Pegasus Economics

Live Sheep Export Trade: Review of the Draft Regulation Impact Statement

Dr Alistair Davey and Roger Fisher

February 2020

Pegasus Economics • www.pegasus-economics.com.au • PO Box 449 Jamison Centre, Macquarie ACT 2614

Pegasus Economics is a boutique economics and public policy consultancy firm that specialises in strategy and policy advice, economic analysis, trade practices, competition policy, regulatory instruments, accounting, financial management and organisation development.

This report has been commissioned by Animals Australia.

The views and opinions expressed in this report are those of the authors.

For information on this report please contact:

Name: Dr Alistair Davey

Telephone: + 61 2 6100 4090

Mobile: 0422 221 110

Email: adavey@pegasus-economics.com.au

Front cover photograph shows sheep outside Cowra in New South Wales.

Table of Contents

Executive Summary

Introduction

- This report has been commissioned by Animals Australia to provide independent commentary on the economic analysis contained in the publication by the Department of Agriculture (2019) entitled *Live sheep exports to or through the Middle East—Northern Hemisphere summer: Draft regulation impact statement*.
- This report will consider the economic implications arising from the three regulatory options proposed in the regulation impact statement (RIS), namely:
  - Option 1: maintain the regulatory status quo (pre 2019).
  - Option 2: implement a prohibition on live sheep exports from 1 June to 14 September with additional prohibited periods for Qatar and Oman.
  - Option 3: implement a revised Heat Stress Risk Assessment (HSRA) model consistent with recommendations of the HSRA Review.

Live Sheep Export Trade

- Sheep procured for the live export trade are usually either sold at saleyard auction or sold on-farm through paddock sales.
- The live sheep export trade has been predominantly comprised of sheep sourced from Western Australia (WA).
- Since July 2014, WA sourced live sheep have made up almost 87 per cent of the Australian live sheep export trade by volume.
- Rather than being a market for sheep in general, the live sheep export trade is predominately a trade in wethers.
- Even before the *Awassi* incident in April 2018 that effectively curtailed the live sheep export trade to the Middle East during the northern summer in both 2018 and 2019, the trade was in long term structural decline.[1]
- The number of live sheep exported per annum has fallen from 7.1 million in 1988 to 1.1 million in 2019.
- The main markets for Australian live sheep exports are countries in the Middle East. The largest customers for Australian live sheep exports historically have been the six Arab states bordering the Persian Gulf and the Gulf of Oman: Saudi Arabia, the United Arab Emirates (UAE), Qatar, Kuwait, Bahrain and Oman.
  - These six states together comprise the Gulf Cooperation Council (GCC).
- One distinguishing feature of the GCC states has been the provision of food subsidies for the importation of livestock. A range of price control measures are deployed across the region, including the provision of subsidies to the marketers of imported products (Lahn, 2016, p. 4).
- Food subsidies are only available on animals slaughtered domestically in GCC states and do not apply to processed sheep meat imports (Drum & Gunning-Trant, 2008, p. 15).
- With reduced supply available from Australia, importing countries have switched to alternative suppliers including those located in North Africa, and in Eastern Europe (Keogh, Henry, & Day, 2016).
- Since the early 1990s, GCC states along with Jordan have exhibited an increasing demand for processed sheep meat imports as live sheep imports have declined in trend terms, suggesting there is substitutability between processed sheep meat and live sheep imports.

[1] In April 2018, video footage obtained by Animals Australia showed Australian sheep in severe heat stress while being transported to the Middle East on 5 consecutive voyages on the MV *Awassi Express*, with most footage taken during a voyage in August 2017 (the *Awassi* incident) (Department of Agriculture, 2019, p. 19).

- Over the last 30 years, the WA sheep flock has undergone considerable structural change, having gone from a peak of 38 million sheep in 1990 to a current level of around 14.5 million.
    - The fall in wool prices, coupled with rising grain prices, saw a shift towards cropping by many farms and an expansion of cropping in more marginal areas (Dahl, Leith, & Gray, 2013, p. 207).
    - The WA sheep flock has undergone significant change in structure and composition (Department of Agriculture and Food Western Australia, 2016, p. 3) with the percentage of breeding ewes having increased while the percentage of wethers has decreased.
    - As the WA sheep flock continued to decline during the 1990s and 2000s, there was also a switch by many woolgrowers to prime lamb production that reduced the supply of merino wethers suitable for the live export trade (Keogh, Henry, & Day, 2016, p. 21).
- With the decline of the live sheep export trade, the relative significance of the trade for WA sheep farmers has also diminished.
- Based on 2017-18, sales to the live sheep export industry represent only around 5 per cent of total cash receipts for WA specialist sheep farmers and around 1½ per cent for WA mixed sheep farmers.[2]

Economic Impacts Associated with the Live Sheep Export Trade

- It has been long contended the live sheep export trade underwrites farm gate prices for sheep in Western Australia.
- The concept of the *Law of One Price* (LOP) relates to the impact of market arbitrage and trade on the prices of identical commodities that are exchanged in two or more different geographical markets (Persson, 2008). In an efficient market there must be, in effect, only one price of such commodities regardless of where they are traded.
- There is ample evidence the LOP applies to sheep prices across Australia and no support for the contention the live sheep export trade underwrites domestic sheep prices or even provides a price floor.
- In light of the fact that Australia produces far more lamb and mutton than it consumes, domestic mutton and lamb prices are far more likely to be determined by international commodity prices than by the live sheep export trade.
- Rather than prices paid by live sheep exporters, it appears that international commodity prices for lamb and mutton are what is underwriting farm gate prices paid for Australian sheep.
- Since the effective curtailment of the live sheep export trade to the Middle East during the northern summer in 2018 and 2019, farm gate prices for WA sheep farmers have not crashed and the mutton sheep displaced from the live sheep export trade have found new export markets, predominately in China.
    - This contradicts assertions to the effect that the live sheep trade underwrites WA farm gate sheep prices or provides a price floor.
- It has been claimed the live sheep export trade delivers a price premium to sheep farmers. While there is evidence to support this claim for some classes of sheep, the application of the price premium is more limited than these claims might imply.

[2] Based on ABARES (2019a).

- At WA saleyard auctions the price premium paid by live sheep exporters is generally highest for sheep that are lighter and in worse condition, thus requiring further input in finishing them off to a level that would make them attractive to local processors.
- Based on crude approximations we have estimated the average price premiums for each of the three main categories of sheep that make up the live sheep export trade:
    - 17.8 cents per kg carcase weight (cwt) for adult wethers (i.e. wethers and young wethers), that translates to $4.16 per head[3]
    - 48.2 cents per kg cwt for hoggets, that translates to $10.36 per head[4]
    - 10.5 cents per kg cwt for lamb, that translates to $1.68 per head.[5]
- A weighted average across the three main sheep categories suggests that live sheep exporters pay a price premium of almost 18.7 cents per kg cwt, that roughly translates to $4 per head.
- At current export levels of around 1 million live sheep exported per annum, the cessation of the live sheep export trade would thus translate into a loss of around $4 million for WA sheep farmers from the loss of the price premium paid by live sheep exporters. This works out at around $936 per WA sheep farmer on average.[6]
    - This represents a loss of less than 0.2 per cent of total cash receipts for specialist sheep farms and less than 0.1 per cent of total cash receipts for mixed enterprise sheep farms.[7]
- While the temporary cessation of the live sheep export trade would reduce overall demand to some extent as those seeking to procure sheep for live export will no longer participate in the market, the price impact will be greatest in relation to sheep that are lighter and in worse condition; in other words, those least attractive to local processors.
- On the basis of econometric modelling, there is evidence to suggest that live sheep exporters do have a statistically significant positive upward impact on WA saleyard sheep prices relative to the eastern states except in relation to heavy lamb.
    - Based on the last week in which live sheep exporters were active in WA saleyards in December 2019, this suggests a price reduction in the order of 4.4 per cent for trade lamb, up to 9.4 per cent for restocker/feeder lamb (in real 2018-19 price terms) as compared to prices in the eastern states when the live sheep exporters are absent.
- Further, this price impact does not extend to over the hooks (OTH) sale prices for WA lamb and mutton sheep prices as compared to NSW lamb and mutton sheep prices.
- While WA saleyards have delivered price premiums for mutton sheep on average around 20.4 cents per kg cwt higher than OTH sale prices over the 10 year period from 2009 to 2019, it was found that OTH WA sale prices for trade lamb have delivered a price premium on average 9.4 cents per kg cwt higher than WA saleyard prices over the same period (in real 2018-19 price terms).

[3] Carcase weight (cwt) refers to carcase weight, the weight of the animal's carcase following the removal of head, feet, skin and internal organs (Meat & Livestock Australia, 2019). Weightings for adult wethers based on WA saleyard auction data amended to increase their negatively skewed distribution so as to arrive at an average cwt for live export wethers with a fat score of 3 of 23.4 kg that converts to a liveweight of 52 kg.

[4] Weightings based on WA saleyard auction data with an assumed average cwt for live export hoggets with a fat score of 2 of 21.5 kg that converts to a liveweight of 50 kg.

[5] Weightings based on WA saleyard auction data with an assumed average cwt for live export lamb with a fat score of 2 of 16.1 kg that converts to a liveweight of 37.5 kg.

[6] Assumes 90 per cent of live sheep exports come from Western Australia and that there were 4,217 sheep farmers in Western Australia as per ABS (2019).

[7] Based on total cash receipts for 2017-18 from ABARES (2019a).

- Concerns arise that with the partial or even complete curtailment of the live sheep export industry, that meat processors will struggle to find additional new markets for the sheep displaced from the loss of the trade.
    - Presumably those markets would be export markets as Australians consume far less lamb and mutton.
- With the effective curtailment of the live sheep export trade to the Middle East during the northern summer in 2018 and 2019, there has been a sharp increase in the slaughter of mutton sheep in trend terms, while there has been no discernible change in the slaughtering of lamb associated with the curtailment.
- With the increase in the slaughter of mutton sheep, full time employment in the WA meat processing sector has recently reached record levels while total hours worked is only just below the record levels set during the winter of 2016 when the slaughter of lamb peaked.
- The average level of total employment in the WA meat processing sector increased by 2,300 jobs, from an average of 3,400 jobs in 2017 and 2018, to 5,700 jobs in 2019.[8]
- Monthly WA mutton exports have increased since the effective curtailment of the live sheep export trade to the Middle East during the northern summer in 2018 and 2019, with the category of 'other Asia' (predominantly China) absorbing most of the additional product.
- The capacity of live sheep exporters to pay a price premium at saleyard auctions is arguably directly linked to the provision of food subsidies provided by recipient countries that in turn artificially increases demand for Australian live sheep exports and enables them to pay above market rates to procure sheep.
- The sustainability of such subsidies over the medium to longer term is in grave doubt.
- There is a question mark over the capacity of Gulf states to maintain food subsidies over the medium and longer term given budgetary pressures with mounting budget deficits, especially in light of slowing and eventually contracting demand for oil.
- The future of food subsidies, and in turn, the ongoing ability of live sheep exporters to continue to pay price premiums for Australian sheep, is heavily dependent on the price received by GCC countries for their petroleum product exports. Slowing and eventually contracting demand for oil could curtail live sheep exports to GCC states altogether due to mounting fiscal pressures.

Considering the Options

- Option 1 presented in the RIS represents the regulatory status quo and does not prohibit any voyages; therefore the live sheep export trade could occur for all months of the Northern Hemisphere summer (Department of Agriculture, 2019, p. 25).
- The primary concern of the Department of Agriculture (2019, p. 35) in regard to option 1 appears to relate to the risk of a recurrence of another animal welfare incident that in turn jeopardises the entire future of live sheep export industry through the loss of its social licence to operate.
- Concerns expressed by the Department of Agriculture that the pursuit of option 1 could place in jeopardy the entire future of the live sheep export industry through the loss of its social licence to operate appear well founded based on history.
- According to the Department of Agriculture (2019, p. 39), restricting live exports along the lines of option 2 would have two distinct market impacts:
    - A decline in world sheep meat prices due to an increase in sheep meat supply out of Australia.

[8] See ABS (2019a).

  - A decline in domestic saleyard/direct sale prices due to an increase in the supply of sheep for slaughter into the domestic processing market and the removal of a source of competition for meat processors (that is live export) and therefore increased processing costs.
- The countries in which replacement sheep are procured for the live sheep export trade will have less sheep available for processing and export, in turn potentially creating new market opportunities in relation to processed sheep meat products. On this basis, we remain sceptical as to whether there will be any significant and identifiable decline in world sheep meat prices due to an increase in sheep meat supply out of Australia due to a temporary cessation in the live sheep export trade.
- Further challenging concerns regarding price falls associated with the displacement of sheep from the live sheep export trade and redirection towards sheep meat export markets, the Organisation for Economic Co-operation and Development (OECD) and the Food and Agriculture Organization of the United Nations (FAO) (2019) are projecting that world sheep meat consumption (including both lamb and mutton) will increase from 15 million carcase weight equivalent (cwe) tonnes in 2019 to 17 million cwe tonnes in 2028 – an increase of 13 per cent.
- While there is likely to be a relative decline in WA saleyard/direct sale prices compared to the eastern states in the event of the withdrawal of live sheep exporters from purchasing sheep, our modelling suggests the order of magnitude of any price decline is only likely to be a quarter up to a half of the maximum price decline suggested by the Department of Agriculture, and is in the range of between $4.68 to $7.37 per head of per head.
- The Department of Agriculture (2019, p. 43) also contend that any price impact from the temporary withdrawal of live sheep exporters is likely to dissipate over time. The considerable structural change observed in the WA sheep flock over the last 30 years is testament to the fact that WA sheep farmers are not stagnant and can adjust their business mix and model in response to changing market conditions and circumstances.
- The recent history of live sheep export trade has been characterised by repeated cycles of animal welfare incidents provoking public outrage followed by government-commissioned reviews and subsequent adjustments to the regulatory arrangements that fall short of the recommended changes followed after a period of time by further revelations of animal welfare incidents, exposing wholesale regulatory failure.
- The historical record suggests the live sheep export industry has been living on borrowed time in terms of its capacity to maintain its social licence to operate.
- The established familiar pattern continues to the present day with the current RIS with the Department of Agriculture now seeking to water down the recommendations from the McCarthy and HSRA reviews through its pursuit of option 2 rather than option 3.
- If history is any guide then any reprieve provided to the live sheep export trade from the pursuit of the new regulatory arrangements in option 2 is only likely to be temporary before yet another animal welfare incident entails. On this basis, the implications of option 2 may ultimately not be all that dissimilar from option 1.
- Option 3 is consistent with the recommendations from the McCarthy Review and the HSRA Review.
- The economic issues raised are the same as previously discussed in relation to option 2, it is just that they would relate to a longer period of cessation for the live sheep export industry.

- However, the draft RIS appears to strongly focus upon the negative aspects of the pursuit of option 3 while brushing over the benefits, such as a greater overall net increase in employment due to higher levels of employment in the meat processing sector.

1. Introduction

This report has been commissioned by Animals Australia to provide independent commentary on the economic analysis contained in the publication by the Department of Agriculture (2019) entitled *Live sheep exports to or through the Middle East—Northern Hemisphere summer: Draft regulation impact statement*. This report considers the economic implications arising from the three regulatory options proposed in the regulation impact statement (RIS), namely:

- Option 1: maintain the regulatory status quo (pre 2019).
- Option 2: implement a prohibition on live sheep exports from 1 June to 14 September with additional prohibited periods for Qatar and Oman.
- Option 3: implement a revised Heat Stress Risk Assessment (HSRA) model consistent with recommendations of the HSRA Review.

In doing so, this report examines the economic implications of the live sheep export trade. As part of this analysis, the report considers the economic impact associated with the temporary cessation of the live sheep export trade during 2018 arising from the public fallout from the *Awassi* incident and subsequent suspension of the live sheep export licence of Emanuel Exports on 22 June 2018 and in 2019 due to the Commonwealth Government's interim order prohibiting live sheep exports to the Middle East during the northern summer. [9]

As the live sheep export trade is dominated by sheep supplied by farmers in Western Australia (WA), this report will primarily focus on WA sheep farmers and WA meat processors.

2. Sheep and their Economic Application

2.1 Taxonomy of Sheep

Sheep can be categorised on the basis of sex and age (measured in terms of the number of adult teeth they possess on their lower front jaw). When born, sheep usually have no teeth (Cashburn, 2016). Within a week after birth, the milk teeth or temporary teeth appear in the front lower jaw and by the time the sheep is two months old these, eight in all, have erupted. These temporary teeth are eventually replaced by permanent incisors or adult teeth, which appear in pairs, commencing with the two central teeth, followed by one on either side at intervals, until the eight temporary teeth have been replaced. During the period the teeth are growing, sheep are referred to by the number of permanent incisors present, such as two-tooth, four-tooth, six-tooth, eight-tooth or full mouth. Sheep will usually be over two before they are six-tooth, and at least three before they are full mouth.

As sheep age, the adult teeth will start to spread, wear and eventually break (Schoenian, 2015). This progressive deterioration is known as 'broken mouth', the rate depending on the conditions under which the sheep has grazed (Cashburn, 2016).

