and 77% of all avoided costs/benefits in our central scenario (see *4.5 Results*). We test how consumer costs impact on our CBA results in *4.6 Sensitivity analysis*.

Costs to consumers vary by hundreds of millions but are still the highest

In the central scenario and with a $524m retail foam furniture market (see *Appendix C*), consumer costs are between $578m and $771m within the first 10 years.

Based on stakeholder responses, we assumed that consumers would need to pay between 15% and 20% more for foam furniture and mattresses under the product safety regulation (Ministry of Business, Innovation and Employment 2019b).

However, we are wary that these price increase estimates come from stakeholders who may have an interest in portraying this figure as higher. As this figure is also the biggest cost (and benefit component), we have tested our results for scenarios where consumer costs are 25% lower than the ones we used in our central scenario (see Scenario 2 in *4.6 Sensitivity analysis*).

Industry compliance costs burden small firms

Costs to the industry are twofold:

- The set-up costs for changing processes and supply chain systems to meet the new regulation.
- Ongoing training costs.

We assumed the following:

- Set-up costs would be lower for large firms than small firms (see *Appendix D*).
- Large firms have a head office taking care of the system change on behalf of the rest of the organisation.
- All small enterprises (with fewer than six employees) would need at least one person to learn about and implement the new regulations.

As a result, the burden of changing systems for compliance falls heavily on small businesses under a product safety regulation.

Regulation enforcement costs are minimal

Key components of regulation enforcement costs include one full-time equivalent of additional inspector time, 10 tests per year to confirm fire retardancy meets the standard and costs for legal proceedings in case of a breach of the regulations once every 2 years. Nevertheless, these costs are minimal compared to the total.

Environmental hazards grow bigger in the long term

Almost all available fire-retardant additives exhibit environmental persistence and or aquatic toxicity (US EPA 2015). But compliant furniture will only gradually penetrate the furniture stock and will mostly become toxic for the environment when consumers throw it out. As a result, the environmental costs of foam furniture over 20 years is more than three times the environmental costs over the first 10 years.

We pay more to protect the surrounding environment from hazardous substances when we dispose of them (for example, asbestos). We used this price difference to get an estimate of environmental costs.

However, in time, we expect to see new environmentally friendly regulation-compliant fire-retardant additives. This will reduce long-term environmental costs. As a result, we've included a partial reduction in environmental costs from the 10-year mark.

Regulation development, implementation and stewardship figures from MBIE

The costs of regulation development, implementation and stewardship provided by MBIE make up 0.02% of total present value costs for the first 10 years of the regulation. Most of these costs are one-off costs taking place in the first year.

Some fire retardants we use may be carcinogenic

Chlorinated phosphates are common fire retardants in foam furniture, but countries are becoming wary of the associated health effects of this type of additive. According to the US EPA, chlorinated phosphate fire retardants are carcinogenic, or some studies suggest that they might be carcinogenic (see Table 4). We assumed that 50% of new foam furniture products will include chlorinated phosphates as fire retardants for the first 5 years of the regulation. By year 6, we assume that the Stockholm Convention or laws in New Zealand will ban any further import or use of chlorinated phosphates in furniture.

Table 4 Chlorinated phosphates and cancer

High = known or presumed human carcinogen, medium = suspected human carcinogen

Types of chlorinated phosphates	Carcinogenicity
Tris (2-chloroethyl) phosphate (TCEP)	High
Tris (2-chloro-1-methylethyl) phosphate (TCPP)	Medium
Tris (1,3-dichloro-2-propyl) phosphate (TDCPP)	High
Phosphoric acid, P, P'-[2,2-bis9chloromethyl)-1-3-propanediyl] P, P, P', P'-tetrakis(2-chloroethyl) ester	Medium

Source: US EPA 2015

Chlorinated phosphates are common fire retardants. Both the UK and the US have relied on these chlorinated phosphates to make furniture fire retardant since the Stockholm Convention banned penta-BDE (the previously most common fire retardant until scientists linked it to several serious health effects). Stapleton et al. found that 52% of furniture sold in the US between 2005 and 2010 contained TDCPP (Stapleton et al. 2012).

However, regulation for change is coming. The UK House of Commons notes that using chlorinate phosphates was a "regrettable substitution" for penta-BDE (House of Commons Environmental Audit Committee 2019, 24). The European Chemicals Agency is now considering TCEP, TCPP and TDCP "for restriction" (House of Commons Environmental Audit Committee 2019, 24).

As regulations elsewhere haven't yet caught up with chlorinated phosphates, we assumed that the same share (50%) of foam furniture coming to New Zealand will include chlorinated phosphates.

No additional disposal costs

We assumed no additional disposal costs for furniture. We found no research to suggest that other countries dispose of fire retardant-treated furniture differently to

general waste. In a submission to the UK Parliament's Environmental Audit Committee, Dr Arlene Blum notes that internationally "treated products are primarily land filled" (Blum 2019).

Stakeholders in the New Zealand industry supported this view, indicating that they would most likely do the same unless toxic leachate became a problem.

Research for the Ministry for the Environment found that volume of brominated diphenyl ether (BDE) flame retardants (now banned) in New Zealand landfill leachate was infinitesimal compared to the volume of BDE-containing product disposed of (Keet et al. 2010). However, this research mainly focussed on electronic goods, which deteriorate differently to foam. As a result, fire retardants in furniture could become a problem for secure waste management and incur higher costs as more of the furniture stock turns over.

4.2.2. Non-quantifiable costs

Some costs that we did not quantify are:

- the product safety regulation's effect on the Trans-Tasman Mutual Recognition Agreement (TTMRA)
- non-cancer health risks
- health risks to firefighters due to burning fire retardants
- the distributional effects of furniture purchases.

Imposing a cost on Australian firms may cost us

The main cost risk of the TTMRA is that the product safety regulation imposes additional costs on Australian firms – a burden that these firms may politicise – impacting future trade between Australia and New Zealand. The Australian Government has also indicated its preference for health-safe and eco-friendly options and may not approve of New Zealand's choice of standard. Both these factors mean that Australia could become a less 'friendly' trading partner in the future, but we have no way of anticipating its response.

As a result, we recommend consulting with the equivalent Australian government departments to reduce any potential points of conflict before implementing this regulation.

Technically, product safety regulations are above board:

- Under the Fair Trading Act 1986, the product safety regulation means that furniture that doesn't meet the regulation will be prohibited (Parliamentary Counsel Office 1986, sec. 33).
- All prohibited goods cannot be imported into New Zealand as per the Customs and Excise Act (Parliamentary Counsel Office 2018, sec. 96).
- Goods prohibited under the Customs and Excise Act 2018 are excluded from the TTMRA under schedule 1 category 1 (New Zealand Government 1997).

