The Australian Journal of Agricultural and Resource Economics

AARES AUSTRALASIAN AGRICULTURAL & RESOURCE ECONOMICS SOCIETY

Australian Journal of Agricultural and Resource Economics, 65, pp. 767–775

Disaster, disruption, recovery and resilience: lessons from and for agricultural and resource-based industries

Deborah C. Peterson and Lin Crase[†]

The special issue assembles papers that addressed the following themes: how COVID-19 has affected agricultural and resource-based industries, the effects of major disruptions due to other disasters beyond COVID-19 on the sector and the collective lessons for policymakers and practitioners. This paper provides an overview of the contributions.

Key words: disaster, disruption, recovery, resilience.

1. Introduction

The COVID-19 pandemic that gathered pace in 2020 and 2021 caused morbidity, mortality and economic damage throughout the world. Measures designed to reduce the spread of the virus have impacted almost every aspect of life, from how and where we work; where and what goods and services we consume; where we travel; and how our social networks function (e.g. Nicola et al., 2020). It has challenged agricultural and other resource-based industries, significantly affecting trade and food distribution systems at national, regional and global levels (e.g. Labode et al., 2020). Simultaneously, the notion of a 'new normal' has been heavily promoted as a consequence of COVID-19 (e.g. WHO, 2020). Socially, this change implies transition in human behaviours, to firmly entrench new norms within communities.

Given economists' underlying interests in human behaviour, the profession is well-positioned to consider the various dimensions from a disruptive event like COVID-19. Importantly, economics can also help answer questions about how to deal with calamitous events in general and to reflect on what other potential disruptions could lie ahead. The attention given to the earlier analyses of droughts, bushfires and floods in AJARE is testament to the contribution of economists to these types of debates, and this special issue follows in that tradition. The special issue assembles papers that addressed these themes: how COVID-19 has affected agricultural and resource-based industries, the effects of major disruptions due to other disasters beyond

[†]Deborah C. Peterson (email: deborahcpeterson@gmail.com) is Director at Sapere Research Group, Melbourne, Victoria, Australia; Lin Crase (email: lin.crase@unisa.edu.au) is Professor at UniSA Business, University of South Australia, City West Campus, North Terrance, Adelaide, South Australia, Australia.

doi: 10.1111/1467-8489.12460

COVID-19 on the sector and the collective lessons for policymakers and practitioners.

2. Overview of contributions to the special issue

The special issue comprises seven papers that fall into three different types of analyses. The first three papers use economy-wide computable general equilibrium (CGE) models to shed light on the impacts of COVID-19. The settings and sectors used to shape each study differ and also offer methodological innovations. The next two papers draw on different approaches to consider the impacts of COVID-19. They explore the extent to which the pandemic and the responses to it have reinforced pre-existing trends or driven lasting adjustments. The papers also consider adaptation behaviours. The final two papers look beyond COVID-19. These two contributions add to our understanding of a wide array of disruptions that agricultural and resource-based industries are already experiencing and will increasingly face in the future (Table 1).

3. Economy-wide modelling of impacts of COVID-19

CGE models have become the workhorse for many economic analysts for almost half a century. The increased power and accessibility of computational software has aided to their widespread deployment and progressive refinement. However, the unanticipated (if not strictly unpredictable) advent and impact of COVID-19 means that analysts have significantly modified existing CGE models in order to better replicate the flow-on effects to the wider economy. Arguably, the CGE modelling that aims to simulate the impacts of COVID-19 is now a sub-strand of literature in its own right.

Dixon et al. (2021) simulate Australia-wide economic impacts of COVID-19 using the Victoria University Regional Model (VURM) as the starting point and make three major adjustments. First, they modify the time-interval for VURM from the conventional yearly modelling approach to quarterly intervals. While conceptually straightforward, this adjustment requires substantial modifications, a point also raised by Dixon and Rimmer (2021). Second, they modify VURM to reflect the likelihood of capital idling; namely, 'a special version of capital idling theory is adopted, with endogenous utilisation of capital adjusting to prevent the real rental return on capital from falling more the 20 per cent in a single period' (Dixon et al., 2021). Third, they modify VURM to reflect changes related to international visitors and student education exports, with exports of these services linked to the price of the bundle of services.