Sheep can be divided into the following categories:

- Very young male and female sheep that are still sucking are referred to as young lamb (Meat & Livestock Australia, 2019).

[9] In April 2018, video footage obtained by Animals Australia showed Australian sheep in severe heat stress while being transported to the Middle East on 5 consecutive voyages on the MV *Awassi Express*, with most footage taken during a voyage in August 2017 (the *Awassi* incident) (Department of Agriculture, 2019, p. 19).

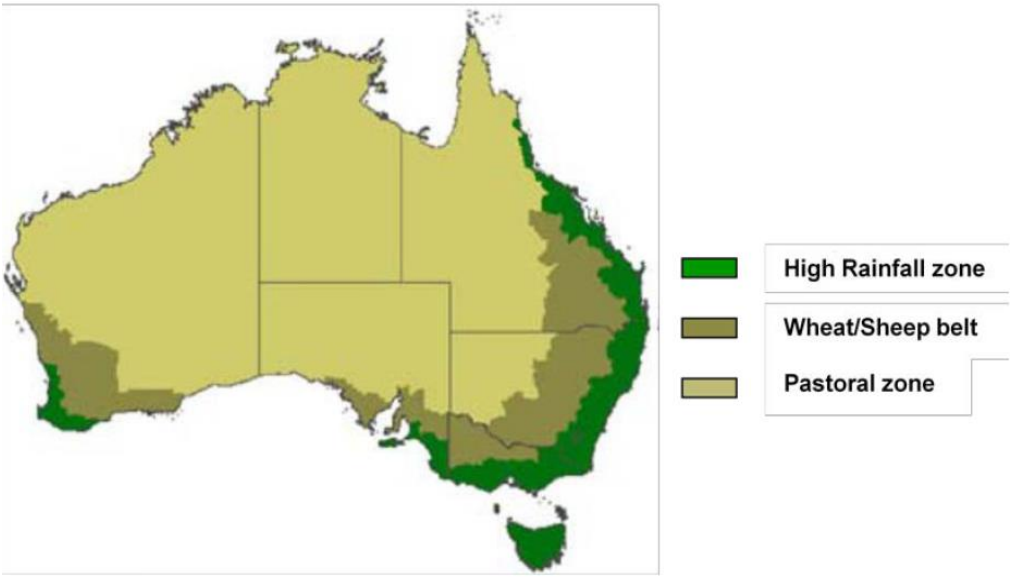
- Young male and female sheep that have been weaned, normally older than 5 months and typically under 14 months with no permanent adult teeth are referred to as lamb (Jones, 2004, p. 1; Meat & Livestock Australia, 2019).
- Hoggets are castrated male and female sheep with no 'ram-like' characteristics and up to two permanent adult teeth (Meat & Livestock Australia, 2019).
- Ewes are female sheep with more than two permanent adult teeth (Meat & Livestock Australia, 2019).
- Wethers are castrated male sheep with no 'ram-like' characteristics and with more than two permanent adult teeth (Meat & Livestock Australia, 2019).
- Rams are male sheep that have not been castrated and castrated male sheep that display 'ram-like' characteristics such as aggressive behaviour (e.g. head butting).

2.2 Economics of Sheep Production

Sheep are farmed throughout the world, with most production constrained by temperature and rainfall to islands, coastal regions and the fringes of continental deserts (Sargison, 2008, p. 451). In some regions sheep are used to exploit pastures which are unsuitable for other agricultural purposes, while elsewhere sheep production is integrated into other agricultural systems to enable cost-effective and efficient grassland management or crop rotation.

In Australia, sheep farming is mostly concentrated around the wheat-sheep and high rainfall zones in New South Wales (NSW), Victoria, South Australia and WA. Around half of Australia's sheep are located in the wheat-sheep zone where they are grazed on sown pasture in rotation with cereal crops (Australian Surveying and Land Information Group, 1990, p. 44). The high rainfall zones lie along the wetter, coastal side of the wheat-sheep belt, where the natural pastures are rich, and carry around one third of sheep. The inland pastoral zone lies on the drier, inland side of the wheat-sheep belt and carries around 20 per cent of sheep. A map of the main wool and sheep growing regions is provided below in Figure 1.

Figure 1: Australian Broadacre Zones and Regions



Source: Stoutjesdijk (2013, p. 9).

Sheep give rise to four products, namely:

- wool
- sheep meat

- skin
- milk.

Wool and sheep meat are the primary outputs from sheep farming, with market conditions for each commodity affecting the size and composition of the national sheep flock (Deards, et al., 2014, p. 6). Historically, the sheep meat industry has developed as a by-product of the wool industry (Jones, 2004, p. 1). Although the use of wool in textiles has faced major competition from synthetic fibres, world wool production is relatively stable at just over 2 million tonnes (Sargison, 2008, p. 451). Sheep are inferior as convertors of their feed to meat relative to poultry and pigs, largely because of the overhead costs of breeding stock and replacements, however, they can live and produce on land unfavourable to other forms of agriculture (Morris, 2009, p. 59).

Sheep skins are often considered a by-product of the sheep meat manufacturing process (Sargison, 2008, p. 451). While there are more sheep milked each day than cattle worldwide, sheep dairying is a relatively small industry in Australia (Biosecurity Tasmania, 2014, p. 1). Most sheep milk is primarily used in the manufacture of cheese (Sargison, 2008, p. 451).

Sheep meat produced from young sheep with no permanent adult teeth is referred to as lamb while sheep meat produced from more mature sheep (with at least one adult tooth) is referred to as mutton. The colour of lamb meat ranges from pale pink to pale red and is generally lean while its mild flavour makes it very versatile for a number of uses (Prakash, 2016). On the other hand, mutton has a deep red colour and is much fattier than lamb; its flavour is strong and gamey and the meat is often stewed to help tenderise it (Prakash, 2016). Mutton can have a distinctive odour and flavour that can be unattractive to consumers (Sheep CRC, 2008). Mutton typically attracts a lower price than lamb due to age, fat content, flavour, and eating quality (Meat & Livestock Australia, 2016b).

3. Live Sheep Export Trade

3.1 Procuring and Sourcing Sheep

Sheep procured for the live export trade are usually either sold at saleyard auction or sold on-farm through paddock sales.

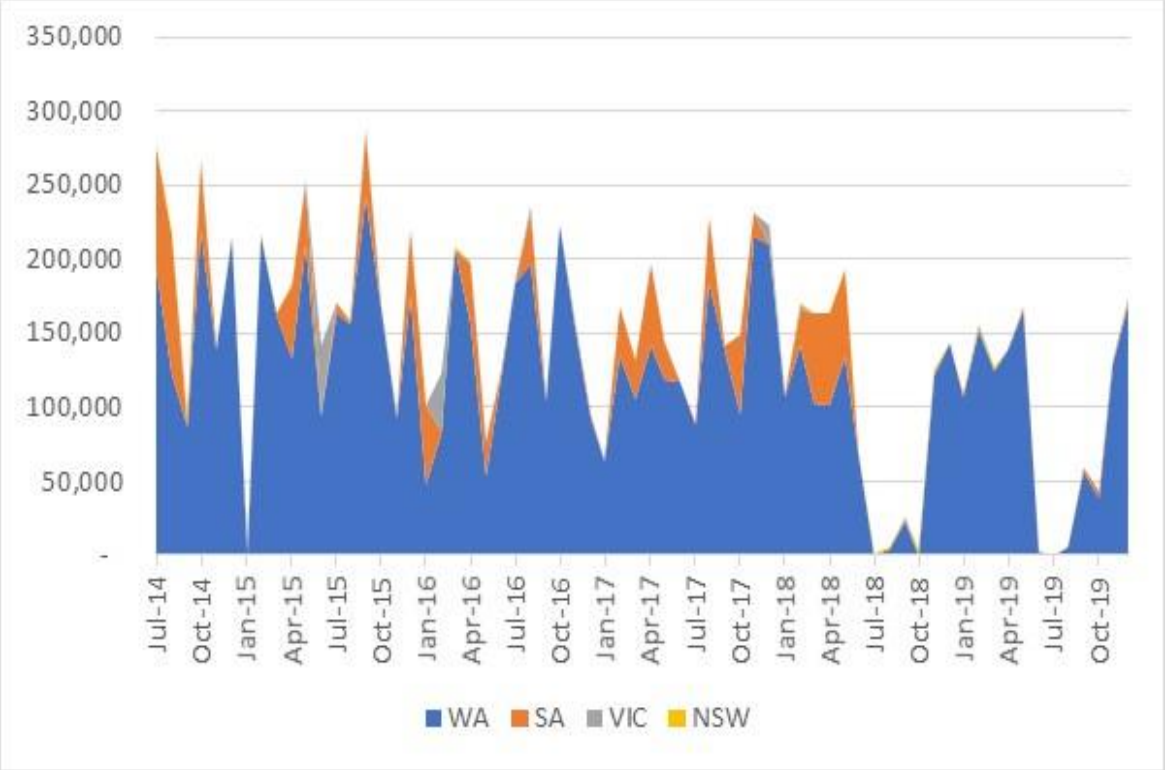
With saleyard auctions, sheep are transported to a central saleyard and sold to the highest bidder with prices reflecting supply and demand in the market on the day (Meat & Livestock Australia, 2019b). Saleyards are the main pathway for farmers with smaller flocks who sell animals of varying standard and type in small lots, and for disposal of poorer stock (Australian Meat Industry Council, 2015, p. 17).

With paddock sales, livestock are inspected on the vendor's property by the buyer or their agent and sold from the paddock with buyers preferring to purchase in large numbers (Meat & Livestock Australia, 2019b). Large buyers, such as meat processors and live exporters, prefer direct sales, rather than competing for stock via an auction (AuctionsPlus, 2015). Sheep meat processors also procure sheep directly from farmers through over the hooks (OTH) sales, whereby sheep are delivered directly to the abattoir with change of ownership taking place at the abattoir scales (Meat & Livestock Australia, 2019b).

Once procured by the live sheep exporters, the sheep are usually transported to feedlots to await shipment to their final destination (Kingwell, et al., 2011, p. 22).

The live sheep export trade has been predominantly comprised of sheep sourced from WA, as outlined in Figure 2 below. Since July 2014, WA sourced live sheep have made up almost 87 per cent of the Australian live sheep export trade by volume.

Figure 2: Western Australian, South Australian, Victorian and New South Wales Monthly Live Sheep Exports – July 2014 to December 2019



Source: Department of Agriculture (2020).

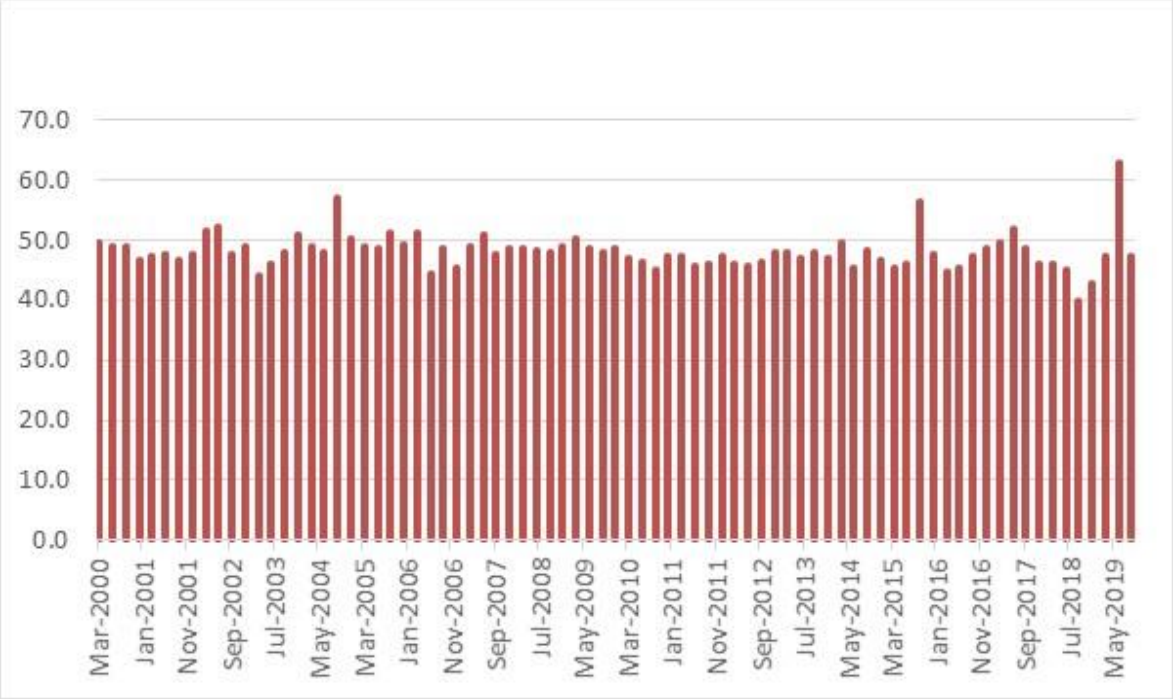
In WA, live sheep exporters must compete with sheep meat processors, restockers and Eastern States buyers for sheep (Herrmann, Dalgleish, & Agar, 2017, p. 69).

Rather than being a market for sheep in general, the live sheep export trade is predominately a trade in wethers. Wethers are the most common type of Australian sheep exported live and are typically aged between one and two years (Deards, et al., 2014, p. 9). In 2017, over 51 per cent of live sheep exported by sea out of Australia were wethers (Department of Primary Industries and Regional Development and Norman, G J, 2018, p. 9). Almost 88 per cent of live sheep exported by sea in 2017 came out of Fremantle, comprising of 45.6 per cent wethers, 10.5 per cent male hoggets, and 32.1 per cent castrated male lambs.

Sheep for the live export trade should typically be as heavy and as fat as possible with a minimum of 50 kg liveweight being preferred for wethers and 40 kg liveweight for hoggets (White, Shands, & Casburn, 2001, p. 3).[10] . The average liveweight of live export sheep since 2000 has been 48.1 kg.[11] The average quarterly liveweight of sheep exported live since 2000 is provided in Figure 3 below.

[10] Liveweight is the weight of the live animal (Meat & Livestock Australia, 2019).
[11] See ABS (2019b).

Figure 3: Quarterly Average Liveweight of Live Export Sheep (kg) – March Quarter 2000 to September Quarter 2019



Source: ABS (2019b).

3.2 Current State of the Live Sheep Export Trade

Even before the *Awassi* incident in April 2018 that effectively curtailed the live sheep export trade to the Middle East during the northern summer in both 2018 and 2019, the trade was in long term structural decline. The number of live sheep exported per annum has fallen from 7.1 million in 1988 to 1.1 million in 2019.

According to a 2014 report published by the Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) (Deards, et al., 2014, p. viii):

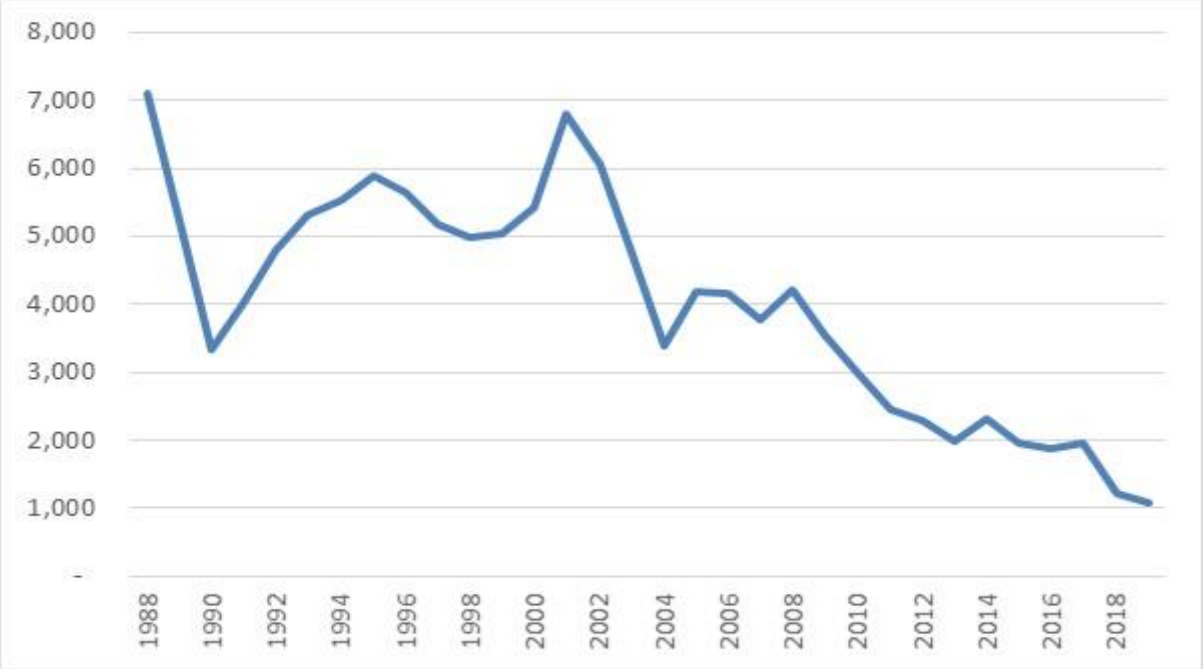
> *Australia's live sheep exports have declined considerably since the 1980s, when annual exports frequently exceeded six million head each year.*

According to the Department of Agriculture (2019, p. 10):

> *Exports of live sheep have generally declined since the 1990s due to a decline in the size of Australia's sheep flock and growing acceptance of chilled and frozen sheep meat in the Middle East.*

Australian live sheep exports declined in the 1990s, following disruptions in trade to several markets and a fall in the number of sheep available for export (Deards, et al., 2014, p. 8). Although live sheep exports have more recently peaked at over 6 million per annum during 2001 and 2002, they have been in continuous decline since then, falling to below 2 million per annum since 2014. Movements in live sheep exports are outlined in Figure 4 below.