Australia may still respond in a way that negatively impacts the New Zealand market. A product safety regulation will mean that non-compliant Australian foam furniture

and mattresses cannot be imported into New Zealand, leaving Australian furniture exporters with two options:

- Leave the New Zealand foam furniture market:
  - If Australian firms did choose to leave the New Zealand furniture market, we do not know the size of this impact.
  - Products from Australia make up between 3% and 4% of foam furniture and mattresses imported by New Zealand, indicating that other trading partners can fill this gap.
  - However, we do not know how many Australian-based firms send furniture direct from suppliers in, for example, China to New Zealand.
  - As a result, more firms could leave the market than import statistics indicate.
- Comply with the regulations and maybe complain about it:
  - Any Australian firm that complies with the regulation to continue selling furniture in New Zealand faces additional costs.
  - The purpose of the TTMRA is to reduce the cost of trading across the Tasman.
  - If Australian firms are negatively impacted by the regulation, they may ask the Australian Government to address the problem with New Zealand legislators.
  - Although the regulation doesn't technically breach the TTMRA, Australian legislators may see the product safety regulation as an opportunity for them to impose their own regulations that negatively impact New Zealand products. We have no bearing for the cost and extent of such retaliation.

Australia does not have the same view about fire retardants. The Australian Government is concerned about the health risk of fire retardants in their furniture. Just last year, the Australian Ministers for the Department of Industry, Innovation and Science set up funding for the textile industry to make "eco-friendly, non-toxic, durable flame retardants" noting that "toxic flame retardants" are common in furniture (Ministers for the Department of Industry, Innovation and Science 2018).

The Australian Government may find that the New Zealand regulations pose an unwanted health or environmental risk to Australian consumers as all furniture made to meet New Zealand standards can be sold in Australia.

We found evidence of non-cancer health risks but no values

Many fire-retardant additives have been classed by the United States EPA as having moderate to high associated health risks (US EPA 2015). We only found a relevant value for the cost of cancer risks. As a result, we did not include the health impacts of fire retardants of:

- acute toxicity
- genotoxicity
- reproductive
- developmental

- skin sensitisation
- respiratory sensitisation
- eye irritation
- dermal irritation.

Firefighters may face additional health risks if furniture is fire retardant

Eventually fire-retardant items burn, and research indicates that firefighters may have a higher risk of negative health outcomes if furniture includes fire retardants (Shaw et al. 2013). However, these studies focus on penta-BDE – a now banned fire retardant – and we have not found any information on the effect of current fire retardants. As a result, we did not include the impact of the product safety regulation and PSPS on firefighters' health.

Lower-income households could be the last to receive protection

We have not accounted for the distributional effects of new furniture purchases across different income brackets in New Zealand.

Low-income households may not buy as much new furniture as often as high-income households. If this is the case, low-income households will be less exposed to the higher costs of furniture, but they will not receive the safety benefit from having fire-retardant furniture for a long time.

Low-income households are more likely to live in rental accommodation, which is overrepresented in fire statistics.

Fires causing fatalities and injury are more common in rented dwellings. In a study for Fire and Emergency New Zealand, Lilley, McNoe and Duncanson found that 51% of fires were in rental or community care dwellings (Table 5). In contrast, rented dwellings make up just 34% of the New Zealand housing stock, compared to the 62% occupied by their owner (Table 6).

Table 5 Dwelling ownership characteristics represented in fires

For fires during 2007–2014 that caused fatalities, n=107

Property ownership	Percentage share of dwelling fires	Pro-rate no information and other
Private and occupied by owner	38%	43%
Housing NZ/council owned, rented	16%	18%
Privately owned, rented	31%	35%
Community care services	4%	4%
No information	5%	
Other	6%	

Source: Lilley, McNoe and Duncanson 2018, 54

Table 6 Dwelling ownership characteristics in New Zealand

For fires during 2007–2014 that caused fatalities, n=107

Property ownership	Percentage share of dwelling fires
Private and occupied by owner	62%
Privately owned, rented	34%
Provided free (e.g. held in a family trust)	4%

Source: Lilley, McNoe and Duncanson 2018, 54

4.3. Benefits

Introducing and carrying out a product safety regulation will generate $267m from avoiding a PSPS and an additional $326m in fire safety benefits in the first 10 years (Table 7). We found no non-quantifiable benefits. We used a 6% discount rate to calculate present values in our central scenario. This comes from Treasury's recommendations as a guide on which discount rate to use for CBA (The Treasury 2018).

Table 7 Benefits (avoided costs) over the first 10 years

Present values with a 6% discount rate, 2019 dollars

Benefits (costs avoided)	Present value	% of benefits
Costs avoided from not having a PSPS		
Costs to consumers	$231,411,149	71.03%
Industry compliance costs	$32,408,627	9.95%
Regulation enforcement	$2,955,075	0.91%
Environmental hazard costs	$224,491	0.07%
Regulation implementation and stewardship	$61,424	0.02%
Health hazard costs	$0	0.00%
Landfill disposal costs	$0	0.00%
Subtotal PSPS cost rise avoided	$267,060,766	81.97%
Costs avoided from having a fire retardancy regulation		
Fire injuries	$31,232,199	9.59%
Property damage	$24,084,339	7.39%
Fire fatalities	$2,743,105	0.84%
Fire and Emergency response team and equipment	$686,042	0.21%
Subtotal fire damage costs avoided	$58,745,686	18.03%
Total benefits (costs avoided)	$325,806,451	

Source: NZIER

4.3.1. Quantifiable benefits

Many of the benefits are avoided costs from not undertaking a PSPS. These benefits have been scaled to account for the lower uptake of fire-retardant treatments.

The remaining benefits are reduced property damage, lives saved and injuries avoided.

Costs to consumer and industry are the biggest avoided costs/benefits

Collectively, these avoided costs make up 81% of total benefits.

To calculate the cost to consumers, we assumed all large firms in the industry would adopt the PSPS, meaning that 60% of new foam furniture would be fire retardant and more expensive (see *Appendix D*). We assumed that price increases under the PSPS will be about 10% – the midpoint of what respondents indicated when asked to respond on what they'd expect in terms of price increases (Ministry of Business, Innovation and Employment 2019b). This price rise is close to that used in Wassmer and Fesler's (2018) CBA of fire-retardant interliners in the US, which estimated that sofa retail prices would increase by US$37.44–40.52. Using a standard two-seater sofa as a benchmark (IKEA, 2019), and adjusting for 2019 prices, this increase translates to a 7–8% price jump.

Costs to the industry are proportionately less under a PSPS than under the regulations. We assumed only large firms adopted the PSPS guidelines. We also kept the assumption that large firms have better systems in place to organise new product supply to meet the standards and can therefore do this at a lower per firm cost (see *3. Proposed changes*).

