



Photo: David Bruce, Bushfire and Natural Hazards CRC

POLICY BRIEF

AUGUST 2020

Disasters and economic resilience: the effects of the Black Saturday bushfires on individual income

A case study

Prof Mehmet Ulubasoglu
Bushfire and Natural Hazards CRC and Deakin University.



bushfire&natural
HAZARDSCRC



About this research

This research began in 2013 and was conducted as part of the *Optimising post-disaster recovery interventions in Australia* project. The project investigated how recent natural hazards have impacted and rippled through communities and the broader economy over time, through case studies of the 2009 Black Saturday bushfires, 2009 Toodyay bushfire, 2010-11 Queensland floods and 2013's Tropical Cyclone *Oswald*. The research findings will help policymakers better understand the socio-economics of natural hazards and formulate public policies in a way that better distributes budgets and resources towards vulnerable socio-economic groups and sectors of employment.

Background

The 2009 Victorian Black Saturday bushfires were some of the worst bushfire conditions ever recorded globally; equivalent in energy to 1,500 Hiroshima-style atomic bombs (SMH, 2009). One hundred and seventy-three people died and over 2,100 houses and 3,500 structures were destroyed, with thousands more suffering damage (Parliament of Victoria, 2010). The total area burnt was around 400,000 hectares (CFA, 2009). The total economic loss is estimated to be \$3.1 billion in tangible damages and \$3.9 billion in intangible costs (Deloitte Access Economics, 2016).

Aims and objectives

Disasters and economic resilience: the effects of the Black Saturday bushfires on individual income (Ulubasoglu 2020) estimates the impact of the Black Saturday bushfires on individuals' income in different sections of the workforce. In particular, it traces the impact of the bushfires on the income trajectory of individuals that were in the labour force at the time and were residents of the disaster-hit Statistical Area-2s (SA2s)¹.

¹ There are 2,310 SA2 regions covering the whole of Australia without gaps or overlaps, of which 433 are in Victoria. Their populations range between 3,000 and 25,000, with an average of about 10,000 persons. Their purpose is to represent a community that interacts together socially and economically.

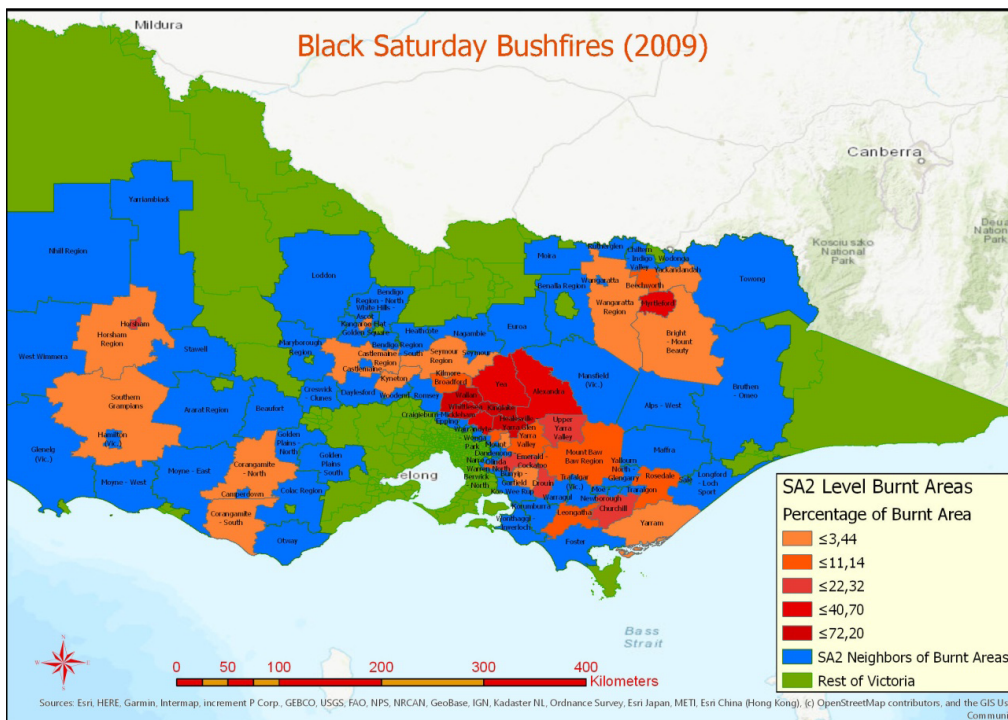


Figure 1: Burnt SA2s during the 2009 Black Saturday bushfires, with the percentage share of burnt areas in total SA2 surface area depicted in red/orange colour. Blue represents neighbouring SA2s that border the burnt SA2s. Rest of Victoria in green colour.