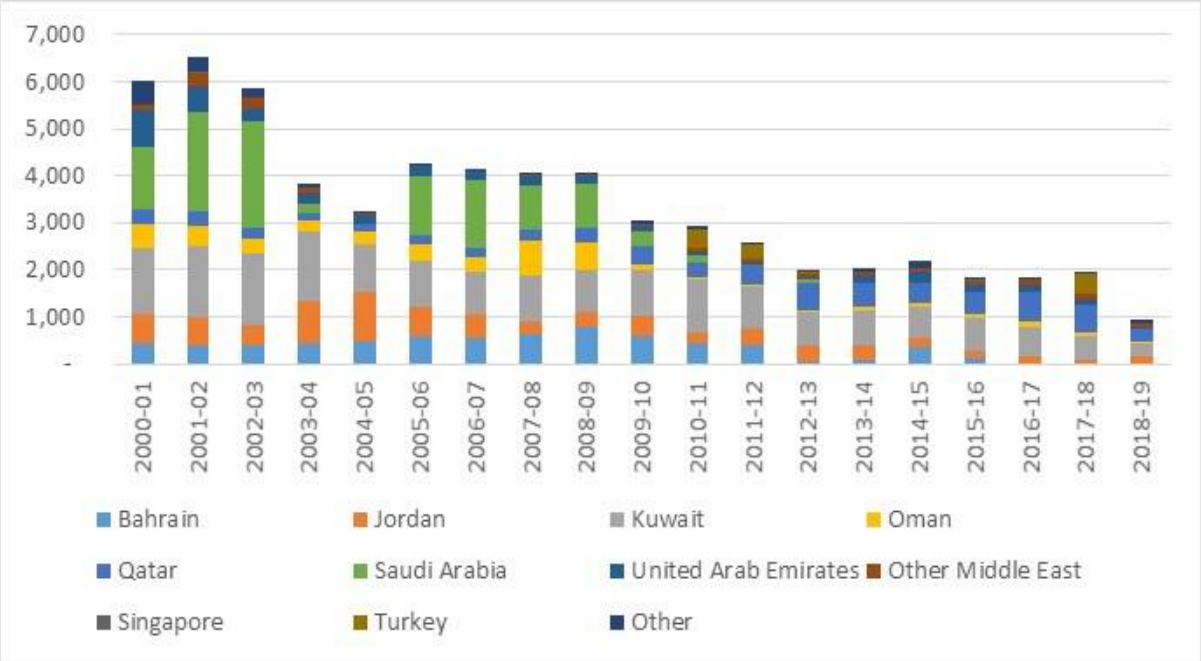
Figure 4: Australian Live Sheep Exports – 1988 to 2019 ('000)



Sources: ABS (2019b) and Department of Agriculture (2020).

The main markets for Australian live sheep exports are countries in the Middle East. The largest customers for Australian live sheep exports historically have been the six Arab states bordering the Persian Gulf and the Gulf of Oman: Saudi Arabia, the United Arab Emirates (UAE), Qatar, Kuwait, Bahrain and Oman. These six states together comprise the Gulf Cooperation Council (GCC) which is a customs union that is moving towards becoming a common market. Figure 5 below shows the composition of live sheep exports by destination country since 2000-01.

Figure 5: Australian live sheep exports by destination country, 2000-01 to 2018-19



Source: ABARES (2019).

In the 2019 calendar year 74 per cent of Australian live sheep exports went to GCC countries. One distinguishing feature of the GCC states has been the provision of food subsidies for the importation of livestock. A range of price control measures are deployed across the region, including the provision of subsidies to the marketers of imported products (Lahn, 2016, p. 4). Food subsidies are only available on animals slaughtered domestically in GCC states and do not apply to processed sheep meat imports (Drum & Gunning-Trant, 2008, p. 15). According to the Independent Review into Australia's livestock export trade undertaken by Bill Farmer (2011, p. 24):

> *… a number of countries, particularly in the Middle East, have subsidised meat for their citizens for some years in an effort to ease food security concerns. This has created additional demand for meat and, by extension, Australian livestock.*

According to the Managing Director of major sheep meat processing company Fletcher International Exports, Roger Fletcher:

> *The only reason why the trade existed is because it was heavily subsidised by their governments.* (Clancy, 2013)

Data on food subsidies in GCC countries is scarce and what information is available may be incomplete as the level of subsidies fluctuates as new measures are announced and withdrawn (Bailey & Willoughby, 2013, p. 6).

Saudi Arabia is the largest importer of live sheep in the world, importing almost 5.8 million sheep during 2017.[12] At the peak of the trade, Saudi Arabia imported almost 1.2 million sheep from Australia during the 2006 calendar year. However, Saudi Arabia has proven to be an extremely fickle customer of Australian live sheep exports since 1989 with the trade having been suspended on several occasions following decisions by Saudi Arabian authorities to refuse acceptance of Australian shipments on often contentious biosecurity grounds.

Australian live sheep exports have been unable to access the Saudi Arabian market since the application of the Exporter Supply Chain Assurance Scheme (ESCAS) to Saudi Arabia on 1 September 2012 (Department of Agriculture, 2015, p. 35).

Under ESCAS the exporter must demonstrate, through a system of reporting and independent auditing:

- animal handling and slaughter meets World Organisation for Animal Health animal welfare standards
- the exporter has control of all supply chain arrangements for livestock transport, management and slaughter, and all livestock remain in the supply chain
- the exporter can trace or account for all livestock through the supply chain (Department of Agriculture, 2015, p. 2).

The last shipment of Australian live sheep went to Saudi Arabia in August 2012 although this had been the first shipment in over 12 months. The inability of Australian live sheep exports to access this market are due to Saudi Arabia's concern that ESCAS would impinge upon its sovereignty (Department of Agriculture, 2015, p. 35).

In Muslim countries, ESCAS has the biggest impact on the Haj and Ramadan religious occasions that involve the ritual slaughter of sheep in the family environment (Manton-Pearce, 2013, p. 24). The

[12] United Nations FAOSTAT database.

practical implications of ESCAS are that Muslims can no longer buy Australian sheep from the feedlots and slaughter them outside of an approved abattoir.

There have been no live sheep exports from Australia to Bahrain since December 2015 as a result of the decision by the Bahrain Government to remove import meat subsidies (Australian Livestock Export Corporation Limited (LiveCorp), 2016, p. 7). This move was prompted by the need on the part of the Bahrain Government to cut its rising subsidy bill (Lahn, 2016, p. 14).

In Bahrain, import meat subsidies were previously provided by the Bahrain Government through payments to the Bahrain Livestock Corporation, the main distributor of meat in Bahrain (Al A'ali, 2017). The removal of import meat subsidies resulted in Australian live sheep imports no longer being a competitive alternative to locally sourced sheep and chilled product (Australian Livestock Export Corporation Limited (LiveCorp), 2017, p. 7).

Like Saudi Arabia, Bahrain had also proven to be a fickle customer of Australian live sheep exports. In late August 2012 Bahrain refused a shipment of around 22,000 live sheep over concerns that some of the sheep had scabby mouth (Valdini, 2012). In September 2012 the Australian Livestock Exporters Council imposed a voluntary ban on live sheep exports to Bahrain (Varischetti, 2012). Australian live sheep exports did not resume until February 2014 (Deards, et al., 2014, p. 29) and were terminated altogether with the cessation of government subsidies.

Kuwait and Qatar are currently the largest importers of Australian live sheep. Food and construction materials are provided at highly subsidised rates to Kuwaiti citizens through the Kuwait Ministry of Commerce and Industry (Times Kuwait, 2019). In the 2018-19 Kuwaiti financial year, the Kuwait Ministry of Commerce and Industry was allocated 230 million Kuwaiti Dinar (AUD$1,092 million) to spend on food and construction material subsidies (State of Kuwait Ministry of Finance Budget Public Affairs, 2018, p. 9). According to the Kuwait Ministry of Commerce and Industry, nearly 2.12 million people benefit from the government's subsidised food program (Times Kuwait, 2019).

In Qatar the Widam Food Company (Widam) (2019) has a contractual relationship with the Qatar Government to import Australian livestock and sell it to the Qatar market at a price fixed by the government. Under the contract between Widam and the Qatar Government, the government pays a certain amount of compensation to Widam for each kilogram of meat sold. In 2018 Widam received 565 Qatar Riyal (AUD$224 million) in compensation from the Qatar Government.

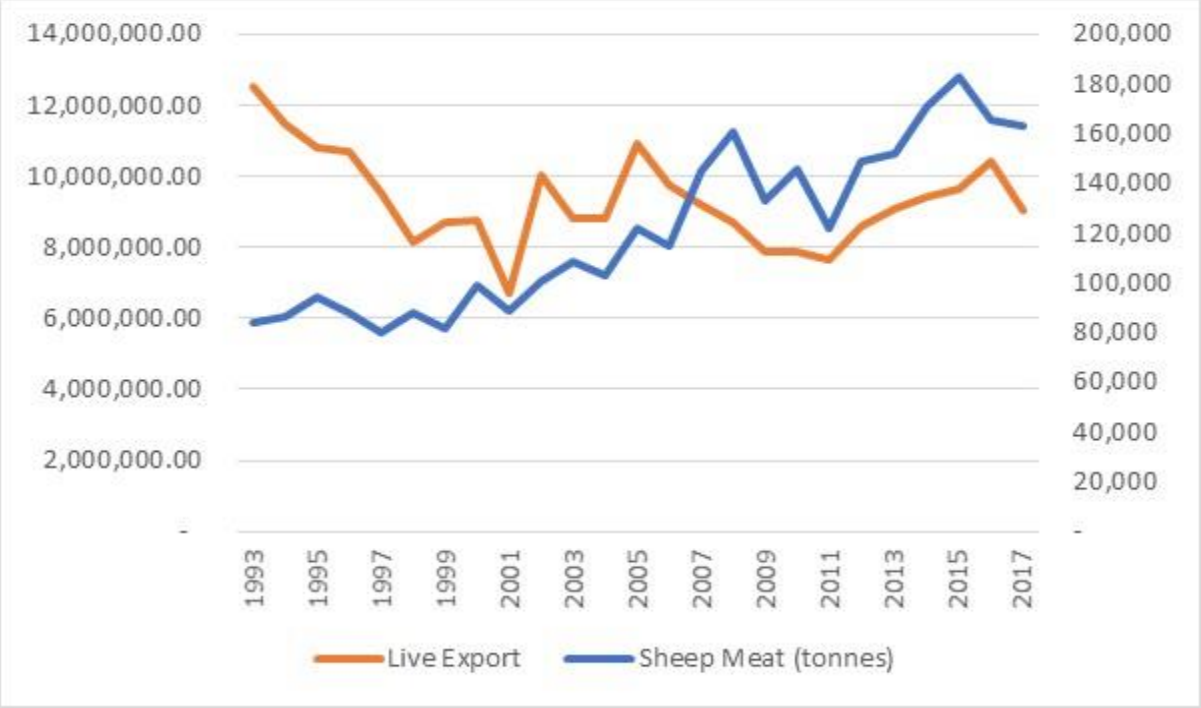
In order to ensure affordability, the UAE heavily subsidises food (Fischbach, 2018, p. 34), however, information on the provision of food subsidies across the seven emirates that makes up the UAE is scant. Oman reduced the level of food subsidies that it provided from 6.8 million Omani Rials (OMR) (AUD$25.5 million) in 2015 to 3.8 million OMR in 2016 (AUD$14.2 million) (Times News Service, 2017).

Although not a GCC country, Jordan is the fourth largest importer of Australian live sheep. Jordan is expected to spend some 216 million Jordanian Dinar (JD) (AUD$438.6 million) on food subsidies in 2020, rising to 228 million JD (AUD$463 million) in 2021 (International Monetary Fund, 2017, p. 45).

With reduced supply available from Australia, importing countries have switched to alternative suppliers including those located in North Africa, and in Eastern Europe (Keogh, Henry, & Day, 2016).

Since the early 1990s, GCC states along with Jordan have exhibited an increasing demand for processed sheep meat imports as live sheep imports have declined in trend terms, suggesting there is substitutability between processed sheep meat and live sheep imports. This is outlined in Figure 6 below.

Figure 6: Live Sheep and Processed Sheep Meat Imports to GCC States and Jordan – 1993 to 2017



Source: United Nations FAOSTAT database.

While GCC countries generally have zero tariffs applying to chilled meat, there is a 5 per cent tariff on frozen sheep meat and a 2.5 per cent tariff applying to ovine offal (Meat & Livestock Australia, 2018, p. 4). Jordan has a 12.5 per cent tariff on boneless chilled and frozen sheep meat. Unlike the live sheep export trade, processed sheep meat exports to GCC states and Jorden are not dependent on food subsidies and are often subjected to tariffs.

According to the Australian Meat Industry Council (AMIC) (2014, p. 6), there has been a continuous shift towards western-style dining across the Middle East region:

> *Thirty years ago the Middle East took close to 6 million head of live sheep and quantities of live cattle. This catered to the cultural and religious traditions of the region, lack of refrigeration and also reflected the level of sophistication and development at the time and traditional lifestyles.*
>
> *There has been a generational shift in the region over the past 15 years. … The younger generation is well educated, often in western schools and thus has adopted western lifestyles. This includes purchasing chilled and frozen meat from the large European-style supermarkets rather than buying livestock and having it killed at a local slaughterhouse.*

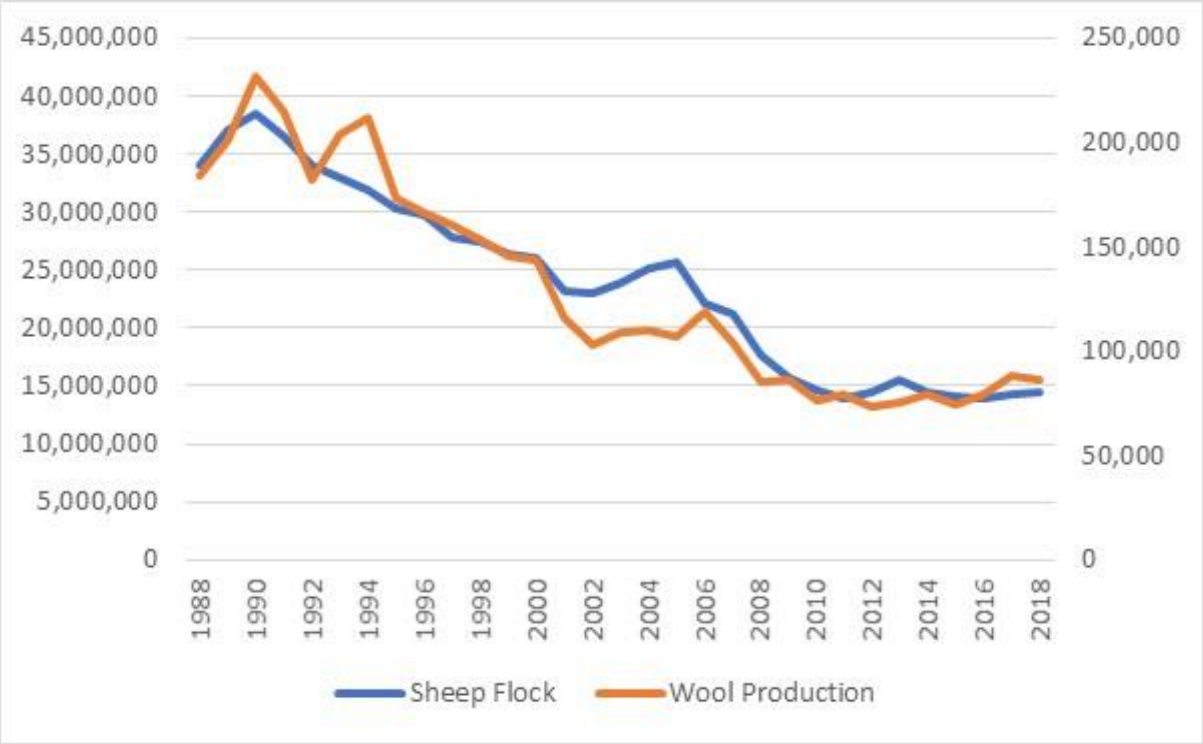
3.3 Relative Importance of the Live Sheep Export Trade to WA Sheep Farmers

Over the last 30 years, the WA sheep flock has undergone considerable structural change, having gone from a peak of 38 million sheep in 1990 to a current level of around 14.5 million.