Fire injuries are expensive and can be avoided with regulation

Over $31m from fire injuries could be avoided with a product safety regulation. House fires from foam furniture and mattresses injure almost 20 people each year, and burn injuries are expensive to treat and live with.

Burn injuries are expensive when you count quality of life impacts. Average quality of life losses range from 1–1.9 quality adjusted life years for each of the 2 years after a burn injury (Table 8).

After 2 years, a burn victim's quality of life stabilises (Miller et al. 2013), but the post-burn quality of life never returns to the burn victim's original state for adult victims (Miller et al. 2013).

Table 8 Quality of life losses

Average quality of life loss over the 2-year follow-up period

Total body surface area (TBSA) burnt	% of injured cohort in each TBSA group	Annual quality of life lost during the 2 years post-burn	Annual quality of life lost after the 2 years post-burn
<25% TBSA burned	96.74%	1.068	0.064
25–50% TBSA burned	3.54%	1.572	0.098
>50% TBSA burned	1.06%	1.884	0.104

Source: Miller et al. 2013

Avoiding these costs stacks up quickly assuming all injuries are burn injuries and that fire retardants prevent foam furniture fires from harming people (see discussion on fire retardant effectiveness in *2. The current situation*).

A regulation avoids $24m worth of property damage over 10 years

If fire-retardant treatments stop all fires that begin on foam furniture (see *Appendix B*), the product safety regulation could avoid $24m of property damage over the next 10 years. Given ongoing uptake, the regulation can help avoid $57m of property damage within the next 20 years.

About 35% of fires burn down the whole house or apartment requiring demolition and a full rebuild (see *Appendix E*).

The remaining 65% of dwellings need between $15,000 and $20,000 of cleaning up and smoke decontamination.[2] Clean-up costs are higher if asbestos is involved – the case for about half of dwellings (see *Appendix F*).

About 51% of fires burn out part of the house, requiring some structural rebuilding equivalent to alterations and additions costs.

Replacing contents costs about $90,000 per standard dwelling (Consumer NZ n.d.).

Costs for temporary accommodation during a rebuild or from lost rental income are relatively small, with most replacement taking between 14 and 18 months since the day of the fire.

Enforcement costs are almost the same for both options

Complexities in enforcing the PSPS mean that enforcement costs will be similar to the regulation, despite fewer firms adopting the standard. The PSPS allows several ways for furniture providers to claim fire retardancy. This means that the Commerce Commission will need to inspect and test furniture under several guidelines, boosting its overall workload.

However, we anticipate only half as many regulation breaches, with large firms more equipped to ensure that their products meet the standard.

Fire fatalities (and the benefits of avoiding them) are few and far between

On average, about 15 people die each year in residential dwelling fires. Of fire deaths, 7.3% result from house fires beginning on foam furniture (see *Appendix A*). This means preventing all foam furniture-based fires can reduce about one death per year at a value of $4.34m (Ministry of Transport 2019).

However, the slow turnover of furniture significantly reduces the chance that this regulation will reduce fire fatalities (see *4.4 Turnover*). In our central scenario, this regulation may not even save one additional life within the first 10 years.

Fewer fires mean fewer call-outs

We assume that increased fire retardancy eliminates house fires from foam furniture and thus the likely costs of attending a full-blown house fire. Costs of attending a house

[2] Data provided in confidence

fire range from $5,000 to over $7,000 per event (Fire and Emergency New Zealand 2019a). Foam furniture is the first ignited material in 191 of these house fires each year (see *Appendix B*). However, the furniture stock isn't going to turn over quickly, meaning that this avoided cost only makes up 0.2% of total benefits in the first decade.

Environmental hazards are the same but proportionately fewer under a PSPS

Almost all fire-retardant additives are environmentally toxic meaning that, even under a PSPS, these toxins will be released into the environment (US EPA 2015). The only thing that reduces environmental costs under a PSPS is the number of furniture items that have fire retardants in them. We've estimated this at about 60% of new furniture (see *4.1 The counterfactual*).

Development costs already sunk for a PSPS

We have only counted the avoided costs of implementing and reviewing the PSPS (see *4.1 The counterfactual*). MBIE has already developed a PSPS. As this CBA is forward looking, we haven't counted the expense of putting together the PSPS as MBIE cannot recover these costs. More importantly, the costs are the same with or without any new regulations.

Health risks are low under a PSPS

Because firms have the option to choose not to introduce fire retardants into their products, we assumed that those that do adopt the PSPS will choose lower health risk options.

We also assume that firms will choose to adopt the California standards, which are designed so that producers don't have to use large amounts of potentially harmful fire retardants to achieve appropriate fire retardancy.

4.4. Turnover

We used a market penetration rate for new furniture of 4.3% per year, which means that 50% of the furniture stock will be replaced within the first 16 years of the product safety regulation (see Figure 3).

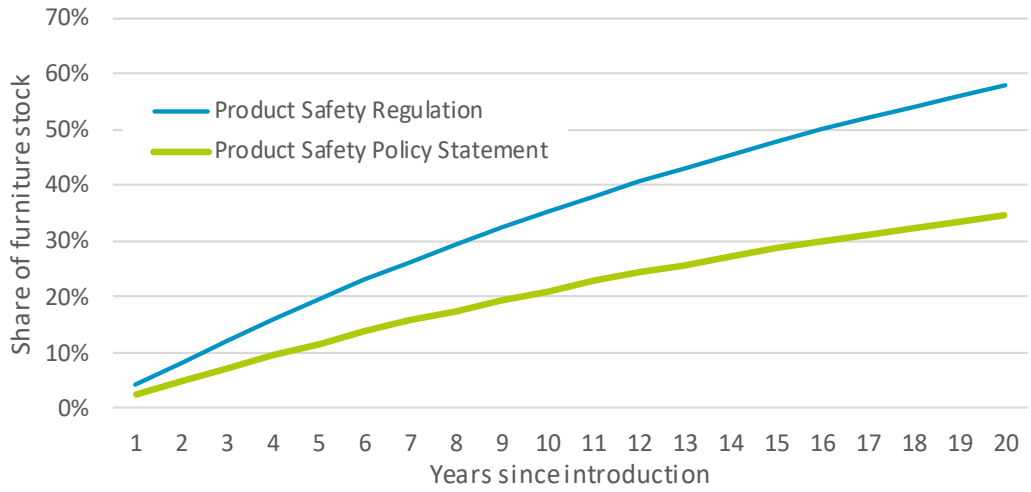
The 2003 CBA on regulating fire safety performance of upholstered furniture used a turnover rate of 6%, plus or minus 2%, based on data from the Household Economic Survey at the time (Wade et al. 2003). This put the timeline for half the stock to turnover between 9 and 17 years.