The analysis by Dixon et al. (2021) explores the impacts on productivity, changed consumption due to physical distancing requirements, the impacts on export demand, the effects of government stimulus measures and the consequences of reduced migration. Collectively, these influences are

Table 1 Manuscripts in 'Disaster, Disruption, Recovery and Resilience: Lessons from and for agricultural and resource-based industries' by categories, authors, title and topic

Category	Author	Title	Research topic
Economy-wide modelling of impacts of COVID-19	Dixon et al. (2021)	Impact of COVID-19 containment on the Australian economy and its agricultural and mining industries	Simulates the economic impacts of COVID-19 on the Australian economy and investigates the implications for the energy sector
	Dixon and Rimmer (2021)	Coping with seasonality in a quarterly CGE model: COVID-19 and US agriculture	Introduces seasonal factors into the agricultural specification of a quarterly CGE model of the United States and applies scenarios about loss of labour at harvest time in fruit and nut farms and the temporary closure of meat processors
	Wittwer and Anderson (2021)	COVID-19's Impact on Australian wine markets and regions	Models the impacts on the wine sector as the mechanics of wine purchases changes. Includes a new model of global beverage markets and a new economy-wide model with sub-national regions
COVID-19 impacts versus underlying trends	Thilmany et al. (2021)	Novel methods for an interesting time: Exploring U.S. local food system's impacts and initiatives to respond to COVID	Documents the changes to local and regional food systems using real-time qualitative and quantitative feedback on the adjustments occurring in response to COVID-19 restrictions
	Nygaard and Parkinson (2021)	Analysing the impact of COVID-19 on urban transitions and urban-regional dynamics in Australia	Assesses the disruptive legacies of COVID-19 on urban-regional dynamics by empirically investigating the pandemic's impacts against three theoretical propositions (random growth theory; locational fundamentals theory; increasing returns theory)
Other sources of disruption	Cooper and Okello (2021)	An economic lens to understanding anti-microbial resistance: disruptive cases to livestock and wastewater management in Australia	Reviews the gaps in economic analyses of anti-microbial use and resistance in Australian settings and positions two cases studies as important areas for urgent research
	Wittwer and Waschik (2021)	Estimating the economic impacts of the 2017–2019 drought and 2019–20 bushfires on regional NSW and the rest of Australia	Uses a multi-regional dynamic CGE model to estimate the short-term and longer-term impacts of prolonged drought and bushfires, both of which are expected to increase in frequency and severity in future

considered against different potential recovery arcs. In all cases, real GDP is significantly lower in the near term and household incomes slowly return to normal growth rates, with the exception of a scenario characterised by

ineffective vaccination. In the current context, of rapidly deployed and effective vaccines, this analysis presents a somewhat positive view on a relatively bleak event in history. Another important insight offered by Dixon et al. (2021) is that while gas and electricity demand is only modestly reduced by these events, the demand for petroleum in Australia is more heavily impacted. This result calls into question the longer-term viability of Australia's sole petroleum refining operation.

Dixon and Rimmer (2021) also adjust an established CGE model in an effort to simulate the wider effects of COVID-19 more accurately. This study uses the US Applied General Equilibrium (USAGE) model to understand the implications for US farm industries. As with Dixon et al. (2021), this study uses a quarterly time period because it better captures the impacts of severe but brief interruptions to production such as those associated with stay-at-home mandates. Importantly, Dixon and Rimmer (2021) also account for seasonality in agriculture, arguing that 'a disruption which stops the harvesting of the saleable product may be considerably more devastating to a farm industry than a disruption occurring at another time of year' (Dixon & Rimmer, 2021).

The macroeconomic modelling that follows in Dixon and Rimmer (2021) was undertaken in mid-2020 to project impacts in the subsequent years. Perhaps unsurprisingly, the immediate negative impacts on GDP, employment and private consumption of COVID-19 are substantial at around 10 per cent. In contrast, the immediate impacts on agriculture are relatively muted, with output and real farm income falling by 3 per cent and 5 per cent, respectively. Over time, (i.e. the year commencing March 2021), the forecast impacts on agriculture are even less severe, with output and real farm income falling by 1.6 per cent and 0.76 per cent, respectively, relative to the no-COVID-19 scenario.