Low wool prices following the collapse of the wool reserve price scheme in 1991 provided a long term incentive for farmers to switch from sheep to cropping (Department of Agriculture, 2019, p. 10). Hence, the fall in wool prices, coupled with rising grain prices, saw a shift towards cropping by many farms and an expansion of cropping in more marginal areas (Dahl, Leith, & Gray, 2013, p. 207).

The decline in WA wool production largely tracks the decline in the WA sheep flock as outlined in Figure 7 below.

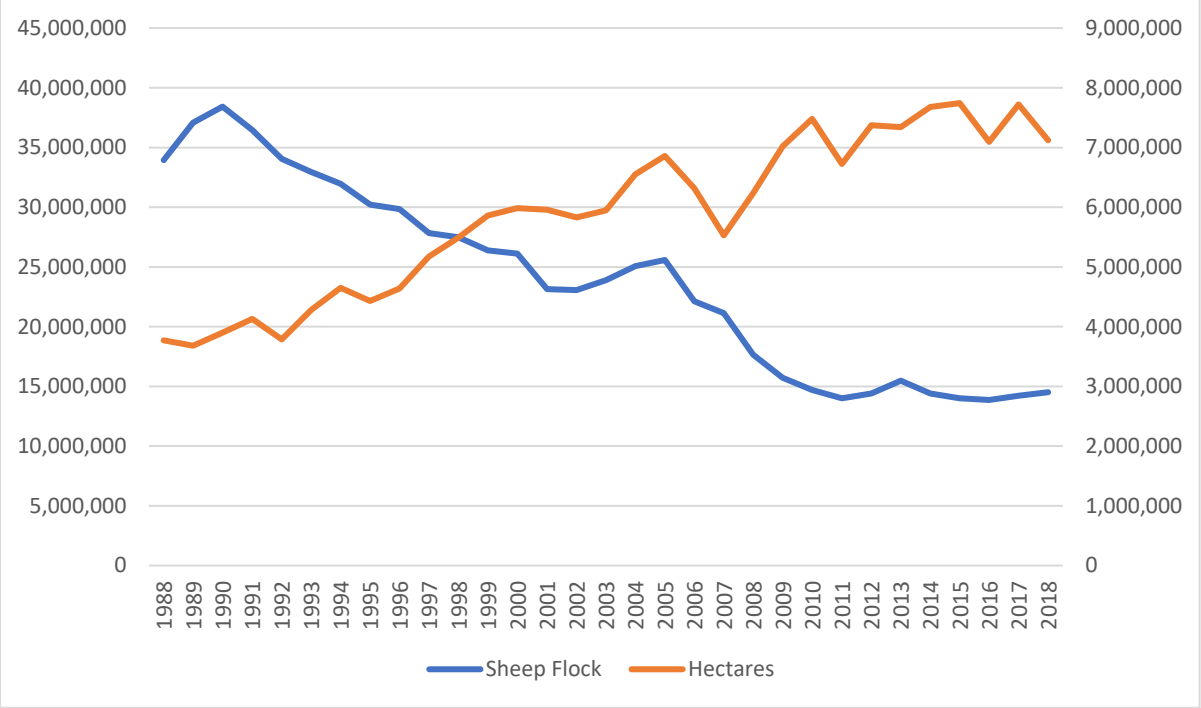
Figure 7: WA Sheep Flock Numbers and WA Wool Production (tonnes)



Sources: ABS (2019; 2020a).

The inverse relationship between the declining WA sheep flock and the trend increase in the number of hectares devoted to wheat, barley and canola production in Western Australia is outlined in Figure 8 below. It is worth noting the amount of land devoted to wheat, barley and canola production can be influenced year-to-year by climatic conditions such as drought and commodity prices.

Figure 8: WA Sheep Flock Numbers and WA Hectares Devoted to Wheat, Barley and Canola Production – 1988 to 2018

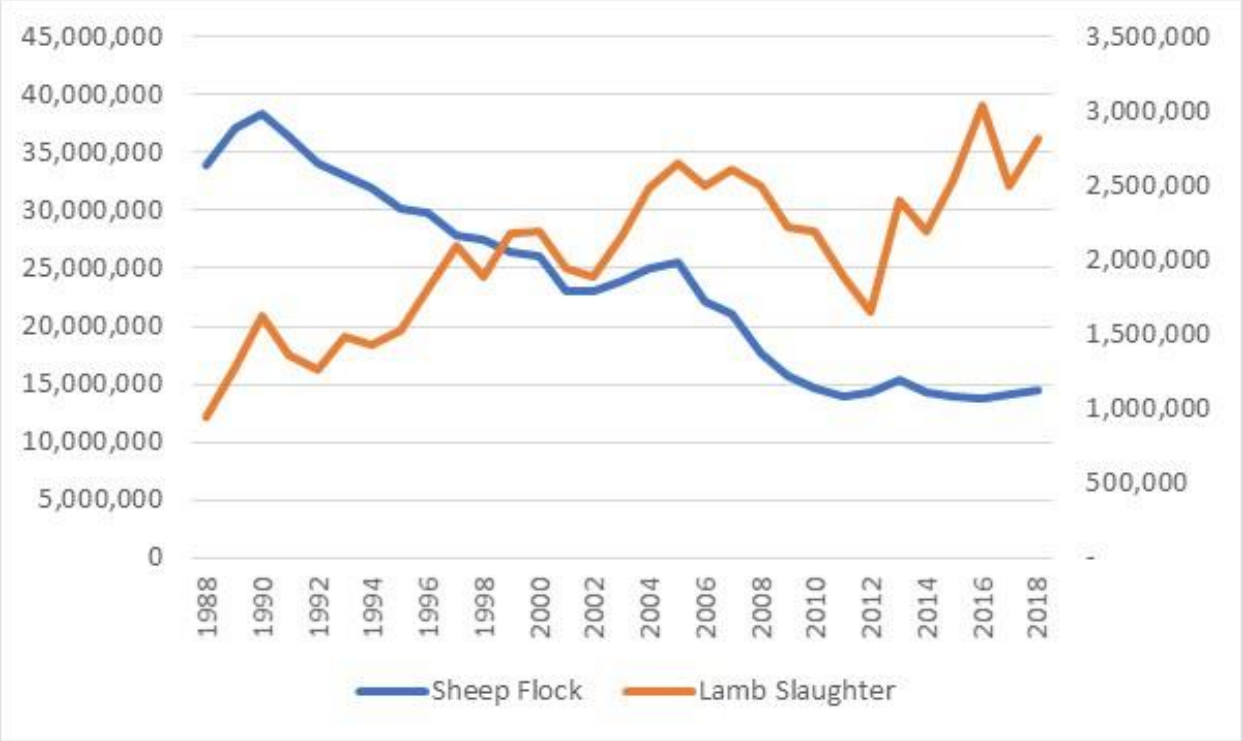


Sources: ABS (2013; 2019).
Note: Canola only included from 1998 but was not a significant broadacre crop before that time.

Since the 1990s, the WA sheep flock has undergone significant change in structure and composition (Department of Agriculture and Food Western Australia, 2016, p. 3). While wethers made up around 30 per cent of the WA sheep flock during the early 1990s (Australian Bureau of Statistics, 1994), this has declined to a current level of around 7 per cent (Pritchett, 2019, p. 4). In 1990 breeding ewes made up 34.1 per cent of the WA sheep flock (Australian Bureau of Statistics, 1994), which had increased to 55.6 per cent in 2018 (Australian Bureau of Statistics, 2019). Low wool prices in the early 1990s reduced the importance of wethers relative to that of ewes and lambs (Pritchett, 2019, p. 4).

While lamb slaughter was negligible 30 years ago, it has now become a significant aspect of production for the WA sheep industry (Pritchett, 2019, p. 2). As the WA sheep flock continued to decline during the 1990s and 2000s, there was also a switch by many woolgrowers to prime lamb production that reduced the supply of merino wethers suitable for the live export trade (Keogh, Henry, & Day, 2016, p. 21). The decline of the WA sheep flock as the number of WA lamb slaughter increased is outlined in Figure 9 below.

Figure 9: WA Sheep Flock Numbers and WA Lamb Slaughtering – 1988 to 2018

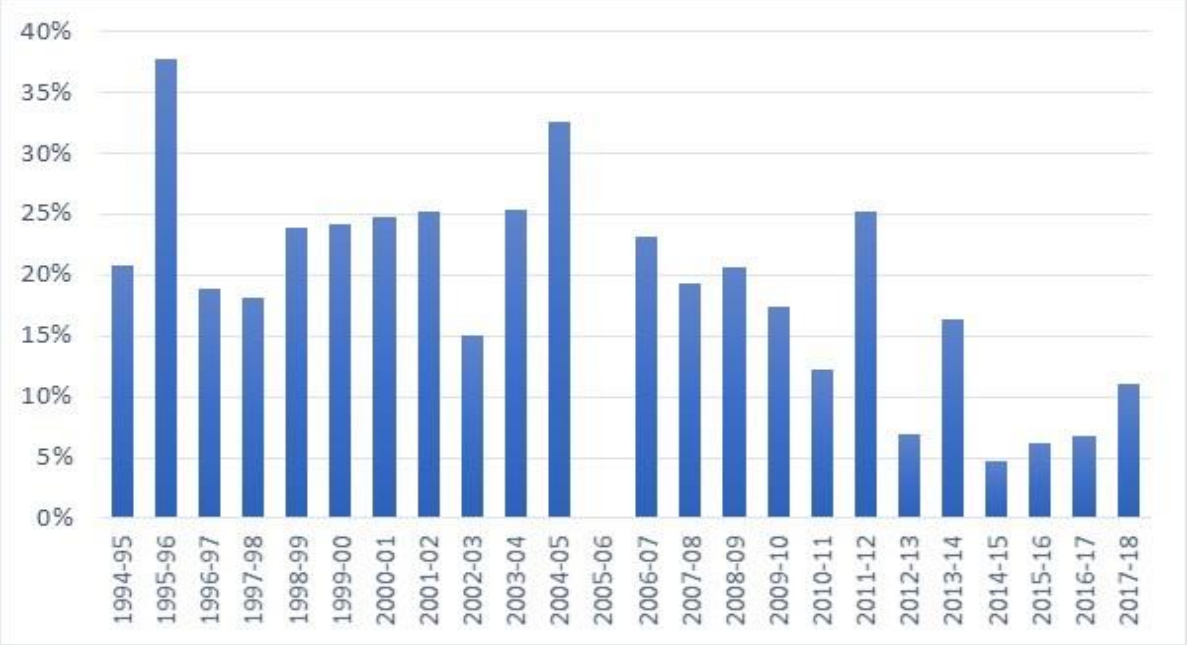


Sources: ABS (2019; 2020a).

With the decline of the live sheep export trade, the relative significance of the trade for WA sheep farmers has also diminished. Even in the case of WA specialist sheep farmers, the sale of sheep to the live export trade now only makes up only a relatively minor part of their enterprise. The relative decline in the percentage of sheep sales by WA mixed and specialised sheep farmers to the live sheep export industry is outlined in Figures 10 and 11 below.[13]

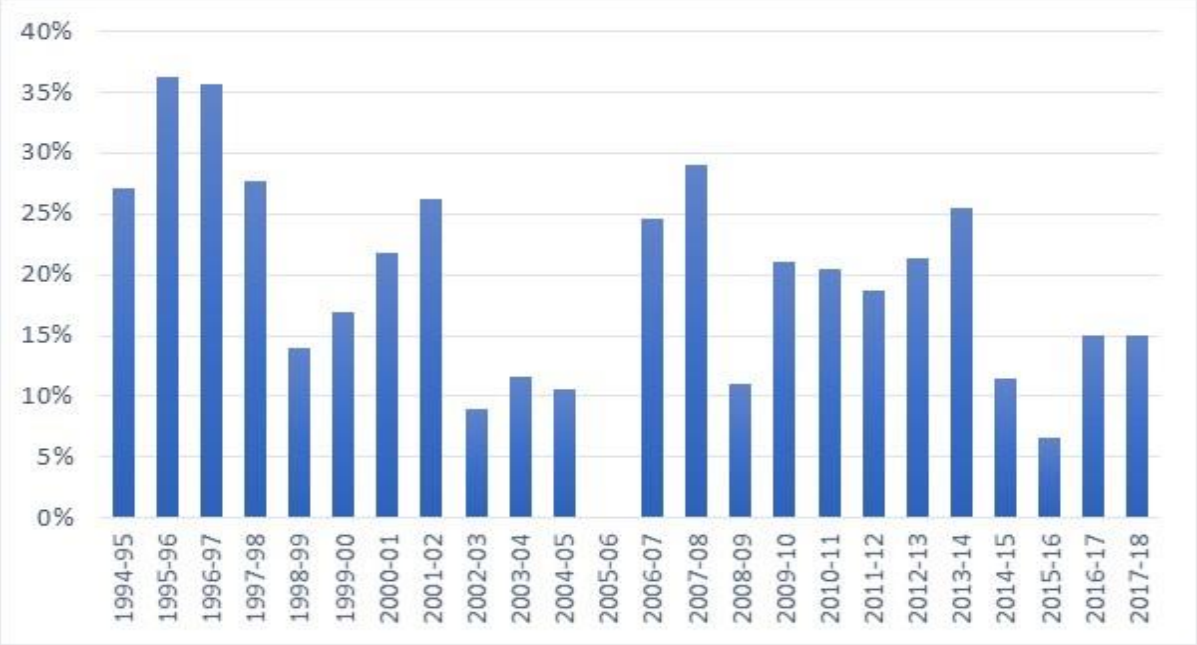
[13] A specialist sheep producer is a sheep producer who earns more than 50 per cent of receipts from the sale of sheep, lambs or wool (Australian Bureau of Agricultural and Resource Economics and Sciences, 2019a). All sheep producers who do not meet this criterion are classified as nonspecialist sheep producers.

Figure 10: Percentage of Total Sheep Sales by WA Mixed Sheep Farmers to Live Sheep Exporters – 1994-95 to 2017-18



Source: ABARES (2019).

Figure 11: Percentage of Total Sheep Sales by WA Specialist Sheep Farmers to Live Sheep Exporters – 1994-95 to 2017-18



Source: ABARES (2019).

In the 10 year period from 2007-08 to 2017-18, total sheep sales (minus the sale of prime lamb) constituted only 28.1 per cent on average of WA specialist sheep farmers' total cash receipts, while it was only 8.5 per cent for WA mixed sheep farmers (Australian Bureau of Agricultural and Resource Economics and Sciences, 2019a). Based on 2017-18, sales to the live sheep export industry represent

only around 5 per cent of total cash receipts for WA specialist sheep farmers and around 1½ per cent for WA mixed sheep farmers.[14]

4. Economic Impacts Associated with the Live Sheep Export Trade

4.1 Do Live Sheep Exports Underwrite Farm Gate Prices?

It has been long contended that the live sheep export trade underwrites farm gate prices for sheep in Western Australia. According to the Centre for International Economics (CIE) (2014, p. 6) in a report commissioned by the Wool Innovation Council:

> *It has been widely recognised that the export of live sheep underwrites the saleyard price of lambs and sheep nationally, and in particular Western Australia …*

Similarly, the Sheepmeat Council of Australia (2012) has commented:

> *The live export trade also underpins sheep prices received throughout the domestic markets in Australia.*

Mecardo (2018) claimed that a ban on the live sheep export trade would result in a fall in lamb and sheep prices of between 18-35 per cent and a loss to WA sheep farmers in the range of $80 to $150 million. The Mecardo (2018) report claimed that its results were driven by:

> *… analysis of the historic relationship between WA slaughter levels and the average weighted WA sale yard price achieved for trade lamb and mutton sales…*

According to the Department of Agriculture (2019, p. 36), Mecardo appear to have reached these results by assuming that WA sheep slaughter determines the state's export prices of mutton and lamb, rather than prices being determined in world markets.