Using 2016 Household Economic Survey data we found that furniture turnover rates are likely to be lower than 6%. As a result, we assumed a 16-year timeline for half of the stock to turnover, which is both lower than the 2003 CBA's central scenario and still within the 9 to 17-year ballpark range for half of all furniture stock to turnover.

Given a turnover rate of 4.3%, Figure 3 illustrates fire-retardant furniture as a share of stock under the product safety regulation where all new furniture is fire-retardant, compared to the PSPS where 60% of new furniture is fire retardant.

Figure 3 Fire-retardant furniture as a share of furniture stock

Uptake of fire-retardant furniture under a product safety regulation compared to a PSPS



Source: NZIER

4.5. Results

Based on central 'typical' assumptions, the **quantifiable benefits** of implementing a product safety regulation instead of a PSPS **are less than half the quantifiable costs**. However, with all non-quantifiable components on the cost side, benefit-cost ratios are likely to be lower than what we report in this CBA.

Although we see some improvement in benefits over time, costs still dominate

Over time, quantified benefits improve slightly relative to costs due to reductions in fire injuries and property damage. The benefit-cost ratio over 20 years is slightly higher at 0.47, compared to 0.41 for 10 years. However, even after 20 years, costs still outweigh benefits by 2:1.

Costs to consumers are both the biggest cost and the biggest benefit

As it drives up furniture prices, the regulation's impact on costs to consumers is more than all the benefits combined. Avoided costs to consumers are also the biggest benefit subcomponent because the counterfactual of a PSPS also implies that retail furniture prices will go up.

The sheer magnitude of consumer costs means that other variables make very little difference to our results. We investigate this further in *4.6 Sensitivity analysis*.

Non-quantifiable components add to the cost side

We included several non-quantifiable components in this CBA, but all these factors add to the cost side.

Some of these effects could be quite large. Negative responses from Australia could be quite large and (expensively) damaging to our trans-Tasman trade relationship.

However, we are uncertain about whether, how or to what extent Australia will respond.

In contrast, we are certain that this policy will have distributional effects within New Zealand, limiting benefits for low-income households.

All these costs could or will further reduce the benefit-cost ratio for putting in place a product safety regulation.

Table 9 Costs and benefits

Present values for the first 10 years with a 6% discount rate, 2019 dollars

Cost or benefit component	Present value	% of costs	Comment
Costs			
Quantifiable costs			
Costs to consumers	$674,949,185	84.88%	15–20% product price increase
Industry compliance costs	$115,221,855	14.49%	
Regulation enforcement	$4,438,132	0.56%	
Environmental hazard costs	$375,922	0.05%	
Regulation development, implementation and stewardship	$140,612	0.02%	
Health hazard costs	$46,338	0.01%	Cancer risk only
Landfill disposal costs	$0	0.00%	
Non-quantifiable costs			
Trans-Tasman trade effects			Australian firms could request that the Australian Government intervene in response to a mandatory requirement
Non-cancer health hazard costs			No values available for the cost of non-cancer health risks
Firefighter exposure risks			Suspected but not proven link between current fire retardants and negative health outcomes for firefighters
Distributional effects			Low-income households are the last to receive the benefit of fire-retardant foam furniture
Total costs	**$795,172,045**		
Benefits (costs avoided)			
Quantifiable benefits			
Costs avoided from not having a PSPS			
Costs to consumers	$231,411,149	71.03%	10% product price increase
Industry compliance costs	$32,408,627	9.95%	Only large firms

Cost or benefit component	Present value	% of costs	Comment
Regulation enforcement	$2,955,075	0.91%	Forward-looking, does not include sunk costs
Environmental hazard costs	$224,491	0.07%	
Regulation implementation and stewardship	$61,424	0.02%	Minimal as almost in place
Health hazard costs	$0	0.00%	Cancer risk only
Landfill disposal costs	$0	0.00%	
Subtotal PSPS cost rise avoided	*$267,060,766*	*81.97%*	
Costs avoided from having a fire retardancy regulation			
Fire injuries	$31,232,199	9.59%	
Property damage	$24,084,339	7.39%	
Fire fatalities	$2,743,105	0.84%	
Fire emergency response team and equipment	$686,042	0.21%	
Subtotal fire damage costs avoided	*$58,745,686*	*18.03%*	
Non-quantifiable benefits			
None			No non-quantifiable benefits
Total benefits (costs avoided)	**$325,806,451**		
Summary results			
Benefit-cost ratio = 0.41			

Source: NZIER

Costs always outweigh safety benefits

Safety benefits still don't measure up against other costs or benefits, suggesting that either regulatory option incurs more costs than it provides benefits. Safety benefits are benefits from avoiding fires such as reduced property damage, injury and death.

Undertaking a PSPS alone is better value for money in the long term, but still doesn't result in a benefit payoff that exceeds costs. Implementing a PSPS costs $267m and will provide $87m worth of safety benefits in the first 10 years.

At the same time, implementing a product safety regulation costs $795m and will only yield $146m of benefits in the first 10 years.

In time, safety benefits improve relative to costs for both options, but both do not break even.

Table 10 Counting safety benefits only

Present values with a 6% discount rate, 2019 dollars

	10 years	20 years
Product safety regulation		
Total costs of the regulation	$795,172,045	$1,207,649,586
Full safety benefits from the regulation	$145,833,831	$376,793,698
Safety benefits to costs ratio	0.18	0.31
PSPS		
Total costs of the PSPS	$267,060,766	$409,711,802
Full safety benefits from the PSPS	$87,088,146	$225,011,331
Safety benefits to costs ratio	0.33	0.55

Source: NZIER

4.6. Sensitivity analysis

We tested for five sensitivity scenarios, but costs exceeded benefits in all scenarios.

Scenario 1: Different discount rates

Varying discounts show us whether benefits and costs respond to the passing of time. To test this, we altered our discount rates by 2 percentage points up and down.

Virtually no changes in the benefit-cost ratios for the different discount rates shows that the spread of costs and benefits are similar to one another over time.

Table 11 Scenario 1: Different discount rates

Present values with different discount rates, 2019 dollars

		Low 4% discount rate	Central 8% discount rate	High 8% discount rate
10 years	Total costs	$871,514,943	$795,172,045	$728,971,935
	Total benefits (costs avoided)	$360,015,895	$325,806,451	$296,289,920
	Benefit-cost ratio (=benefits/costs)	**0.41**	**0.41**	**0.41**
20 years	Total costs	$1,421,468,253	$1,207,649,586	$1,040,898,442
	Total benefits (costs avoided)	$675,408,311	$561,494,170	$473,888,637
	Benefit-cost ratio (=benefits/costs)	**0.48**	**0.46**	**0.46**

Source: NZIER

Scenario 2: Costs to consumer from the regulation are +/- 25%

We used stakeholder responses, checked against the 2003 CBA by Wade et. al to determine our consumer price increases.