This study is the first in the economics literature to examine the impact of a bushfire on individual income. It also considers demographic and sectoral heterogeneities at fine geographic units (i.e., SA2s). The key highlight of this study is that it is an analysis of a catastrophic disaster that ravaged different pockets of regional Victoria (see Figure 1, page one).

Methodology

This research used a statistical technique called difference-in-differences (DID) modelling. The model mimics experimental research design by comparing the effect of a treatment (i.e. a disaster) on a 'treatment group' relative to a 'control group'. That is, it compares the effect of this treatment on an outcome (individual income) by comparing the changes in income in the treatment group (that are reported to be in the labour force in 2006) before and after the disaster, relative to the changes in the control group. The latter provides the expected income trajectory had the bushfires not occurred, enabling any income deviations (losses or gains) in the bushfire-hit areas to be calculated. The treatment group comprised of individuals living in the disaster hit SA2s, while those in neighbouring SA2s that were not directly impacted by the bushfires were the control group (see Figure 1, page one).

The research team utilised data from the Australian Census Longitudinal Dataset (ACL) of the Australian Bureau of Statistics (2016), which provides a unique opportunity to robustly examine the bushfires' impacts across a long timeframe (from 2006 to 2011 and 2016) and across multiple dimensions (demographic and economic). All results reported in this brief are net results, after disaster relief and recovery efforts. Short-term results are defined as changes over 2006–11, and medium-term results as changes over 2006–16.

The framework developed captures income effects followed by the bushfires. Data limitations impede the ability to confirm some of the assumptions of the modelling approach, but a number of steps have been taken to alleviate the likely impact of these limitations on the reliability of the findings.

Key findings

In the bushfire-affected areas:

- A significant decline in individuals' overall income in the short-term was detected
- The short-term income losses are concentrated in certain disaster-sensitive sectors, such as agriculture and accommodation and food services (of which tourism is part)
- There are flow-on effects from sectors onto certain demographic groups, such as female residents and low-income earners, who are heavily represented in these two sectors
- Both low-income earners and the female workforce exhibit weak economic resilience to disasters in that they are not fully able return back to their pre-disaster income trajectories in the medium-term
- While the key vulnerable groups identified in this study (e.g. low-income individuals and female residents) are similar to those that identified in this project's other case studies (2009 Toodyay bushfire, 2010-11 Queensland floods and 2013's Tropical Cyclone *Oswald*), there is also evidence that a disaster on the scale of the Black Saturday bushfires inflicts heavy losses on every part of a regional community. Notably, even high-income earners do not escape income losses in the short-term.

Additional findings

Overall findings

- Geo-referencing of the Black Saturday bushfire map and the SA2 boundaries reveals that the share of burnt area in the total SA2 surface area among the 37 SA2s impacted by the bushfires is between 0.1 per cent and 72.2 per cent, with the mean share in the estimation sample being 12.5 per cent (see Figure 1, page one).
- In this mean group of SA2s, bushfires were associated with losses in average annual individual income of 5.1 per cent, which corresponds to about \$2,000 per person.
- Every additional ten percentage point increase in the share of burnt area in an SA2 (e.g. an increase from 12.5 per cent to 22.5 per cent) is associated with additional reduction in the average annual individual income of 5.5 per cent.