Despite this observation, the Department of Agriculture (2019, p. 12) has also supported the claim that live sheep exporters underwrite sheep prices by suggesting that:

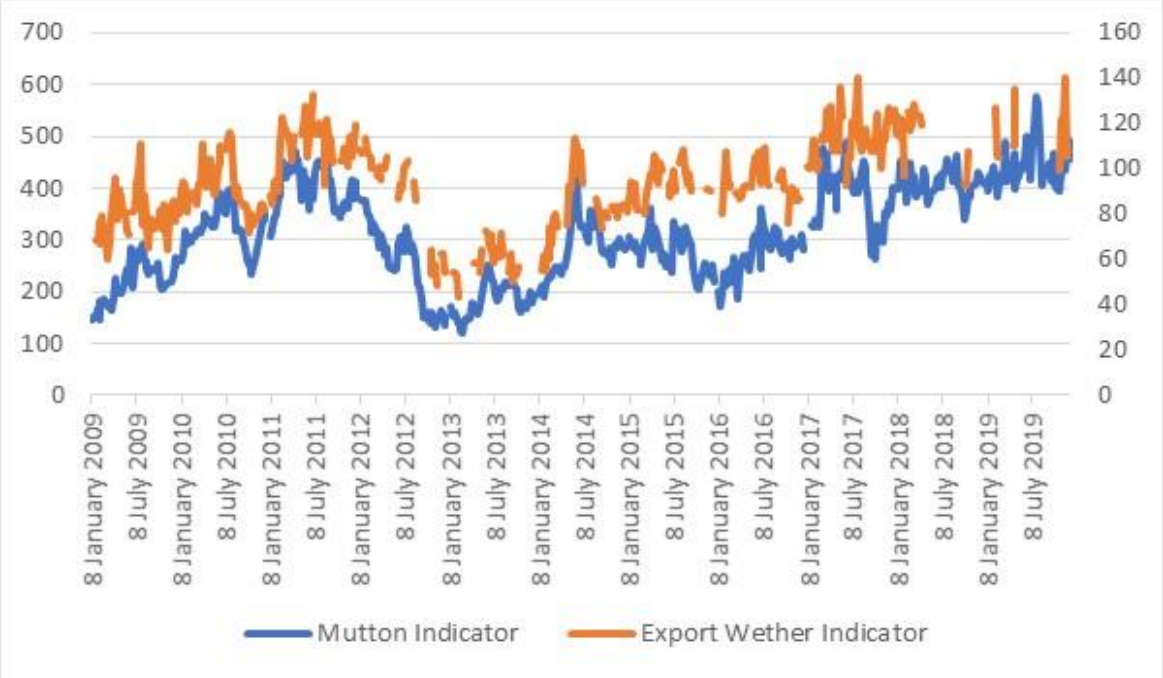
> *… fewer buyers are present in WA sheep markets compared to eastern Australian states, and the competition provided by the live export market provides a relatively stable price floor for WA producers.*

The Department of Agriculture failed to explain exactly how this supposed 'relatively stable price floor' provided by live sheep exporters actually operates or provide any evidence for its existence. If this contention were true, mutton prices would be relatively stable when live sheep exporters were in the market and prices would fall when live sheep exporters were not active. This is demonstrably not the case.

A comparison of the WA mutton indicator and the export wether indicator provided in Figure 12 below, reveals variations in the mutton indicator price whether or not live sheep exporters are in the market and does not demonstrate a consistent collapse in prices when live sheep exporters are absent. The WA mutton indicator price can move both up and down in the absence of live sheep exporters, implying that something else is actually driving WA sheep prices.

[14] Based on ABARES (2019a).

Figure 12: Weekly WA Mutton Indicator Price (cents per kg carcase weight (cwt)) and Weekly Export Wether Indicator ($ per Head) – January 2009 to December 2019



Source: Meat & Livestock Australia (MLA).
Carcase weight (cwt) refers to carcase weight, the weight of the animal's carcase following the removal of head, feet, skin and internal organs (Meat & Livestock Australia, 2019).

The concept of the *Law of One Price* (LOP) relates to the impact of market arbitrage and trade on the prices of identical commodities that are exchanged in two or more different geographical markets (Persson, 2008). In an efficient market there must be, in effect, only one price of such commodities regardless of where they are traded. If the price of a product is different in two different markets, then an arbitrageur will purchase the asset in the cheaper market and sell it where prices are higher in order to generate a profit.

The LOP does not imply that prices in two separate geographical locations should be identical, just that any price differential should reflect transport and transaction costs. Transaction costs can be divided up into three main categories:

- information costs that arise *ex ante* to an exchange and include the costs of obtaining price and product information and the costs of identifying suitable trading partners
- negotiating costs involved in undertaking the transaction and may include commission costs, the costs of physically negotiating an exchange and the costs of formally drawing up contracts
- monitoring or enforcement costs that occur *ex post* to a transaction and are the costs ensuring that the terms of the transaction are adhered to by other parties to the transaction (Hobbs, 1997, p. 1083).

According to Lamont and Thaler (2003, p. 201), the logic as to why the law of one price must hold is simple: if the same asset is selling for two different prices simultaneously, then arbitrageurs will step in, correct the situation and make themselves a tidy profit at the same time. Despite the inherent logic surrounding the LOP, many studies fail to find significant support for the LOP in commodity markets (Pippenger & Phillips, 2008, p. 915). However, Pippenger and Phillips (2008, p. 924),

conclude that once pitfalls in previous studies are accounted for, there is no empirical evidence that would lead them to reject the law of one price in commodity markets. Those pitfalls are:

1) using retail prices
2) omitting transportation costs
3) ignoring time
4) not using identical products.

Despite its contention that live sheep exporters somehow provide a price floor for WA sheep prices, the Department of Agriculture (2019, p. 45) also appears to implicitly accept the LOP, as the following comment infers:

> *The amount sheep prices in Western Australia can fall is limited by alternatively transporting sheep and lambs to Australia's eastern states for processing.*

Similarly, Mecardo and Strategis Partners (Herrmann, Dalgleish, & Agar, 2017, p. 69) have observed:

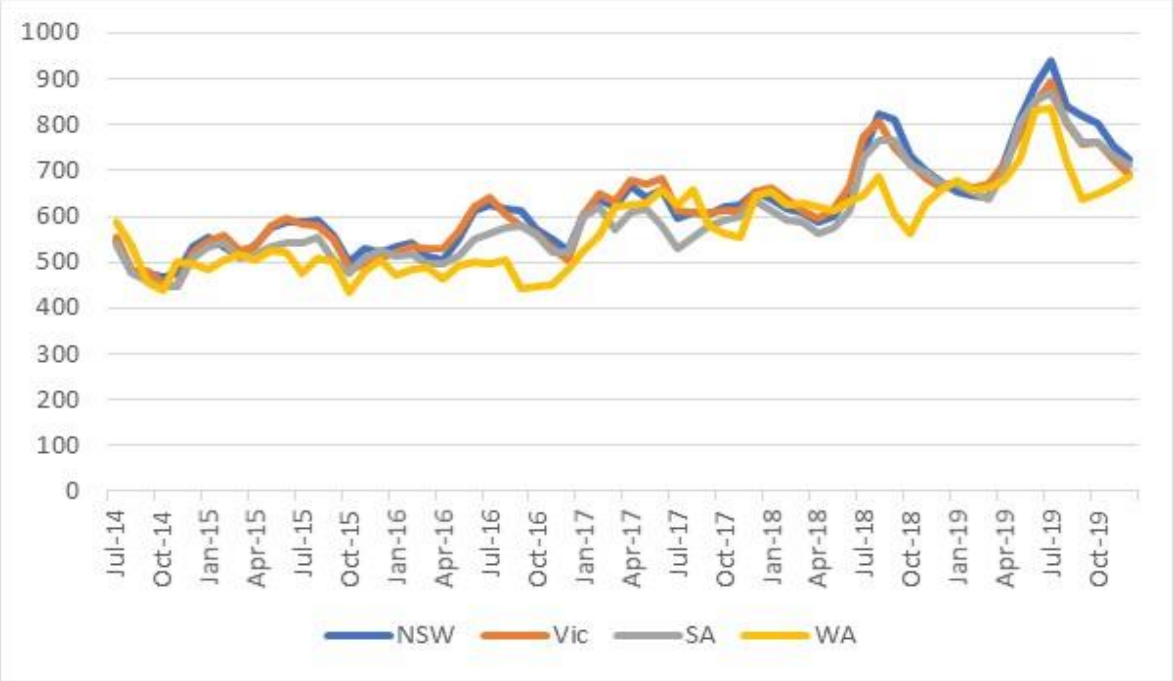
> *While east coast buyers are opportunistic operators in WA when prices including freight are below East Coast prices, they do however perform a valuable service providing purchasers and a floor price in sheep sales.*

The LOP suggests that prices received by sheep farmers in different regions of Australia should be closely related. As a test of this general proposition, monthly WA saleyard indicator prices for lamb and mutton with its very high exposure to the live sheep export trade, have been compared to those in South Australia and Victoria with varying degrees of exposure to the live sheep export trade and New South Wales (NSW), which has virtually no exposure to the live sheep export trade. In the period from July 2014 to December 2019, WA accounted for almost 87 per cent of live sheep exports, South Australia for almost 12 per cent, Victoria for 1 per cent and NSW 0 per cent.[15]

If the contention the live sheep export trade underwrites sheep prices is true, then the prices paid at saleyard auctions for sheep in Western Australia with its high exposure to the live sheep export trade should bear no relationship to saleyard auction prices in NSW with virtually no exposure. Trade lamb prices and mutton prices for NSW, Victoria, South Australia and WA are provided in Figures 13 and 14 below.

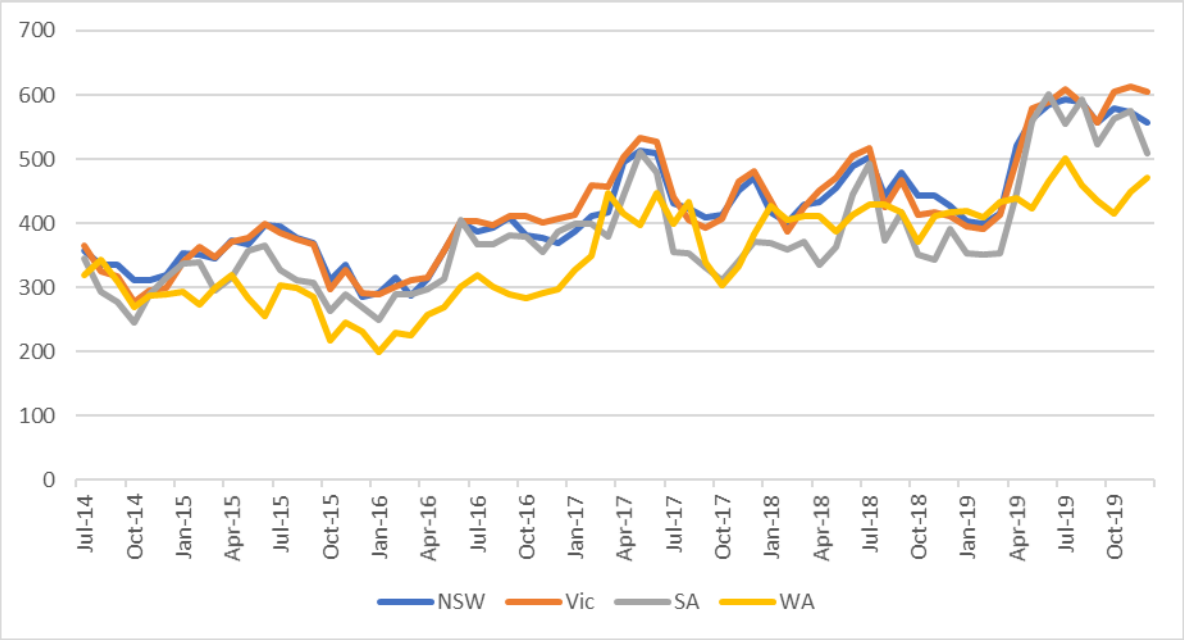
[15] Rounded up to the nearest whole number.

Figure 13: Monthly Trade Lamb Indicator Price for New South Wales, Victoria, South Australia and Western Australia (cents per kg cwt) – July 2014 to December 2019



Source: MLA.

Figure 14: Monthly Mutton Indicator Price for New South Wales, Victoria, South Australia and Western Australia (cents per kg cwt) – July 2014 to December 2019



Source: MLA.

Figures 13 and 14 reveals a close relationship between trade lamb and mutton prices across all four states. The correlation coefficient between trade lamb prices in NSW and WA was 0.83 and the coefficient of determination (r^2) was 0.68, while the correlation coefficient between mutton prices in

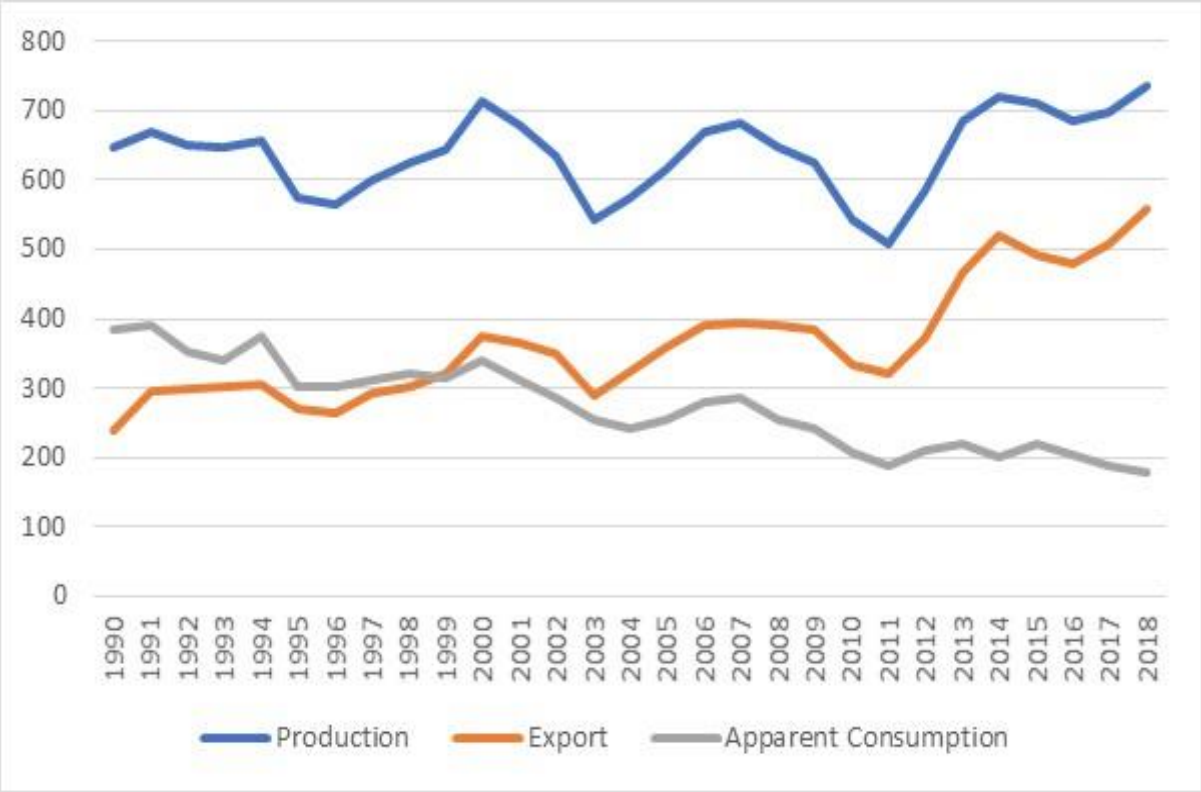
NSW and WA was 0.85 and the r^2 was 0.72.[16] The close relationship between trade lamb and mutton prices in NSW and WA was achieved despite the fact that NSW has virtually no exposure to the live sheep export trade.

As a further test of the LOP for trade lamb and mutton, WA prices have been econometrically modelled as a function of eastern Australian prices using dynamic ordinary least squares (DOLS) that yields a statistically valid relationship. Further details on the modelling are provided in the Econometric Appendix.

On the basis of visual, statistical and econometric evidence, it is concluded the LOP applies to sheep prices across Australia and thus there is no support for the contention the live sheep export trade underwrites domestic sheep prices or even provides a price floor. Rather than the live sheep export trade, this suggests that something else is underwriting sheep prices.

In light of the fact that Australia produces far more lamb and mutton than it consumes, as outlined in Figure 15 below, domestic mutton and lamb prices are far more likely to be determined by international commodity prices than by the live sheep export trade.

*Figure 15: Australian Supply and Use of Sheep Meat – 1990 to 2018 (kilotonne cwt)**



Source: ABARES (2019).

* Includes both lamb and mutton.

[16] Correlation refers to how closely two variables are related to each other. A correlation coefficient puts a value on the relationship and can range from 1 to -1. A "0" means there is no relationship between the variables, "-1" means there is a negative relationship (one goes up while the other one goes down, while "1" refers there is a positive relationship (they both increase or decrease in unison). A correlation coefficient of greater than 0.8 or less than -0.8 is generally referred to as a strong correlation. The coefficient of determination (r^2) is the square of correlation coefficient and gives the proportion of the variance (fluctuation) of one variable that is predictable from the other variable.

This analysis suggests that international commodity prices for lamb and mutton are underwriting farm gate prices paid for Australian sheep rather than prices paid by live sheep exporters. This is consistent with the views expressed by the Australian Competition and Consumer Commission (2007, p. iii):

> *The ACCC considers that saleyard prices for cattle and sheep are determined by a number of supply and demand factors. In both sectors international demand is a key influence on saleyard prices and may place a constraint on domestic stock, particularly high-quality stock. The quality of livestock sold through saleyards is also a key determinant of saleyard prices: the higher the quality of stock, the higher the price it can command in both export and domestic markets.*

Similarly, the Department of Agriculture (2015a, p. 26) has also commented:

> *The potential for red meat exporters to influence livestock prices is constrained because the prices received for these meats are largely determined in international markets. In 2014, 71 per cent of Australian beef, lamb and mutton (by volume) was exported. World prices are a major factor influencing the prices these buyers pay for domestic livestock.*

Since the effective curtailment of the live sheep export trade to the Middle East during the northern summer in 2018 and 2019, farm gate prices for WA sheep farmers have not crashed and the mutton sheep displaced from the live sheep export trade have found new export markets, predominately in China (discussed below). This contradicts assertions to the effect that the live sheep trade underwrites WA farm gate sheep prices or provides a price floor.