We only had two points of reference for the potential increase in costs to consumers:

- One respondent specifically identified that their product prices would increase by 15–20% if New Zealand adopted the UK regulations (Ministry of Business, Innovation and Employment 2018b).
- Another respondent noted that their prices would increase by 10–20% "depending on the regulation adopted" (Ministry of Business, Innovation and Employment 2018b, 13).

Many respondents also noted that the UK regulations are more difficult to meet than the California standards (Ministry of Business, Innovation and Employment 2018b).

Although the 2003 CBA price increases were a similar range, 9% to 20%, these price estimates also relied on stakeholder responses.

Stakeholder responses could have an upward bias, as higher prices will make any regulatory option less attractive and potentially less likely that regulators will introduce it.

As a result, we are testing our results for sensitivity to a 25% change in consumer costs.

Our CBA is sensitive to consumer cost changes, but even a 25% drop in consumer costs does not push total costs lower than benefits.

Table 12 Scenario 2: Varied consumer costs

Present values over 10 years with a 6% discount rate, 2019 dollars

	Low Consumer costs are 25% lower	Central	High Consumer costs are 25% higher
Total costs	$626,434,749	$795,172,045	$963,909,341
Total benefits (costs avoided)	$325,806,451	$325,806,451	$325,806,451
Benefit-cost ratio (=benefits/costs)	**0.52**	**0.41**	**0.34**

Source: NZIER

Scenario 3: Fewer or more firms adopt the PSPS

As our counterfactual, any success of the PSPS offsets any success of the product safety regulation. In this scenario, we changed the market share of PSPS-adopting firms from 60% to 45% and 75% for low and high scenarios, respectively.

Table 13 Scenario 3: Fewer or more firms adopt the PSPS

Present values over 10 years with a 6% discount rate, 2019 dollars

	Low 45% of firms adopt PSPS	Central 60% of firms adopt PSPS	High 75% of firms adopt PSPS
Total costs	$795,172,045	$795,172,045	$795,172,045
PSPS costs avoided	*$201,050,496*	*$267,060,766*	*$333,073,160*
Fire damage costs avoided	*$80,208,607*	*$58,745,686*	*$36,458,458*
Total benefits (costs avoided)	$281,259,103	$325,806,451	$369,531,618
Benefit-cost ratio (=benefits/costs)	**0.35**	**0.41**	**0.46**

Source: NZIER

When fewer firms adopt the PSPS, the regulation is relatively more effective at avoiding costs associated with fire damage such as property damage, injury and death. However, as consumer costs of the PSPS are the biggest benefit, any reduction in firms taking up the PSPS subtracts more from the total benefit. This shows that the costs of implementing both the regulation and the PSPS outweigh their respective safety benefits of lives saved as well as injuries and property damage avoided.

Scenario 4: Health hazard impacts are +/- 25%

We did not include non-cancer health impacts in our calculation of the health costs for this CBA. Sensitivity testing health costs can show whether an overestimate or underestimate of health impacts affects our results.

Because health costs make up 0.01% of total costs, any variation will make very little difference to the final outcome.

Table 14 Scenario 4: Varied health costs

Present values over 10 years with a 6% discount rate, 2019 dollars

	Low Health costs are 25% lower	Central	High Health costs are 25% higher
Health hazard costs	*$34,754*	*$46,338*	*$57,923*
Total costs	$795,160,461	$795,172,045	$795,183,630
Total benefits (costs avoided)	$325,806,451	$325,806,451	$325,806,451
Benefit-cost ratio (=benefits/costs)	**0.41**	**0.41**	**0.41**

Source: NZIER

Scenario 5: Environmental hazard impacts are +/- 25%

As with health costs, the cost of environmental impacts is small relative to the total and variations make very little difference to results.

We estimated the environmental impact of disposing of fire-retardant furniture by assuming that this furniture would be as hazardous as asbestos. This is an extreme assumption. Varying our cost measure for environmental hazard impacts can show whether our assumptions around this cost measure significantly affect our CBA results. However, we know this effect is small.

Table 15 Scenario 5: Varied environmental costs

Present values over 10 years with a 6% discount rate, 2019 dollars

	Low Environmental costs are 25% lower	Central	High Environmental costs are 25% higher
Environmental hazard costs	*$281,941*	*$375,922*	*$469,902*
Total costs	$795,078,065	$795,172,045	$795,266,026
Environmental hazard costs avoided	*$168,368*	*$224,491*	*$280,613*
Total benefits (costs avoided)	$325,750,329	$325,806,451	$325,862,574
Benefit-cost ratio (=benefits/costs)	**0.41**	**0.41**	**0.41**

Source: NZIER

5. Qualitative assessment of regulatory options

This CBA compares two different regulatory options. In this section, we use Treasury's best-practice regulation guidelines to qualitatively assess both regulatory options as well as one other: an information and education campaign. The purpose of this assessment is to determine whether any one regulation is more:

- proportional
- flexible
- durable
- certain and predictable
- transparent and accountable
- capable regulators
- growth supporting.

What will an information and education campaign look like?

We have assumed that the information and education (I&E) campaign is a 'light touch' campaign involving press releases around the benefits of fire-retardant furniture. As a result, it is unlikely to be effective as growth in compliant furniture relies on consumer awareness.

This is the campaign that MBIE intends to do. Normally, an I&E strategy needs wide coverage and regular campaigns to be effective such as anti-drink driving campaigns or UV protection (slip, slop, slap) campaigns.

However, large firms already adopt safety practices with light prompting from government or media. We discuss this issue further in our emerging conclusions below.

Scoring the different options

We have determined the very low, low, medium and high scores based on the extent to which an option maximises benefits (reduces harm) and minimises costs within Treasury's principles. We have used our own judgement to score each regulatory option, backed up by available literature and evidence.

5.1. Findings

I&E achieves the same or a lower score than the PSPS, suggesting that I&E is a worse option than the PSPS.

However, neither the PSPS nor the regulation achieve a higher score than the other across all criteria. As a result, we cannot say that one option is better than the other unless we weight each criterion based on its relative importance.

A regulation is harder to put in place. This suggests an opportunity for MBIE to adopt the PSPS first and, if the outcomes are insufficient, ramp up to a regulation.