As noted, the novel contribution of Dixon and Rimmer (2021) is combining quarterly modelling with seasonal considerations important to specific agricultural industries. The study examines two case studies, a 10 per cent labour shortfall at critical harvesting times in the fruit and nut industries and a 10 per cent reduction in pig processing facilities caused by plant shutdowns. These cases were likely prompted by the media coverage of euthanised livestock and crop destruction that occurred in April/May 2020, reportedly due to supply chain problems. In contrast to the media reports, the modelling by Dixon and Rimmer (2021) shows only mild impacts on farm incomes and on output, consumption and prices of meat for the pork industry case study. In addition, the authors state that the simulation did not indicate serious problems in satisfying food requirements in the United States for disruption of the fruit and nut industries.

Wittwer and Anderson's (2021) also use CGE modelling to explore impacts on agriculture, in this case the Australian wine industry. They continue the theme of innovation within CGE modelling to account for COVID-19 by implementing two main methodological changes. First, they incorporate

global beverage marketing that covers the categories of grape wine, beer and spirits and recognise the interactions between a nation's producers and consumers across these beverage categories, while allowing for connections via international trade. This approach borrows from Wittwer and Anderson (2020) but provides the platform for more detailed modelling of the Australian economy. Second, they use a new CGE model – TERM-Wine. The contribution of this model is its capacity to provide insights into impacts on regions, as they relate to different wine types and sectors tied to the wine industry (e.g. hotels and cafes versus tourism).

Wittwer and Anderson (2021) show that the pattern of consumer spending on wine is likely to change in response to the impacts of mandated social restrictions (e.g. head-count limits on drinking venues) and income losses. While off-premises sales provide some cushioning, overall wine sales fall, particularly for some varieties associated with social engagement (e.g. sparkling varieties). In terms of modelled regional impacts, this study points to lower gross earnings for wineries in 2020-21 of around 7–8 per cent, with warmer growing regions feeling the greatest impacts. Witwer and Anderson (2021) also note the wine industry's non-trivial concerns about trade tensions with China. More generally, the manuscript highlights the challenges of applying CGE at such a refined scale against a landscape that is constantly adapting.

Collectively, these three papers illustrate the adaptiveness of CGE and its usefulness to shed light on important policy choices when used by expert practitioners. Nonetheless, at least two challenges remain, as noted by Dixon and Rimmer (2021). The first relates to dealing with the 'black-box' nature of the technique, which can be addressed through greater transparency around model specification. The second relates to concerns about the absence of theoretical novelty in CGE analysis. This special issue provides support for Dixon and Rimmer's (2021) observation that 'almost every new project [involving CGE] poses theoretical challenges', which must be resolved to offer appropriate insights.

4. COVID-19 impacts versus underlying trends

While CGE modelling necessarily produces results against a counterfactual (e.g. non-COVID-19 outcomes versus COVID-19), other studies in this special issue take a different approach to explore how COVID-19 might (or might not) contribute to underlying changes or issues of concern already know to researchers. In the case of Thilmany et al. (2021), the interest centres on US food systems, examining 1) the evolving system structures and consumer food acquisition strategies, 2) the persistence of food access issues and their intersection with various inequalities and 3) areas of potential vulnerability and resilience in different types of food systems (Thilmany et al., 2021). Of particular interest are the various and generalised disconnections

across food system sectors that cover supply chain practitioners, researchers, outreach professional and policymakers.

Initially, the response by many countries to COVID-19 included stay-at-home orders that markedly interrupted food consumption away from the home. These mandates reduced US food expenditure generally, but prompted an even more dramatic fall in spending at away-from-home food outlets. Thilmany et al. (2021) also reported the shift to online food procurement, both in the United States and other developed nations. Against that background, Thilmany et al. (2021) report on data collected as these adjustments were occurring. The research employed a transdisciplinary approach to understand behavioural adaptation processes within local and regional food systems. The study also provides insights into the inherent challenges of working across disciplines in complex and rapidly evolving environments.