4.2 Do Live Sheep Exporters Pay a Price Premium?

It has been claimed that the live sheep export trade delivers a price premium to sheep farmers. While there is evidence to support this claim for some classes of sheep, the application of the price premium is more limited than these claims might imply.

According to research commissioned by Meat & Livestock Australia (MLA):

> *The most obvious benefit for producers of involvement in the live export trade is the price premium they receive. For sheep producers, the price of shippers has averaged around $50 per head over the last few years. The same sheep sold on the domestic market would average around $25 per head, perhaps even less. (Clarke, Morison, & Yates, 2007, p. 89)*

Similarly, the 2004 WA Meat Processing Taskforce (Lindner, et al., 2004, p. 16) observed that higher prices were received in terms of $/head for sheep heading for the live export trade as compared to those to be processed domestically.

The Sapere (Davey, 2013) report commissioned by the World Society for the Protection of Animals (now World Animal Protection) found there was evidence of a price premium for farmers selling heavy wethers to the live sheep export trade of around 57 c/kg carcase weight (cwt) in nominal terms.

Pegasus Economics (Davey & Fisher, 2018) undertook an analysis of auction price data from MLA saleyard reports from December 2014 to December 2017 comparing the prices paid by live exporters and by those paid by other purchasers when both live exporters and other purchasers procured sheep on the same day at WA saleyard auctions and found that while a price premium was paid by

live sheep exporters for wethers as compared to other purchasers, the price premium dissipated with the quality of the sheep. The analysis previously conducted by Pegasus Economics has been replicated for the purposes of this report with similar results obtained.

Fat score is the fat measurement on the carcase, based on the actual soft tissue depth at the Girth Rib (GR) site that is over the 12th rib of the sheep (Meat & Livestock Australia, 2017, p. 2). The Australian sheep meat industry uses a 1 to 5 point soft tissue/fat scoring system to describe body condition in sheep and lambs (Gaden, Duddy, & Irwin, 2005, p. 63). Each fat score represents a 5mm band width (Meat & Livestock Australia, 2017, p. 2). The fat scoring system is as follows:

- fat score 1 is very lean;
- fat score 2 is below average or lean;
- fat score 3 is average, ideal or prime;
- fat score 4 is above average or fat; and
- fat score 5 is very fat (AuctionsPlus Pty Limited, 2013, p. 7; Gaden, Duddy, & Irwin, 2005, p. 17).

Condition refers the amount of muscle and fat tissue that can be assessed over the skeleton (Gaden, Duddy, & Irwin, 2005, p. 17). The total amounts, and the relative proportions of each tissue, change as the animal moves from lean to fat condition. The actual soft tissue fat depth can be used as an indicator of condition. Thus, sheep fat scores are generally interchangeable with condition scores (Gaden, Duddy, & Irwin, 2005, p. 2).

Fat scores are used to identify sheep that are too lean or fat to travel. Very lean animals have little in reserve to handle additional stresses such as time off feed, drafting, trucking and adaptation to a strange diet and to new surroundings (Gaden, Duddy, & Irwin, 2005, p. 15). Very fat animals have been associated with higher levels of mortality, particularly in shipments of longer duration and when travelling from a cool to a hot climate (Gaden, Duddy, & Irwin, 2005, p. 16).

We generally found the price premium diminishes as the cwt increases and the fat score of the sheep moves up from 2 to 3, although there were a couple of minor exceptions. In general, it appears the heavier and better the condition of the sheep, the lower the price premium paid by live sheep exporters as compared to other purchasers. This is outlined in Table 1 below. Overall, this suggests the price premium paid by live sheep exporters is generally highest for sheep that are lighter and in worse condition, thus requiring further input in finishing them off to a level that would make them attractive to local processors. In the case of lambs over 16 kg cwt the price premium disappears altogether as live sheep exporters pay less on average for these sheep than other purchasers.

Table 1: Average Price Premium Paid by Live Sheep Exporters at WA Saleyard Auctions over Other Purchasers – January 2017 to December 2019 (c/kg cwt)

Category	cwt (kg)	Fat Score	Price Premium
Wether	18.1 - 24	2	19.7
Wether	18.1 - 24	3	37.2
Wether	24.1 +	3	15.7
Young Wether	14.1 - 18	2	62.0
Young Wether	14.1 - 18	3	38.3
Young Wether	18.1 - 24	2	23.9
Young Wether	18.1 - 24	3	10.5
Young Wether	24.1 +	3	2.5
Hogget	0 - 22	2	53.9
Hogget	0 - 22	3	59.5
Hogget	22.1 +	3	22.5
Lamb	12.1 - 16	2	49.5
Lamb	12.1 - 16	3	14.7
Lamb	16.1 - 18	2	-24.5
Lamb	16.1 - 18	3	-19.2
Lamb	18.1 - 20	3	-38.5

Data Source: Meat & Livestock Australia.

Based on crude approximations we have estimated the average price premiums for each of the three main categories of sheep that make up the live sheep export trade:

- 17.8 cents per kg cwt for adult wethers (i.e. wethers and young wethers), that translates to $4.16 per head[17]
- 48.2 cents per kg cwt for hoggets, that translates to $10.36 per head[18]
- 10.5 cents per kg cwt for lamb, that translates to $1.68 per head.[19]

A weighted average across the three main sheep categories suggests that live sheep exporters pay a price premium of almost 18.7 cents per kg cwt, that roughly translates to $4 per head.

At current export levels of around 1 million live sheep exported per annum, the cessation of the live sheep export trade would thus translate into a loss of around $4 million for WA sheep farmers from the loss of the price premium paid by live sheep exporters. This works out at around $936 per WA sheep farmer on average.[20] This represents a loss of less than 0.2 per cent of total cash receipts for

[17] Weightings for adult wethers based on WA saleyard auction data amended to increase their negatively skewed distribution so as to arrive at an average cwt for live export wethers with a fat score of 3 of 23.4 kg that converts to a liveweight of 52 kg.
[18] Weightings based on WA saleyard auction data with an assumed average cwt for live export hoggets with a fat score of 2 of 21.5 kg that converts to a liveweight of 50 kg.
[19] Weightings based on WA saleyard auction data with an assumed average cwt for live export lamb with a fat score of 2 of 16.1 kg that converts to a liveweight of 37.5 kg.
[20] Assumes 90 per cent of live sheep exports come from Western Australia and that there were 4,217 sheep farmers in Western Australia as per ABS (2019).

specialist sheep farms and less than 0.1 per cent of total cash receipts for mixed enterprise sheep farms.[21]

While the temporary cessation of the live sheep export trade would reduce overall demand to some extent as those seeking to procure sheep for live export will no longer participate in the market, the above analysis suggests the price impact will be greatest in relation to sheep that are lighter and in worse condition; in other words, those least attractive to local processors.

4.2.1 Is there Evidence of Price Premiums at the Aggregate Level?

To test the proposition as to whether the price premiums paid by live sheep exporters carry across over into other categories of sheep in WA saleyards, the econometric models developed for lamb and mutton prices discussed above in subsection 4.1 were extended for this purpose using intervention analysis. Full details on the testing are reported in the Econometric Appendix below.

The different indicator (or dummy) variables designed to account for the potential price impact of live sheep exporters on WA lamb and sheep prices had positive signs, implying that the presence of live sheep exporters in WA saleyards had a positive price impact. One of the dummy variable specifications was statistically significant at the 10 per cent level for WA trade lamb, and 1 per cent for light lamb and restocker/feeder lamb, while the other dummy variable specification was statistically significant at the 1 per cent level for WA mutton. These results suggest:

- the weekly presence of live sheep exporters throughout the month in WA saleyards raise the monthly price of WA restocker/feeder lamb by almost 52 cents per kg cwt as compared to the eastern states; that works out at $4.68 per head (in real 2018-19 prices) for a 9kg cwt lamb
- the weekly presence of live sheep exporters throughout the month in WA saleyards raise the monthly price of WA light lamb by 49.1 cents per kg cwt as compared to the eastern states; that works out at $7.37 per head (in real 2018-19 prices) for a 15kg cwt lamb
- the weekly presence of live sheep exporters throughout the month in WA saleyards raise the monthly price of WA trade lamb by 28.4 cents per kg cwt as compared to the eastern states; that works out at $5.68 per head (in real 2018-19 prices) for a 20kg cwt lamb
- the monthly presence of live sheep exporters in WA saleyards raises the monthly price of WA mutton by 24 cents per kg cwt as compared to the eastern states; that works out at $5.04 cents per head (in real 2018-19 prices) for a 21kg cwt mutton sheep.

However, neither dummy variable specification was statistically significant even at the 10 per cent level in relation to heavy lamb.

The econometric modelling was further extended to OTH sales to determine whether the participation of live sheep exporters in WA saleyards has any price impact that flows through into WA OTH sale prices as compared to NSW OTH sale prices. It was found there was no statistically significant impact. Further, while WA saleyards have delivered price premiums for mutton sheep on average around 20.4 cents per kg cwt higher than OTH sale prices over the 10 year period from 2009 to 2019, it was found that OTH WA sale prices for trade lamb have delivered a price premium on average 9.4 cents per kg cwt higher than WA saleyard prices over the same period (in real 2018-19 price terms).

On this basis, while there is evidence to suggest that live sheep exporters do have a statistically significant positive upward impact on WA sheep prices at saleyards relative to the eastern states

[21] Based on total cash receipts for 2017-18 from ABARES (2019a).

except for heavy lamb, this impact does not extend over to OTH WA sale prices. Based on the last week in which live sheep exporters were active in WA saleyards in December 2019, this suggests a price reduction in the order of 4.4 per cent for trade lamb, up to 9.4 per cent for restocker/feeder lamb for WA saleyard prices (in real 2018-19 price terms) as compared to prices in the eastern states when the live sheep exporters are absent.

4.3 What Happened with the Temporary Suspension of the Live Sheep Export Trade?

According to the Department of Agriculture (2019, p. 42):

> *The impact of a cessation of live exports on price is most apparent when relative prices are reviewed between eastern and Western Australia. WA saleyard lamb prices are usually lower than prices in Australia's eastern states. Over the 5 years from 2013 to 2017, WA trade lamb prices averaged 12% lower than eastern states prices in both September and October. In 2018, this discount for trade lamb prices in Western Australia widened to an average of 28% lower in September and 20% lower in October. In 2019, WA trade lamb prices were 20% and 18% lower in September and October when compared to the eastern states.*

The results of the modelling that we have undertaken suggests that there is evidence that live sheep exporters have a statistically significant positive upward impact on WA sheep prices across the board, consistent with the above statement. On this basis, there is likely to be some modest downward price impact associated with any temporary cessation of the live sheep export industry on WA sheep prices.

Concerns arise that with the partial or even complete curtailment of the live sheep export industry, that meat processors will struggle to find additional new markets for the sheep displaced from the loss of the trade. Presumably those markets would be export markets as Australians consume far less lamb and mutton than we produce as previously discussed above.

This concern, however, ignores the positive economic effects of increased slaughter rates and exports of sheep meat to other markets that have been achieved subsequent to the temporary cessation of the live sheep export trade since 2018.

With the effective curtailment of the live sheep export trade to the Middle East during the northern summer in 2018 and 2019, there has been a sharp increase in the slaughter of mutton sheep in trend terms, while there has been no discernible change in the slaughtering of lamb associated with the curtailment. This is outlined in Figure 16 below.

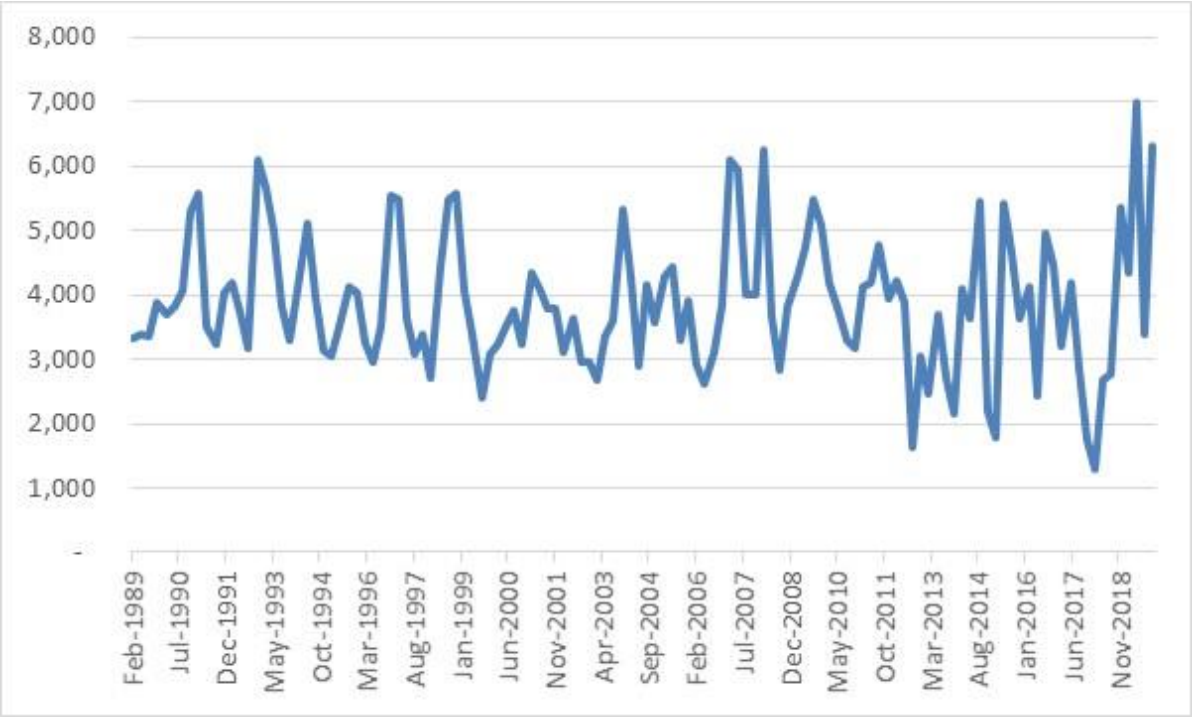
*Figure 16: Monthly Slaughtering of Mutton and Lamb in Western Australia – January 2009 to November 2019 ('000) in Trend Terms**

Source: ABS (2020a).

* Trend estimates are produced by smoothing noise from the seasonally adjusted estimates and is the best indicator of underlying behaviour for month-to-month changes (Australian Bureau of Statistics, 2012).

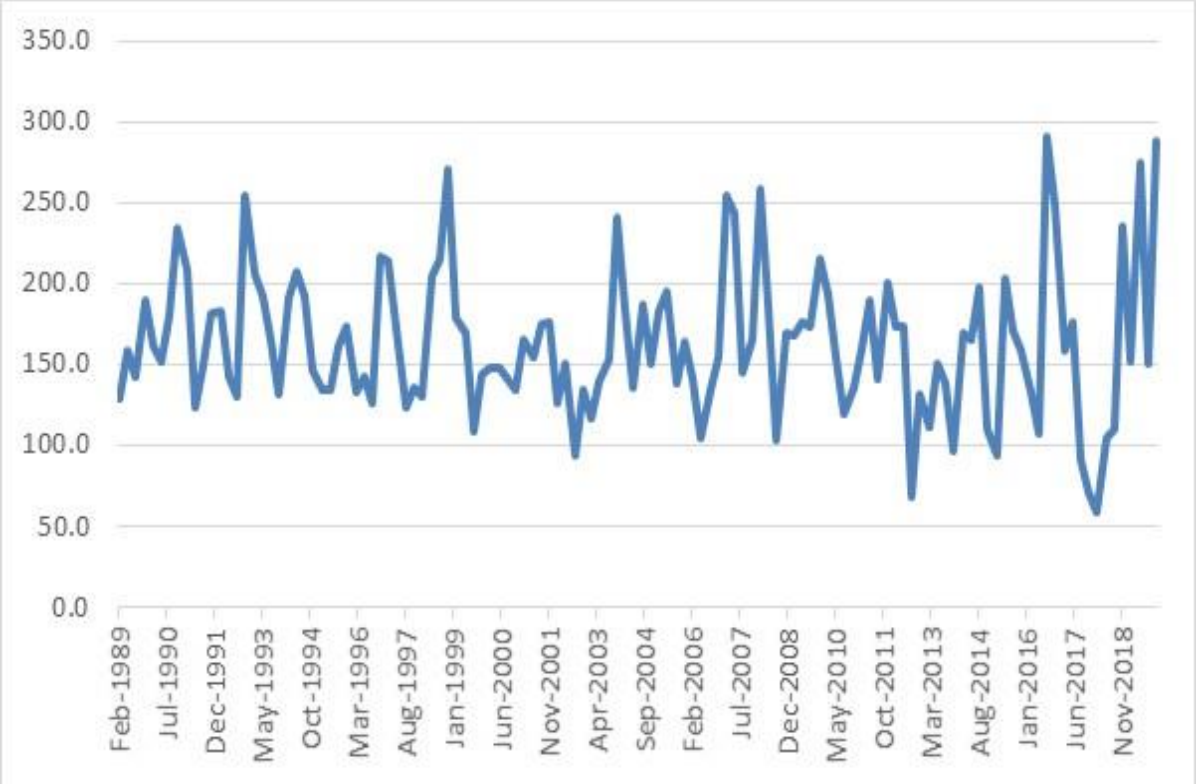
With the increase in the slaughter of mutton sheep, full time employment in the WA meat processing sector has recently reached record levels while total hours worked is only just below the record levels set during the winter of 2016 when the slaughter of lamb peaked. This is outlined in Figures 17 and 18 below.