Table 16 Comparison of regulation options

Qualitative rating of low, medium or high fit with good regulatory principles

Criteria	Product safety regulation	Product Safety Policy Statement (PSPS)	Information and education (I&E)
Proportional Change fits the size of the problem.	**Low** Very high costs with moderate benefit.	**Low** Moderate to high costs with some benefit.	**Low** Low cost but minimal lasting benefit.
Flexible Regulated organisations can adopt least-cost and innovative approaches to meeting legal obligations.	**Low** Regulation is prescriptive. Likely to limit least-cost and innovative approaches.	**High** Provides both the incentive and flexibility for industries to adopt least-cost and innovative approaches.	**Medium** Full flexibility to adopt least-cost approaches but unlikely to encourage change or innovation.
Durable Regulation can adapt when circumstances change.	**Low** Little opportunity to learn about and improve the regulation as new fire-retardant technologies become available.	**High** Increased opportunity to learn about and improve the regulation as new fire-retardant technologies become available.	**Medium** Few barriers to learning about and improving the I&E approach. However, industry and consumers may not respond to changes due to the 'light touch' approach.
Certain and predictable Regulated entities are provided with clear, authoritative and consistent guidance that accounts for their long-term investment decisions.	**High** The regulation, coming from the UK, is certain and predictable in its effect on the regulated industry.	**Low** Guidance is unclear and inconsistent.	**Low** Industry or consumers are unlikely to respond.
Transparent and accountable "Rules development and enforcement should be transparent" and justifiable to the public (The Treasury 2012, 9).	**Medium** Can be justified on the grounds of fire safety, but the public may not agree that potential benefits outweigh potential health and environmental risks.	**Low** Lack of transparency around how compliance is measured.	**Low** May insufficiently protect people – may not be justifiable to the public as an adequate measure to reduce harm.

Criteria	Product safety regulation	Product Safety Policy Statement (PSPS)	Information and education (I&E)
Capable regulators Regulators have the "people and systems to operate an efficient and effective regulatory regime" (The Treasury 2012, 9).	**High** The Commerce Commission can efficiently regulate under the single guideline.	**Low** Multiple measures for compliance complicate systems/personnel requirements and decrease efficiency.	**Very low** Inefficient and ineffective in reducing foam furniture-originating fires.
Growth supporting Decisions made adequately account for economic and non-economic objectives.	**Low** Costs to consumers are very high. Smaller firms face a higher cost for adopting the change, Enforcement ensures a level playing field over imports and industry. May trade off fire retardancy for health and environmental impacts. Implementation should involve discussion with the Ministry of Foreign Affairs and Trade to assess potential impacts on trade arrangements.	**Low** Costs to consumers are high. Large firms 'arm twisted' into accepting fire retardants and associated costs. Enforcement ensures a level playing field over imports and industry. May trade off fire retardancy for health and environmental impacts. Encourages innovation and improvement in price, environmental and health impacts.	**Low** Costs to consumers are low. Smaller firms face a higher cost for adopting the change. May or may not sufficiently protect people due to slow or minimal uptake. Encourages innovation and improvement in price, environmental and health impacts.

Source: NZIER

Furniture turnover constrains the effectiveness of all options (see *4.4 Turnover*).

5.2. Analysis details

Proportional

Definition: The size of the change is proportionate to the size of the problem. The problem size is lives lost, injuries and property damage resulting from residential fires, which is accelerated by foam furniture igniting. We measure the size of the change in terms of the costs each regulatory option incurs.

Note: The benefits of all regulation options are limited by the slow turnover of furniture in the New Zealand market. Fires are also more common in rentals and social housing, and households who rent may be less likely to purchase new furniture and receive the fire prevention benefits. As a result, we have not given a high grade to any option as none of the options fully address the size of the problem.

Results

Costs for the product safety regulation and the PSPS include:

- regulation development and implementation
- regulation enforcement
- industry implementation and support costs
- price increases for consumers due to restrictions on their purchasing options
- health and environmental impacts.

As outlined in our quantitative analysis, costs are high for both the PSPS and the product safety regulation and outweigh benefits by more than two to one.

In contrast, the I&E assumed in this analysis will have low cost but is expected to have minimal lasting benefit.

Flexible

Definition: The regulatory option has built-in scope for organisations to "adopt least cost and innovative approaches to meeting legal obligations" (The Treasury 2014, 3).

Results

Product safety regulations are prescriptive and realistically only allow one method of achieving fire retardancy – including additives in the furniture foam itself. More flexible regulation would enable the industry to adapt faster to new health, environmental or price information.

As a strong signal of what the government requires, a PSPS incentivises the industry to find least-cost and innovative options for ensuring fire safety, health and environmental standards are met.

I&E allows the industry to adopt least-cost approaches but may not encourage much innovation for industries to increase fire retardancy.

Durable

Definition: The ability to learn about and improve regulation, meaning that regulation can adapt and evolve when circumstances change.

Results

A PSPS is very durable for three reasons:

- MBIE can alter the PSPS relatively easily to provide more up-to-date guidance on preferred fire retardancy options, such as more environmentally safe additives.
- The loose definition of compliant fire retardancy means that firms can adopt better fire retardancy capability as it becomes available.
- Industry can revert to providing non-fire-retardant furniture if current fire-retardant treatments are unsuitable. For example, recent research links chlorinated phosphates – a common fire retardant – to several negative health impacts (US EPA 2015).

The regulation has limited adaptability when circumstances change. The UK and US experiences illustrate that mandating fire-resistant furniture locked their industry in to using carcinogenic materials – first BDEs, then chlorinated phosphates (House of Commons Environmental Audit Committee 2019). Both countries currently face the problem of rotating health-hazardous furniture out of the nation's stock, with many calls to ban fire retardants outright.

MBIE faces few barriers to learning about and improving their I&E approaches to enhance public safety and welfare or reduce costs. However, irregular I&E might mean that MBIE will not be aware of new information and education to distribute. Furthermore, industry and customers may or may not respond to any changes due to the 'light touch' approach.

If I&E involved regular and wide-reaching campaigns, MBIE would have regular opportunities to make its campaigns more effective.

Certain and predictable

Definition: Regulated entities are provided with clear, authoritative and consistent advice. This advice should take firms' long-term investment decisions into account.

Results

The regulation will be very close to the UK's Furniture and Furnishings (Fire) (Safety) Regulations 1988. As a tried and tested regulation, its requirements are very clear and authoritative. Industry can also look at outcomes in the UK to see how the regulations might affect them if implemented in New Zealand.

Through consultation, regulated entities identified key areas where the PSPS needed to be:

- clearer and acknowledge long-term investment decisions (i.e. type of fire retardancy measure required)
- more authoritative (i.e. display an understanding of the environmental and health impacts of fire-retardant materials)
- more consistent (i.e. about which furniture articles are included).

Although MBIE can address these problems, the PSPS by nature will remain ambiguous about how MBIE will define adequate fire retardancy long term.