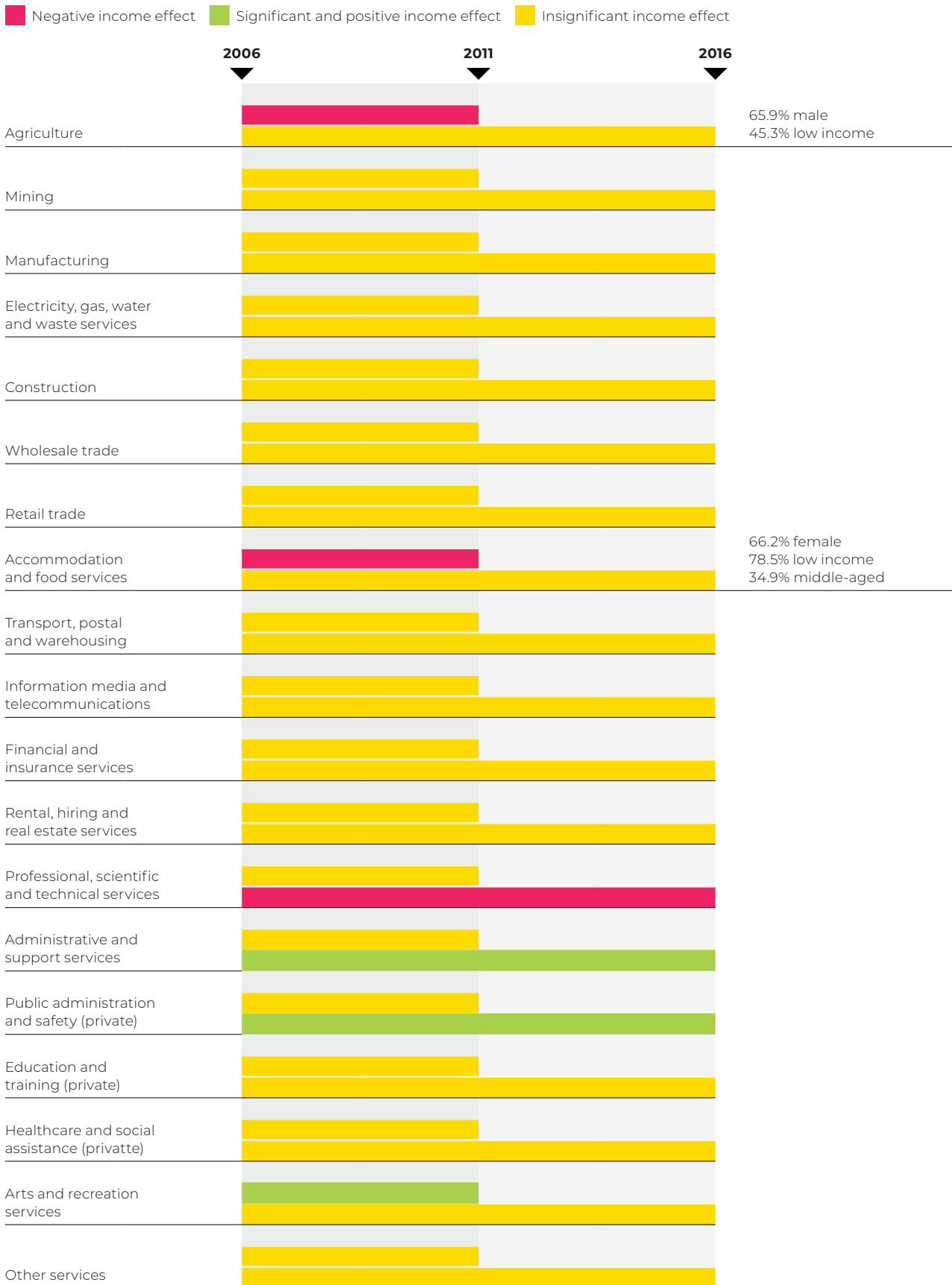
Sector findings

- The heaviest income losses in the short-term are estimated for individuals employed in two key sectors: the agriculture sector (23.4 per cent, \$8,057) and accommodation and food services (16 per cent, \$4,600).

Demographic findings

- There are flow-on effects from the Black Saturday bushfires to certain demographic groups. Annual income losses for low-income earners are estimated to be 8.6 per cent (\$2,240) and for the female workforce to be 9.7 per cent (\$2,961). Some of these differences are explained by the concentration of employment of these groups in those vulnerable sectors.
- There is also evidence that the losses of the low-income earners might have persisted in the medium-term, as continued reduction in their incomes was observed, even in 2016. The evidence for the medium-term adverse effects for the female workforce is much stronger (see Figure 2, page three).

Figure 2: How the Black Saturday bushfires affected income in different sectors and demographics