Figure 17: Full-Time Employment in the WA Meat Processing Industry – February 1989 to November 2019 ('000)



Source: ABS (2019a).

Figure 18: Total Hours Worked in the WA Meat Processing Industry – February 1989 to November 2019 ('000 hours)

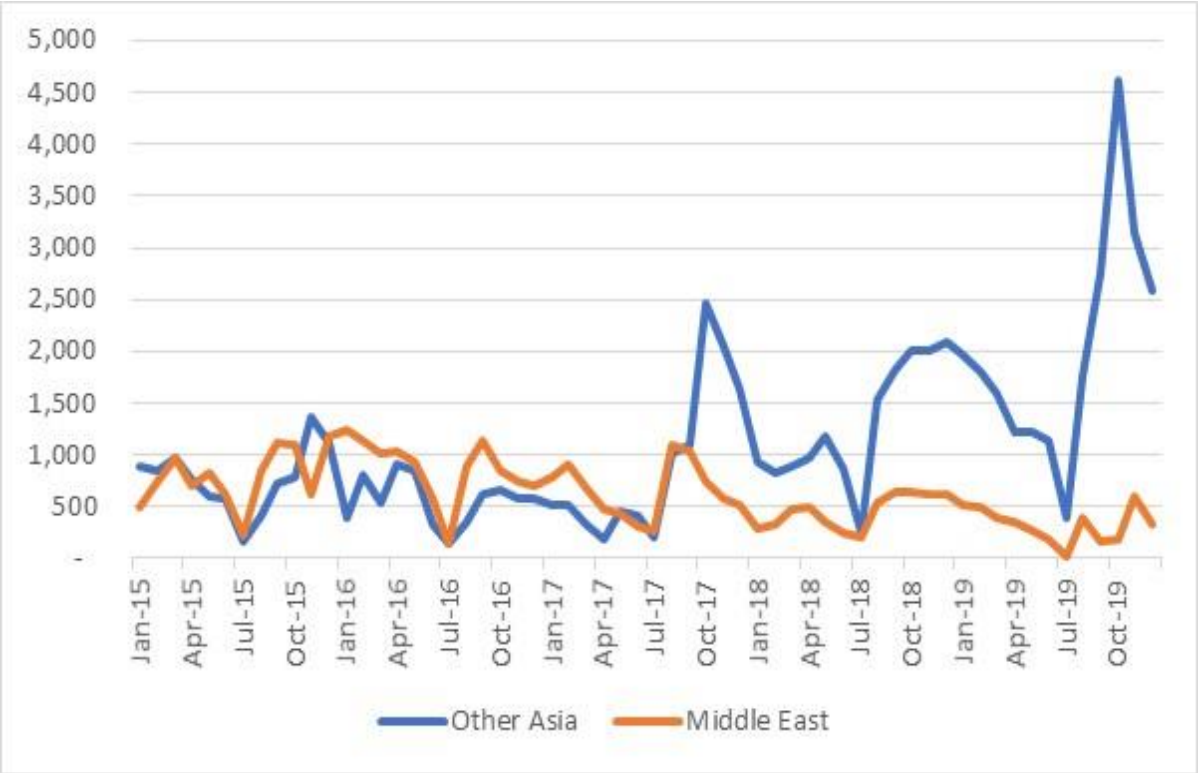


Source: ABS (2019a).

The average level of total employment in the WA meat processing sector increased by 2,300 jobs, from an average of 3,400 jobs in 2017 and 2018, to 5,700 jobs in 2019.[22]

Monthly WA mutton exports have increased since the effective curtailment of the live sheep export trade to the Middle East during the northern summer in 2018 and 2019, with the category of 'other Asia' (predominantly China) absorbing most of the additional product. This is outlined in Figures 19 and 20 below.

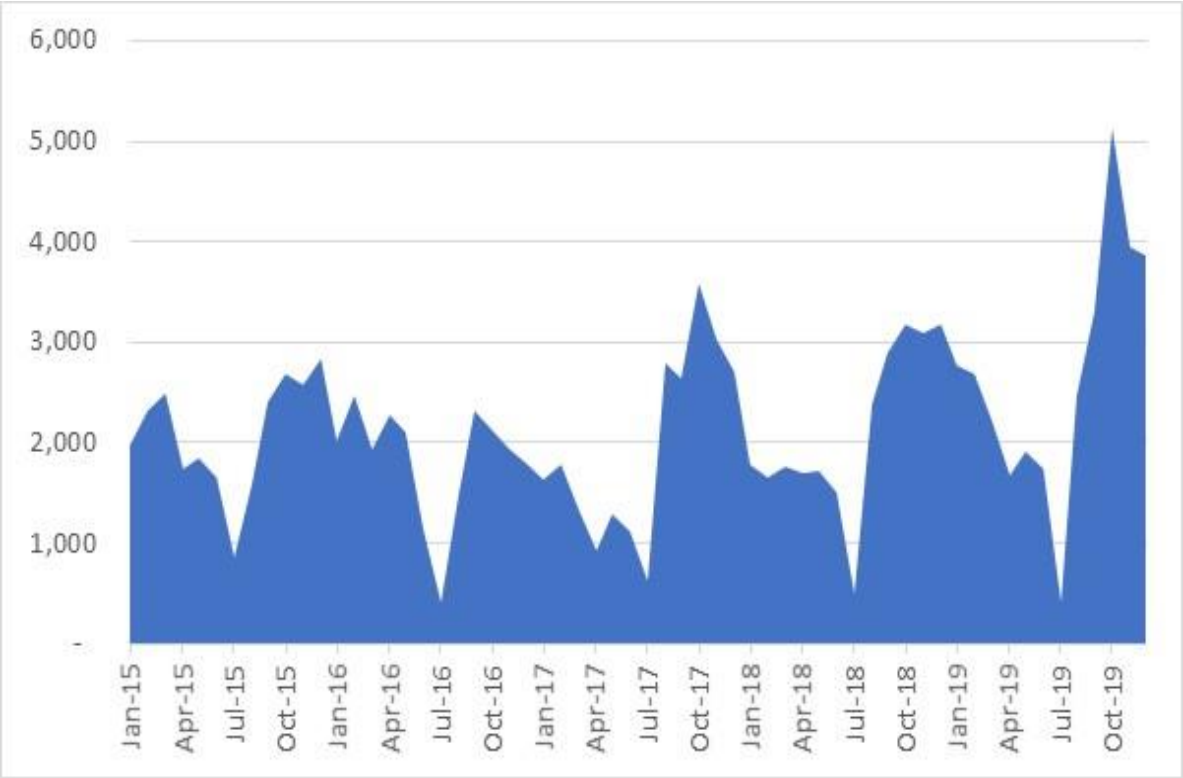
Figure 19: Monthly WA Mutton Exports to the Middle East and 'Other Asia' – January 2015 to December 2019 (tonnes shipped)



Source: Department of Agriculture, Fisheries and Forestry red meat export statistics from 2015 to 2019.

[22] See ABS (2019a).

Figure 20: Monthly WA Total Mutton Exports – January 2015 to December 2019 (tonnes shipped)



Source: Department of Agriculture, Fisheries and Forestry red meat export statistics from 2015 to 2019.

4.4 Fiscal Sustainability of Middle East Food Subsidies

The capacity of live sheep exporters to pay a price premium at saleyard auctions is arguably directly linked to the provision of food subsidies provided by recipient countries that in turn artificially increases demand for Australian live sheep exports and enables them to pay above market rates to procure sheep. According to the Department of Agriculture (2019, p. 14):

> *Many countries in the Middle East that import live sheep have historically subsidised consumer prices for food staples. Subsidies generally apply to live animal imports, to assist those countries' domestic meat processors, but not to imports of processed meat. A combination of food subsidies and lower labour costs for meat processing in the Middle East enable exporters to pay Australian farmers a premium for live sheep.*

The sustainability of such subsidies over the medium to longer term is in grave doubt.

It has been suggested the provision of food subsidies plays an important part in the social compact of many Middle Eastern states, especially those that are absolute monarchies. Eckart Woertz (2017) of the Barcelona Centre for International Affairs observed that:

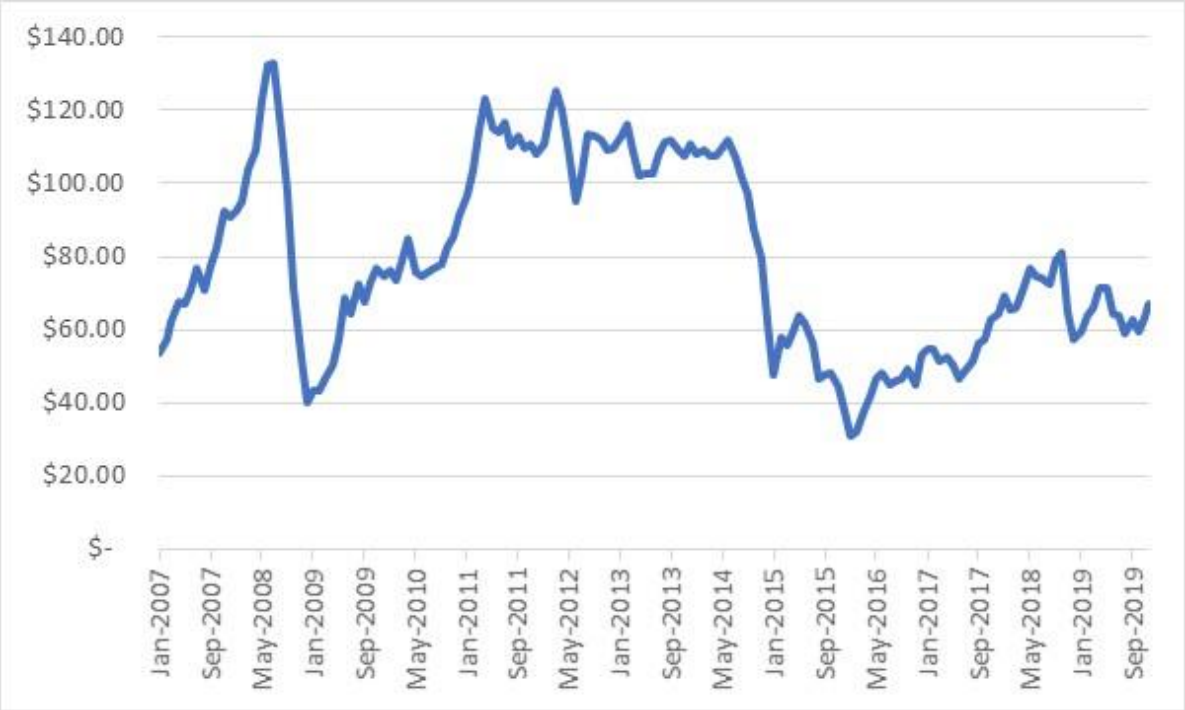
> *… the provision of water and other public services carries great weight in terms of political legitimacy in these states, especially those that are under authoritarian rule. Directly or indirectly financed by rents from resource extraction, they try to buy the consent of a general public that is excluded from political participation. Subsidies applied to water, food and energy are part and parcel of this social contract, alongside public sector jobs and health care services.*

The budgetary position of GCC states is heavily reliant on revenue from petroleum product exports, namely crude oil and natural gas. Oil rents have enabled the Gulf states to establish lucrative welfare systems to distribute wealth to their national population in exchange for political passivity; however, the Gulf states' economies have long been considered unsustainable in the long term (Nosova, 2018). This in turn leaves the Gulf states (and the beneficiaries of their subsidy schemes) vulnerable to any downturn in global energy markets. Gustav Boëthius (2011, p. 2) from the Middle East Institute at the National University of Singapore has previously warned:

> *A high reliance on oil and gas exports results in a heavy fiscal dependence on the global energy market. This market is particularly volatile and this volatility exposes the GCC economies to high levels of risk.*

Since peaking at around $US114 a barrel in June 2014, oil prices plummeted to just above $US30 a barrel in January 2016 before staging a modest recovery to current levels trading in the band of between $US60 and $US70 per barrel.[23] This is outlined below in Figure 21.

Figure 21: Brent Crude Oil Monthly Spot Price – January 2007 to December 2019 ($US per barrel)



Source: U.S. Energy Information Administration.

Multinational oil company BP (BP p.l.c., 2019) is predicting an inflexion point for world oil demand whereby it plateaus during the late 2030s and then begins to decline, driven by improvements in fuel efficiency in the average internal-combustion engine car, and increasing market penetration of electric vehicles. Similarly, an International Monetary Fund (IMF) Working Paper (Cherif, Hasanov, & Pande, 2017, p. 4) has predicted:

> *After examining recent developments in transportation and renewable energy as well as past technology transitions, we conclude that oil as the main fuel for transportation and a major energy source in general could have a much shorter life span than many assume. Like wood and coal in the past, a demand-driven switch away from oil could happen in not too distant a future. In our projection,*

[23] Based on the price of Brent (Europe) crude oil prices, a heavily traded crude oil price marker.

> *this switch could happen in the next 10 to 25 years as electric cars replace motor vehicles like motor vehicles displaced horses a century ago. Oil would lose its role as the main fuel for transportation.*

In turn, that IMF Working Paper (Cherif, Hasanov, & Pande, 2017, p. 30) has warned that a downturn in world oil demand would have serious implications for the fiscal position of major oil producing states:

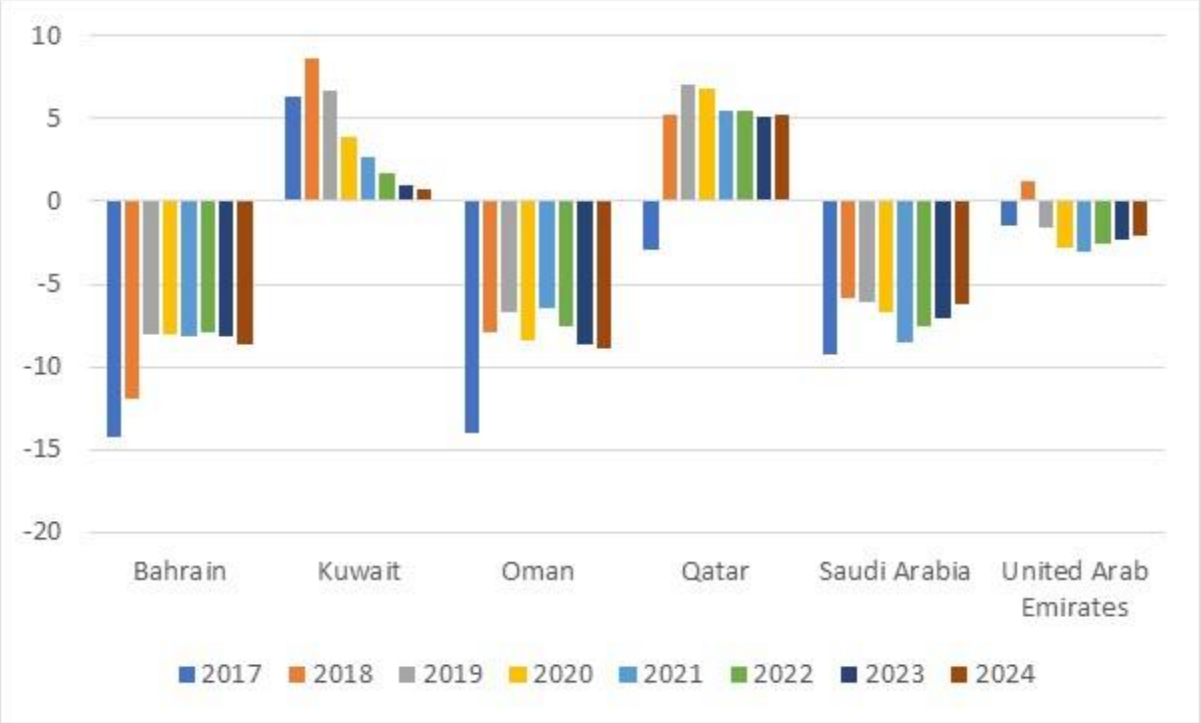
> *The transition away from oil has deep implications. The economic model of many oil exporting nations would not be sustainable in such a world. Even if one believes that the probability of such a future is low, the decline in oil revenues for many oil exporters would be so large that the expected loss would nevertheless be sizable. Such low oil prices would obviously have major implications on the macroeconomic stability, including fiscal sustainability, of these countries.*

The IMF (2019, p. 47) has observed the fiscal position of Middle East countries are already in a precarious state:

> *Fiscal balances have deteriorated sharply in most countries in the Middle East and Central Asia since the onset of the global financial crisis in 2008. The combined negative effects of low growth, shocks to oil prices, and rising spending needs, particularly in countries affected by the Arab uprisings, have resulted in diminished fiscal buffers and rising public debt burdens.*
>
> *Fiscal vulnerabilities have emerged despite recent consolidation efforts across the region.*

In turn this leaves a question mark over the capacity of Gulf states to maintain food subsidies over the medium and longer term given budgetary pressures with mounting budget deficits, especially in light of slowing and eventually contracting demand for oil. Of the Gulf states, only Qatar is in a relatively healthy fiscal position, Kuwait faces a deteriorating fiscal position while all the other states are running budget deficits A summary of the budget position of the GCC states is provided below in Figure 22.