I&E is unlikely to drive enough changes in consumer behaviour to encourage the industry to increase fire retardancy in furniture. I&E will also be inconsistent over time as it adapts to new information.

Transparent and accountable

Definition: "Rules development and enforcement should be transparent" and justifiable to the public (The Treasury 2012, 9).

Results

MBIE will need to engage the public to ensure that its reasons for implementing this regulation – reducing fires – are transparent. However, these regulations may not reduce house fires and may also introduce additional health hazards into the home or toxins into the environment. To the public, the regulation's potential benefits may justify the potential risks.

MBIE has already consulted with the industry about its development of the PSPS. However, the PSPS is not transparent about how MBIE will measure compliance or what the consequences might be for non-compliance.

'Light touch' I&E may be hard to justify to the public as enough of an effort to reduce foam furniture-accelerated fires. However, widespread and regular I&E campaigns can be transparent and accountable assuming:

- consultation with industry and the public
- labelling, standardised labelling criteria and full enforcement of labelling.

Capable regulators

Definition: Regulators have the "people and systems to operate an efficient and effective regulatory regime" (The Treasury 2012, 9).

Results

We have sufficient testing capability in New Zealand to support enforcing all regulatory options. However, the Commerce Commission will need additional capacity to enforce the regulation or the PSPS.

With only one guideline for fire retardancy, the Commerce Commission can regulate under a product safety regulation more efficiently.

In contrast, the PSPS constrains the efficiency of the system. Under this PSPS, the regulator has several different guidelines to measure compliance against (see *4.1 The counterfactual*).

Slow uptake means that I&E risks being ineffective or inefficient in reducing foam furniture-originating fires.

Growth supporting

Definition: Justified trade-offs between economic and non-economic objectives. Economic objectives include trade and investment liberalisation, impact on exports and imports and industry competition. Non-economic objectives include wellbeing, health and environmental factors.

Results

The costs to consumers of the regulation and the PSPS are very high as all new furniture will be more expensive to purchase. Our quantitative analysis shows that, in both cases, these costs outweigh the non-economic safety benefits (see *4.5 Results*). However, I&E may not be effective enough to protect people from foam furniture-related fires – providing no safety benefits.

The regulation burdens smaller firms more than large firms. Larger firms already have people, processes and systems in place for changing their furniture supply requirements. Small firms do not.

However, the PSPS effectively 'arm twists' large firms to convert to fire-retardant furniture (see *4.1 The counterfactual*).

All labelling must be enforced to ensure safety and avoid damaging the local industry. Local manufacturers already face concerns about overseas imports falsely claiming fire retardancy.[3]

In addition, the regulation may trade-off fire retardancy for environmental and health costs. In contrast, the PSPS and I&E allow the industry to find fire-retardant chemicals that are lower cost and environmentally friendly and pose no health risk.

Although neither option breaches the Trans-Tasman Mutual Recognition Agreement, the regulation does drive up costs for Australian firms operating in New Zealand. Regulating for fire retardants may also oppose the Australian Government's views on fire retardants (see *4.2.2 Non-quantifiable costs*).

As a result, we recommend discussing this product safety regulation with the Ministry of Foreign Affairs and Trade and Australian counterparts to establish a common understanding before considering implementation.

5.3. Summary

A staged regulatory process gives you options.

Under a PSPS, furniture manufacturers, retailers and importers have a strong incentive to sell fire-retardant furniture. However, a PSPS may also fail to introduce enough fire-retardant furniture into New Zealand stock.

A product safety regulation is clearer for industry and will introduce fire-retardant furniture into the New Zealand stock as quickly as turnover allows.

If a PSPS doesn't work quickly enough, a regulation is a way to speed up the benefit outcomes. However, the regulation is more expensive (less proportional) and more restrictive (less flexible or durable) and could be avoided if the PSPS is put in place first.

[3] Data provided in confidence.

6. Conclusions

These results show that the costs of implementing a product safety regulation instead of a PSPS are more than double the benefits. However, our analysis also suggests that both options will incur more costs than benefits due to the high consumer costs component.

The principal parts of our quantified and non-quantified analysis are as follows:

- Regulating for fire retardants in furniture may reduce fires and save millions of dollars in avoided property damage, loss of life and injury. However:
  - robust data on the effectiveness of fire retardants is minimal
  - this does not account for the distributional effects of low-income households buying fire-retardant furniture later, due to price barriers, and being most at risk of house fires.
- The potential benefits of reducing fires through regulating for fire-retardant furniture is smaller than the cost of either regulatory option, but a regulation has a lower safety benefit to cost ratio than a PSPS, which achieves the same proportion of benefit per person at a lower per-person cost.
- The biggest cost driver is the increase in furniture costs for consumers as fire retardants are an additional expense.
- The second-largest cost component is the additional cost burden on the foam furniture industry to provide fire-retardant furniture (through sourcing supply and training staff).
- Costs to consumers and industry are also the biggest benefits as avoided costs of a PSPS.
- Regulating for fire retardants will impose health and environmental costs due to the toxicity of fire retardants, but these costs are small relative to consumer and industry costs.

Although neither option's benefits outweigh their associated costs, our qualitative analysis supports the idea that a PSPS may be a better first step in regulating for fire-retardant foam furniture. A PSPS may achieve enough fire safety and may be worth trialling before considering the more expensive and restrictive product safety regulation.

Key limitations to our analysis rest on available data, particularly for indicators driving our large cost components. We drew our estimate of potential furniture price increases from industry responses to a review of a PSPS. We also assumed that, on the benefits side, fire retardants would prevent 100% of all fires beginning on foam furniture.

However, the purpose of these figures is to show the relative difference between costs and benefits associated with regulating for fire retardants in furniture. These figures are an order of magnitude calculation rather than a definitive measure, and the analysis can use improved information if it becomes available.

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Appendix A Residential New Zealand fire statistics

We used data from a report by Robins and Wade (2010) to determine the role of foam furniture and mattresses in residential fires in New Zealand.

Robins and Wade do not list polyurethane (such as in furnishings, upholstery and mattresses) as one of the main first materials involved in igniting residential fires (see Table 17 and Table 18). However, Robins and Wade do rank polyurethane as a first ignited item common in fires resulting in injuries or fatalities (see Table 18 and Table 19). Polyurethane is the first ignited item in 4.8% of fires causing injury and 7.3% of fatalities (Robins and Wade 2010).