Policy implications

General implications

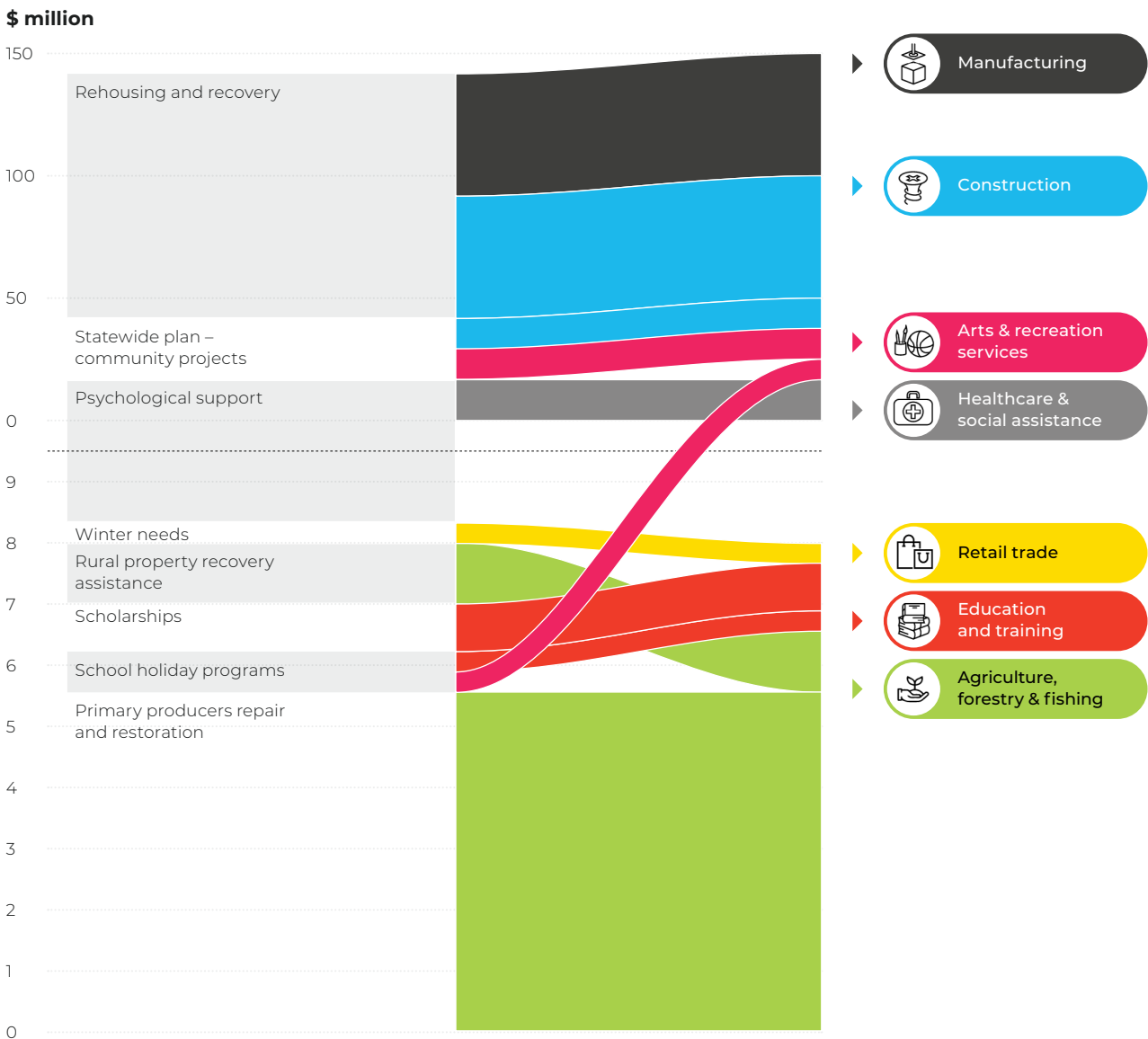
- There is a need to look beyond aggregate impacts to understand socio-economic vulnerability to natural hazards.
- Socio-economic vulnerabilities are concentrated in certain demographic groups and sectors of the economy.
- The acute individual-level losses for agriculture and accommodation and food services (of which tourism is part) highlight the scale of the devastation in the disaster-hit SA2s and the extent of their economic exposure to the disaster-sensitive industries.

- Those in lower socio-economic brackets become poorer following disasters. In addition, both those in lower socio-economic brackets and female residents exhibit lower economic resilience to disasters, in that they may not be fully able to return to their pre-disaster income trajectory in the medium-term. This highlights the potential for disasters to widen income inequality over time.

Implications for relief and recovery programs

- Following the Black Saturday bushfires, government community recovery programs focused on rehousing, statewide community projects, psychological support, scholarship, school holiday programs, and primary producer repair and restoration.

Figure 3: Government disaster recovery packages following the Black Saturday bushfires overlaid on industry sectors



- Government recovery programs have increased money flows into certain economic sectors, such as manufacturing, construction, arts and recreation, health care and social assistance, retail trade, education and training, and agriculture, forestry and fishing (see Figure 2, page three).
- The recovery funding seems to have been unable to lift up the agricultural sector, given that negative income effects are still identified for this sector post-relief funding.
- The funding seems have muted otherwise negative effects that would have accrued to manufacturing and retail trade sectors given the insignificant post-disaster income effects estimated for these sectors.
- With positive income effects identified, there is some evidence that the construction and arts and recreation sectors have benefitted from the recovery funding.
- There is room to ensure that future long-term recovery is not only achieved more quickly, but also is spread more evenly across the community, and more effectively supporting at-risk individuals and sectors.

References

- Australian Bureau of Statistics (2016), "2080.0 – Microdata: Australian Census Longitudinal Dataset, ACLD". Expanded Confidentialised Unit Record File (CURF), DataLab.
- Deloitte Access Economics (2016), *The economic cost of the social impact of natural disasters*. Commissioned by the Australian Business Roundtable for Disaster Resilience & Safer Communities.
- Sydney Morning Herald (2009), Black Saturday fires equal to 1500 atomic bombs: expert <https://www.smh.com.au/national/black-saturday-fires-equal-to-1500-atomic-bombs-expert-20090521-bh79.html>
- Ulubasoglu M, Onder YK (2020), Disasters and economic resilience: the effects of the Black Saturday bushfires on individual income, Bushfire and Natural Hazards CRC.