Thilmany et al. (2021) report on a multiple-round quantitative survey completed by food customers over the course of events to better understand their purchasing decisions. The results cover a range of important food system domains, including customers' participation in different marketing channels, the role of place-based food purchases, food values and food insecurity. The authors note the results were made more contextually interesting by complementary efforts relating to information collected from communities of practice involved in local and regional food systems. This study highlights both the adaptability of local and regional food systems and the benefits of real-time research embedded in agencies charged with providing assistance.

Exploring other long-term trends and known challenges against the backdrop of COVID-19, Nygaard and Parkinson (2021) investigate whether the pandemic will materially change the way we live and work. One of the consequences of COVID-19 has been increased questioning of the functionality of city living versus rural and regional lifestyles and the interrelationships between different urban forms. This study explores working-from-home arrangements accompanying COVID-19 mandates and other restrictions that have prohibited or limited travel within cities. The setting for their analysis is the Australian property market, which is somewhat unique given the prominence of urbanisation in this country (Davison, 1993; Frost & O'Hanlon, 2009) and the related impacts of national and government policies on the acquisition of urban dwellings (see, for example, Pawson et al., 2020). Collectively, these forces create what Nygaard and Parkinson (2021) refer to as a 'slow burn' for urban dynamics.

Nygaard and Parkinson (2021) draw on multiple theoretical explanations around the forces that shape cities and regional towns, focusing on three empirical tests: using data from all Australian cities between 1911 and 2016 to understand the extent to which cities in Australia respond to temporary shocks that change their trajectory permanently; developing an autoregressive distributed lag model to understand internal migration driven by house

prices (and applied specifically to Sydney); and analysing relative property prices (in Sydney) at different points of time cross 2020 to establish the extent to which the shock created by COVID-19 has lasting effects.

The authors note that 'the COVID-19 pandemic constitutes a shock to urban systems. This shock is, however, taking place against ongoing "slow burn" urbanization determinants such as the interplay between centripetal and centrifugal processes in capital cities, and technology/teleworking and amenity-based migration for some household types' (Nygaard & Parkinson, 2021). Their results suggest COVID-19 may not have lasting effects on capital cities generally but may have more significant effects on certain locations within cities, as well as regional cities and towns within commuting distance to capital cities. This has potentially significant implications in rural and regional domains, but the authors sensibly warn against adopting hasty housing-related policy choices solely justified by COVID- 19.

5. Other sources of disruption

The final set of papers in this special issue draws our attention to other disasters and disruptions, apart from COVID-19. Cooper and Okello (2021) focus on the potential for anti-microbial resistance to disrupt economies generally and agricultural and resource-based industries specifically. Worryingly, they note the significant gap in economic analyses, which if filled could better inform actions to act against an increase in anti-microbial resistance. They offer an accessible framework for considering what is essentially a stock and flow conundrum commonly resolved by agricultural and resource economists. Put simply, using anti-microbials to offset disease provides an immediate benefit but the subsequent and unpredictable reduction in the value of the anti-microbial stock needs to be factored in. Similarly, activities and stimuli that encourage the development of new anti-microbials must be considered.

Cooper and Okello (2021) argue that economists have much to contribute to this type of debate but also note the absence of specific studies to help shape the Australian policy environment required to avert future catastrophic disruptions. They draw on two cases relevant to Australia, covering the use of anti-microbials in livestock industries and changes to wastewater recycling to reduce the burden of resistant anti-microbials in the environment. They fittingly query why the economic analysis of anti-microbial resistance is lagging, while noting that sectors such as the livestock and water industries are often distracted by other issues reflects the apparent prominence of other pressing factors, relative to anti-microbial resistance. They nonetheless point out the significant risks of inaction, especially given the predominantly export orientation of Australian agriculture.

The final paper in this special issue deals with a topic familiar to many AJARE readers – the policy dilemmas and consequences of climate change. Wittwer and Waschik (2021) draw on data related to the prolonged drought

witnessed in New South Wales and southern Queensland between 2017 and 2019 and the bushfires that engulfed eastern Australia in 2019-2020. They adapt the VU-TERM CGE model to shed light on the consequences. These modifications include factoring in the direct losses from bushfires, considering the costs of negative health outcomes (although this excludes loss of life) and catering for the prospect of idling capital and capital destruction, along with the consequences for insurance.