Table 17 First material involved in igniting residential fires

Ranked by more common first material involved in ignition by percentage of total fires (1986–2005)

First material involved in ignition	All residential fires
Wood: sawn, finished timber	12.6%
Fat, grease, butter	10.2%
PVC, e.g. floor tiles, guttering/pipes, plastic bags, electrical insulation	9.0%
Food, starch (not fat and grease)	8.0%
Fabric, fibre (finished)	7.6%
Combustible liquid, e.g. linseed, lubricant, cooking oil	6.0%
Information not recorded	5.8%
Cotton, canvas, rayon (not oiled canvas)	4.3%
Multiple materials first ignited	3.3%
Unknown	3.2%

Source: Robins and Wade 2010, 286, Table 50

Table 18 First ignited material in residential fires causing injury

Ranked by more common first material involved in ignition by percentage of total fires

First material involved in ignition	Fires resulting in injury
Fabric, fibre (finished)	14.2%
Fat, grease, butter	13.9%
Combustible liquid, e.g. linseed, lubricant, cooking oil	13.3%
Food, starch (not fat and grease)	7.0%
PVC, e.g. floor tiles, guttering/pipes, plastic bags, electrical insulation	5.9%
Cotton, canvas, rayon (not oiled canvas)	5.5%
Polyurethane, e.g. furnishings, upholstery, mattresses	4.8%

First material involved in ignition	Fires resulting in injury
Wood: sawn, finished timber	4.0%
Unknown	4.0%
Petrol	2.5%

Source: Robins and Wade 2010, 286, Table 54

Table 19 First ignited material in residential fires causing death

Ranked by more common first material involved in ignition by percentage of total fires (1995–2005)

First material involved in ignition	Fires resulting in death
Fabric, fibre (finished)	16.2%
Unknown	15.4%
Wood: sawn, finished timber	8.1%
Polyurethane, e.g. furnishings, upholstery, mattresses	7.3%
Combustible liquid, e.g. linseed, lubricant, cooking oil	6.8%
Multiple materials first ignited	5.6%
Petrol	5.1%
Food, starch (not fat and grease)	4.7%
Cotton, canvas, rayon (not oiled canvas)	3.8%
PVC, e.g. floor tiles, guttering/pipes, plastic bags, electrical insulation	3.8%

Source: Robins and Wade 2010, 286, Table 52

Appendix B Number of house fires caused by foam furniture

We estimate that 152–231 house fires per year are caused by ignited polyurethane foam (mattresses, sofas, etc.). This is likely to be an overestimate as we have used the percentage of fires from foam that caused injury and death to estimate the share of house fires in total that begin from ignited foam furniture.

Data from Fire and Emergency New Zealand shows that New Zealand has an average of 3,161 house fires per year (Fire and Emergency New Zealand 2019b). Data from Robins and Wade shows that between 4.8% and 7.3% of house fires that cause death or injury, respectively, begin on polyurethane such as furnishings, upholstery or mattresses (see *0*). Using both these statistics, we calculated that foam furniture causes about 191 residential dwelling fires.

We focus on first ignition because we found little proof that fire retardants slow the spread of fires which begin on other materials in the house, such as nearby curtains. A United States researcher claims that fabric used to cover foam furniture fuels flames to a point where the foam will ignite (Blum 2019). UK evidence supports this assertion, where 'comfort layers' used in UK furniture make the fabric more vulnerable to ignition in the actual furniture than in the test (McKenna et al. 2017). McKenna et al. also show that fire retardants, once burning, create more toxic smoke, a chief cause of fire deaths (Lilley, McNoe and Duncanson 2018).

Table 20 House fires

Total residential fires recorded in New Zealand

June years	Number of fires in houses, flats and apartments
2013/14	3,205
2014/15	3,279
2015/16	3,191
2016/17	3,162
2017/18	3,089
2018/19	3,037
Average	**3,160.5**

Source: Fire and Emergency New Zealand 2019b

Appendix C Size of the foam furniture market

Indicative data from Statistics New Zealand shows that the New Zealand furniture market was worth about $953m during the year to March 2019 (Statistics New Zealand 2019a).

Using furniture import data, we estimated that foam furniture made up between 40% and 70% of the furniture market (Statistics New Zealand 2019b). For the central scenario in this CBA, we took the midpoint of this range (55%) to estimate the size of the foam furniture market as $524m per annum.

Appendix D Large and small firms

We used three ANZSIC06 codes to define the New Zealand furniture industry:

- C251100 – Wooden Furniture and Upholstered Seat Manufacturing
- C251200 – Metal Furniture Manufacturing
- C251300 – Mattress Manufacturing
- C251900 – Other Furniture Manufacturing
- F373100 – Furniture and Floor Covering Wholesaling
- G421100 – Furniture Retailing

Assumptions:

- Only half of the furniture manufacturing industry (C251100, C251200, C251300, C251900) produces foam furniture.
- Large firms have six employees or more.

Geographic units represent the number of individual firms, meaning that, for example, Harvey Norman receives a count for every one of its locations.

Table 21 Number and size of furniture firms

Number of geographic units (business locations)

Firm size	Number of firms
Small retail and wholesale firms	2,037
Large retail and wholesale firms	441
Small furniture manufacturers	1,161
Large furniture manufacturers	300
Total firms	**3,939**

Source: Statistics New Zealand 2018

Appendix E Extent of fire and smoke damage 2007–2014

Lilley, McNoe and Duncanson (2018) recorded fire damage statistics for 107 fire incidents during 2007–2014.

Table 22 Fire spread characteristics

For fires during 2007–2014 that caused fatalities, n=107

Fire spread characteristics	Percentage share of dwelling fires	Pro-rate no information and other
Extent of fire damage		
Object	8%	8.4%
Part of room of origin	5%	5.3%
Entire room of origin	7%	7.4%
+ minor damage to others	17%	17.9%
+ major damage to others	25%	26.3%
Entire dwelling	28%	29.5%
Entire compartment	5%	5.3%
Other	3%	
No information	2%	
Extent of smoke damage		
Object	5%	5.3%
Entire room of origin	3%	3.2%
+ minor damage to others	8%	8.5%
Entire dwelling	71%	75.5%
Entire compartment	7%	7.4%
Other	5%	
No information	1%	

Source: Lilley, McNoe and Duncanson 2018, 53

Appendix F Asbestos in house fires

Information from the Ministry of Health (2017) indicates that buildings built or renovated between 1940 and 1990 are likely to have asbestos materials in them. Based on the representation of buildings within this age group in house fires (see Table 23), we estimate that about 50% of dwellings have asbestos and therefore incur additional clean-up costs post house fire.

Table 23 Dwelling age characteristics

For fires during 2007–2014 that caused fatalities, n=107

Building age	Percentage share of dwelling fires	Pro-rate no information
2014–1990	7%	15.6%
1989–1970	13%	28.9%
1969–1950	11%	24.4%
1949–1930	5%	11.1%
Pre 1930s	9%	20.0%
No information	55%	

Source: Lilley, McNoe and Duncanson 2018, 54