Wittwer and Waschik (2021) put the collective loss to national welfare from these two events at around AUD$63 billion. This estimate excludes the value of the human lives lost in the bushfires and the value of destroyed flora and fauna. Even with these exclusions, the estimated impacts provide a foundation for questioning government actions in these domains. Wittwer and Waschik (2021) echo many earlier investigations into Australian drought policy responses published in AJARE. Hopefully, their contribution amplifies calls for government interventions based solely on supporting poorer communities in general. They also note the tendency of policymakers to embed discussions around water security and water infrastructure with drought responses and the challenges this poses. In the case of policy response to bushfires, Wittwer and Waschik (2021) contrast government's adherence to expert advice on COVID-19 and near denial of expert opinion around bushfires.

Hopefully, an appreciation by policymakers about the value of economics as well as science (including behavioural sciences) in shaping responses across multiple domains will be a legacy of COVID-19. More specifically, this special issue demonstrates that economic analysis can provide valuable insights into the impacts of disruptive events and shed light on the flow-on effects of disruption. Harnessing economic thinking can also provide guidance to deal with emerging disruptions, provided policymakers are receptive. We can only remain optimistic.

References

Cooper, B. & Okello, W. (2021) An economic lens to understanding antimicrobial resistance: disruptive cases to livestock and wastewater management in Australia. *Australian Journal of Agricultural and Resource Economics*, 65(4).

Davison, G. (1993) The past and the future of the Australian suburb. *Australian Planner*, 31(2), 63–69.

Dixon, J., Adams, P. & Sheard, N. (2021) Impact of COVID-19 containment on the Australian economy and its agricultural and mining industries. *Australian Journal of Agricultural and Resource Economics*, 65(4).

Dixon, P.B. & Rimmer, M.T. (2021) Coping with seasonality in a quarterly CGE model: COVID-19 and US agriculture. *Australian Journal of Agricultural and Resource Economics*, 65(4).

Frost, L. & O'Hanlon, S. (2009) Urban history and the future of Australian cities. *Australian Economic History Review*, 49(1), 1–18.

Laborde, D., Martin, W., Swinnen, J. & Vos, R. (2020) COVID-19 risks to global food security. *Science*, 369(6503), 500–502. https://doi.org/10.1126/science.abc4765

Nicola, M., Alsafi, Z., Sohrabi, C., Kerwan, A., Al-Jabir, A., Iosifidis, C. et al. (2020) The socio-economic implications of the coronavirus pandemic (COVID-19): A review. *International Journal of Surgery*, 78, 185–193. https://doi.org/10.1016/j.ijsu.2020.04.018

Nygaard, C. & Parkinson, S. (2021) Analysing the impact of COVID-19 on urban transitions and urban-regional dynamics in Australia. *Australian Journal of Agricultural and Resource Economics*, 65(4).

Pawson, H., Milligan, V. & Yates, J. (2020) *Housing policy in Australia: A case for system reform*. Sydney: Palgrave Macmillan.

Thilmany, D., Brislen, L., Edmondson, H., Gill, M., Jablonski, B., Rossi, J. et al. (2021) Novel methods for an interesting time: Exploring U.S. local food system's impacts and initiatives to respond to COVID. *Australian Journal of Agricultural and Resource Economics*, 65(4).

Wittwer, G. & Anderson, K. (2020) A Model of Global Beverage Markets. *Journal of Wine Economics*, 15, 330–354.

Wittwer, G. & Anderson, K. (2021) COVID-19's Impact on Australian wine markets and regions. *Australian Journal of Agricultural and Resource Economics*, 65(4).

Wittwer, G. & Waschik, R. (2021) Estimating the economic impacts of the 2017–2019 drought and 2019–20 bushfires on regional NSW and the rest of Australia. *Australian Journal of Agricultural and Resource Economics*, 65(4).

World Health Organisation (2020) *From the "new normal" to a "new future": A sustainable response to COVID-19*. Available from: https://www.who.int/westernpacific/news/commentaries/detail-hq/from-the-new-normal-to-a-new-future-a-sustainable-response-to-covid-19 [Accessed 1st October 2021].