Figure 22: Actual and Estimated Budget Balance for GCC States as a Percentage of GDP - 2017 to 2024*



Source: International Monetary Fund World Economic Outlook Database, October 2019.
* Refers to general government net lending/borrowing that is calculated as revenue minus total expenditure (International Monetary Fund, 2019a). This is a core Government Financial Statistics balance that measures the extent to which general government is either putting financial resources at the disposal of other sectors in the economy and nonresidents (net lending), or utilizing the financial resources generated by other sectors and nonresidents (net borrowing).

The future of food subsidies, and in turn, the ongoing ability of live sheep exporters to continue to pay price premiums for Australian sheep, is heavily dependent on the price received by GCC countries for their petroleum product exports. Slowing and eventually contracting demand for oil could curtail live sheep exports to GCC states altogether due to mounting fiscal pressures.

5. Considering the Options

5.1 Option 1

Option 1 presented in the RIS represents the regulatory status quo and does not prohibit any voyages; therefore the live sheep export trade could occur for all months of the Northern Hemisphere summer (Department of Agriculture, 2019, p. 25).

The World Organisation for Animal Health (2019) has defined animal welfare in the following terms:

> *Animal welfare means the physical and mental state of an animal in relation to the conditions in which it lives and dies.*
>
> *An animal experiences good welfare if the animal is healthy, comfortable, well nourished, safe, is not suffering from unpleasant states such as pain, fear and distress, and is able to express behaviours that are important for its physical and mental state.*

> *Good animal welfare requires disease prevention and appropriate veterinary care, shelter, management and nutrition, a stimulating and safe environment, humane handling and humane slaughter or killing. While animal welfare refers to the state of the animal, the treatment that an animal receives is covered by other terms such as animal care, animal husbandry, and humane treatment.*

According to Mike Radford (2001, p. 261), a Lecturer in Law at the University of Aberdeen, animal welfare involves both a duty to not be cruel and a duty to promote the welfare of an animal:

> *[Welfare] involves taking account of influences which may be either positive or negative, while cruelty is concerned only with treatment that is deleterious. This distinction is reflected in the thrust of public policy. On the one hand, the intention is to prevent cruel treatment by proscribing particular forms of behaviour. On the other, the aim is to promote improved standards of welfare by identifying those matters which are important to animals, and translating these into rules, guidance, and advice, to which those responsible for their care are required to have due regard.*

Sentience is the power of sense perception or sensation, or consciousness (Turner, 2006, p. 6). If an animal is 'sentient', it is capable of being aware of its surroundings, of sensations in its own body, including pain, hunger, heat or cold and of emotions related to its sensations. It is aware of what is happening to it and its relations with other animals, including humans. Over the last 40 years, scientific opinion has moved sharply to agree that animals are indeed sentient beings (D'Silva, 2006, p. xxi).

Many societies now accept animal sentience implicitly or explicitly in their legal systems (Turner, 2006, p. 9). Many of the laws and regulations for the protection of animals (apart from those concerned merely with conservation of species) clearly assume that at least all vertebrate animals (mammals, birds, fish, etc.) can experience suffering from a variety of causes, for example from pain, discomfort, hunger, as well as fear, anxiety and frustration. In this regard, the Australian Standards for the Export of Livestock (ASEL) and the Exporter Supply Chain Assurance System (ESCAS) overseen by the Department of Agriculture (2019, p. 64) are an attempt to promote animal welfare from the sourcing of livestock for export through to slaughter in the importing country.

The primary concern of the Department of Agriculture (2019, p. 35) in regard to option 1 appears to relate to the risk of a recurrence of another animal welfare incident that in turn jeopardises the entire future of live sheep export industry through the loss of its social licence to operate:

> *The biggest impact of option 1 would arise if a welfare event occurred that generated significant public and political pressure against the trade. The consequence of this could place further restrictions on exports (than proposed in options in this RIS) and, in the worst case scenario, lead to the end of the trade. Further restrictions could have the same outcome as the worst case scenario by rendering live sheep exports uneconomical.*

The term social licence to operate is a shorthand way to describe the latitude that society allows its citizens to exploit the resources for their private purposes (Martin & Shepheard, 2011, p. 5). Originally used to describe the social acceptability of mining operations, the term has since been applied to explore the broad acceptance that communities and other stakeholders provide to the activities of the forest, agriculture and energy sectors (Moffat, Lacey,, Zhang, & Leipold, 2016, p. 89).

A social licence to operate means that if industry violates community expectations about how it ought to operate, it is within the power of society to harm industry by a variety of means including legal constraints and market penalties such as consumer boycotts (Martin & Shepheard, 2011, p. 5). The farm sector faces similar challenges to other resource use industries such as mining or oil production as it requires access to natural resources, and the community has the power to reduce or place conditions on that access.

Concerns expressed by the Department of Agriculture that the pursuit of option 1 could place in jeopardy the entire future of the live sheep export industry through the loss of its social licence to operate appear well founded based on history.

5.2 Option 2

Option 2 involves the implementation of a prohibition on live sheep exports from 1 June to 14 September with additional prohibited periods for Qatar and Oman. According to the Department of Agriculture (2019, p. 39), restricting live exports along the lines of option 2 would have two distinct market impacts:

1. A decline in world sheep meat prices due to an increase in sheep meat supply out of Australia.
2. A decline in domestic saleyard/direct sale prices due to an increase in the supply of sheep for slaughter into the domestic processing market and the removal of a source of competition for meat processors (that is live export) and therefore increased processing costs.

In relation to the ramifications on world sheep meat prices of option 2, the Department of Agriculture (2019, p. 39) has suggested:

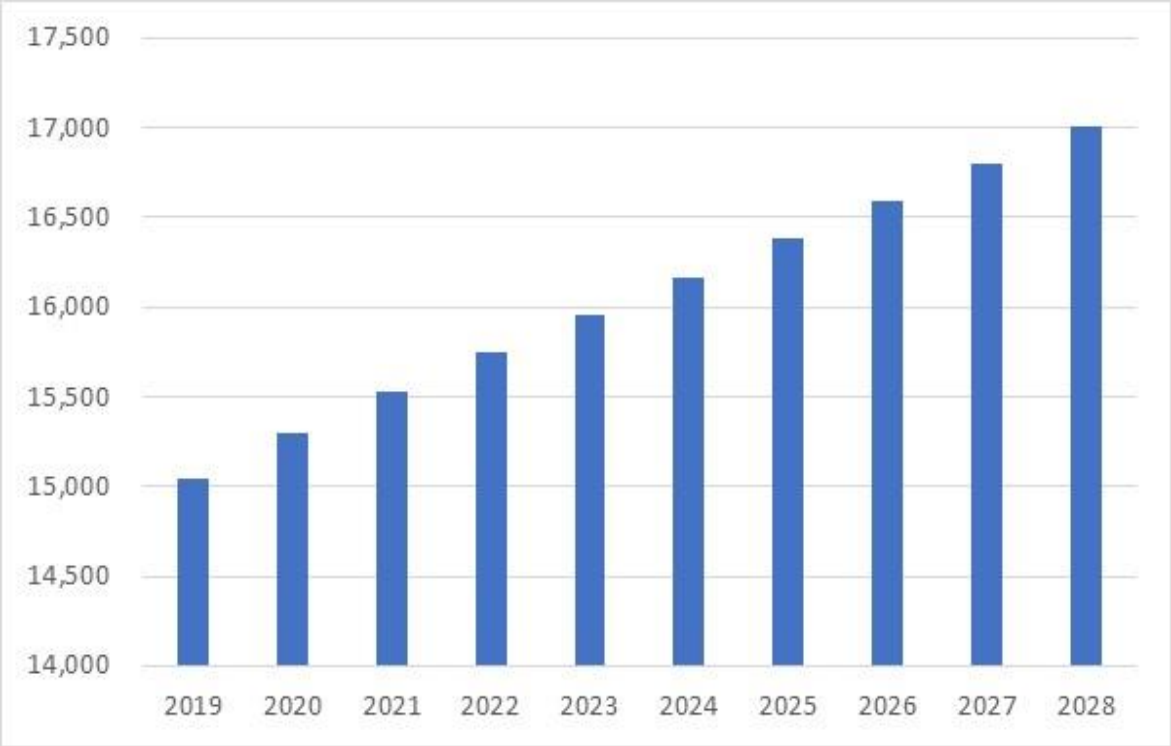
> *World sheep meat prices are likely to fall as supply of sheep meat out of Australia increases (due to increased domestic processing). If live sheep (from 6 months of trade) were converted into processed meat, this would be expected to increase world supply by 1.5%. In reality, some exports will be rescheduled outside the prohibition and some sheep will be retained by producers. However, a 1.5% increase in supply is likely to result in slightly lower world prices because Australia is one of 2 significant exporters in world markets.*

Against this analysis, we note that sheep displaced from the live sheep export industry predominantly in WA and then largely redirected towards export sheep meat markets are likely to be replaced by importing countries seeking live sheep exports from other parts of the world. According to MLA (2019a, p. 6), replacement sheep are likely be drawn from Sudan, Somalia, India, Romania and Georgia. Sheep for the live export trade have also recently been procured from South Africa (Sheep Central, 2019). All of these countries export sheep meat products and in 2017 exported in excess of 36,000 tonnes of sheep meat products.[24] The countries in which replacement sheep are procured for the live sheep export trade will have less sheep available for processing and export, in turn potentially creating new market opportunities in relation to processed sheep meat products. On this basis, we remain sceptical as to whether there will be any significant and identifiable decline in world sheep meat prices due to an increase in sheep meat supply out of Australia due to a temporary cessation in the live sheep export trade.

[24] See United Nations FAOSTAT database.

Further challenging concerns regarding price falls associated with the displacement of sheep from the live sheep export trade and redirection towards sheep meat export markets, the Organisation for Economic Co-operation and Development (OECD) and the Food and Agriculture Organization of the United Nations (FAO) (2019) are projecting that world sheep meat consumption (including both lamb and mutton) will increase from 15 million carcase weight equivalent (cwe) tonnes in 2019 to 17 million cwe tonnes in 2028 – an increase of 13 per cent. China is expected to represent 40 per cent of all of the additional sheep meat consumed by 2028. The expected increase in world sheep meat consumption is outlined in Figure 23 below.

Figure 23: Global Projection for the Consumption of Sheep Meat – 2019 to 2028 (carcase weight equivalent kilotonnes)



Source: OECD/FAO (2019, p. 242).

According to the RIS (Department of Agriculture, 2019, p. 43), diverting sheep from the live export trade to domestic processing could depress WA saleyard prices:

> *Option 2's prohibition is expected to result in a maximum price decline of 20% compared to option 1. This is based on the assumption that the biggest differential would be the approximate cost of transporting sheep from Western Australia to eastern states for slaughter. Transport costs are around $20 per head which is approximately 20% of the average 2017–18 saleyard price of wethers sold for live export. The 2018 and 2019 price declines relative to eastern state prices is consistent with this assumption.*

The analysis conducted in section 4 above is supportive of the proposition that there is likely to be a relative decline in WA saleyard/direct sale prices compared to the eastern states in the event of the withdrawal of live sheep exporters from purchasing sheep. However, our modelling suggests the order of magnitude of any price decline is only likely to be a quarter up to a half of the maximum price decline suggested by the Department of Agriculture, and is in the range of between $4.68 to $7.37 per head (see subsection 4.2.1 and the Econometric Appendix).

The Department of Agriculture (2019, p. 43) also contend that any price impact from the temporary withdrawal of live sheep exporters is likely to dissipate over time:

> *Further it is expected that over time, the prohibition of option 2 would have a lesser impact on price. This is because businesses impacted by the prohibition would be better prepared to operate under different conditions. This fact may also [be] demonstrated in the diminishing price differential between eastern and western states although 2 years is only a small sample size.*

The considerable structural change observed in the WA sheep flock over the last 30 years discussed above is testament to the fact that WA sheep farmers are not stagnant and can adjust their business mix and model in response to changing market conditions and circumstances. We also note that the potential adjustments by WA sheep farmers to a 16 week prohibition on live sheep exports to the Middle East change (with additional prohibited periods for Qatar and Oman) do not appear to be extensive compared to other structural adjustments already undertaken by the industry. We thus concur that the price impacts from the temporary withdrawal of live sheep exporters will, in all likelihood, dissipate over time.

The Department of Agriculture (2019, p. 56) estimates the spare processing capacity within Western Australia to be around 2 million head per year, which is more than enough to absorb additional sheep redirected to domestic production due to a prohibition in live exports. This is consistent with previous analysis by Pegasus Economics (Davey & Fisher, 2018).

The Department of Agriculture (2019, p. 46) contends the WA meat processing sector will face some additional costs associated with bringing disused processing capacity back online:

> *For at least the first few months following an unexpected restriction in trade (and possibly longer) the cost of recommissioning processing capacity is likely to increase processing costs. Significant investment in new processing facilities is unlikely to be needed, but some investment will be necessary to recommission facilities that have fallen into disuse. These additional costs could include recruiting and training new staff and leasing temporary processing and refrigeration while refurbishing more permanent facilities.*
>
> *The cost of processing capacity would begin to fall once these initial investments have been made. Following 2 Northern Hemisphere summer periods of restricted live exports, it is assumed that some of these recommissioning costs have already occurred.*

The expansion in the total average level of employment in the WA meat processing sector that has taken place during 2019 and discussed above, provides some anecdotal evidence that some of those additional costs may have already been incurred.

5.2.1 Employment Impacts

We note the Department of Agriculture (2019, p. 46) contends that overall total WA employment will likely increase in the event that the live sheep export trade is curtailed on the basis of additional employment in the meat processing sector, drawing on previous work by Pegasus Economics (Davey & Fisher, 2018):

> *Total employment in Western Australia is likely to increase if sheep destined for live export are processed in Australia. This is because meat processing is labour*

> *intensive, and likely to employ more people than the live export industry it would replace (Davey & Fisher 2018). In the 3 years to 2016–17, 4,500 full-time staff were employed each year on average in the WA meat processing sector. A recent report by Pegasus Economics estimated that ending live exports could increase employment in the meat processing sector by 350 full-time employees (Davey & Fisher 2018).*

On the other hand, on the basis of survey data and employment multipliers, Mecardo (2019, p. 1) has made the following claims in relation to direct employment and total employment associated with the live sheep export industry:

> *On-farm direct employment on a full time equivalent basis related to the live sheep export trade is calculated to be 1,037 employees nationally. Across the entire live sheep export supply chain, full time equivalent employment is estimated at 3,443 workers.*

The on-farm direct employment related to the live sheep export trade estimated by Mecardo (2019, p. 6) is composed of 798 jobs in WA with another 239 jobs in the eastern states. However, only around 136 of those supposed full time jobs in WA actually relate to hired labour, with over 80 per cent of farm labour being performed by the farmer and associated family members.[25]

On the basis of the source material used by Mecardo, it has allocated almost 9 per cent of farm labour towards farming sheep for the live sheep export industry.[26] However, Mecardo doesn't actually reveal the basis upon which it allocated farm labour to farming sheep sold to the live sheep export industry. If on-farm labour was allocated on the basis of total receipts received by activity, then the total number of WA on-farm jobs directly attributable to the live sheep export industry falls from 798 to around 191, only 33 of which relate to hired labour.[27]

In relation to one of the options available to WA sheep farmers in the event of the curtailment of the live sheep export industry, the Department of Agriculture (2019, p. 46) has noted:

> *Switching from live exports to lamb production is likely to have only minor impacts on employment in the sheep industry. On-farm employment could actually increase because the production of prime lambs requires more labour per sheep than producing sheep for live export.*

Mecardo (2019) uses employment multipliers to gross up the number of on-farm jobs it attributes to the live sheep export industry to the wider economy. Economic multipliers (e.g. for income, output, employment, value added, or imports) are typically derived from input-output tables (The Treasury (NSW Government), 2017, p. 63). They are often applied to measures of direct impact in order to estimate flow-on impacts, which are then presented as estimates of economic benefits arising from a project or program.

Paul Gretton (2013, p. 1) from the Productivity Commission has warned about the potential abuses of multipliers in the following terms:

---

[25] See ABARES (2019a).
[26] Ibid.
[27] Data was obtained from ABARES (2019a). Based on taking sheep sales to live sheep exporters as a proportion of total farm sheep sales (minus the sale of prime lamb), and total sheep sale receipts (minus the sale of prime lamb) as a proportion of total farm receipts.

> *Abuse primarily relates to overstating the economic importance of specific sectoral or regional activities. It is likely that if all such analyses were to be aggregated, they would sum to much more than the total for the Australian economy. Claims that jobs 'gained' directly from the cause being promoted will lead to cascading gains in the wider economy often fail to give any consideration to the restrictive nature of the assumptions required for input-output multiplier exercises to be valid. In particular, these applications fail to consider the opportunity cost of both spending measures and alternate uses of resources, and may misinform policy-makers.*

Similarly, the WA Department of Treasury and Finance (2002, p. 50) has cautioned:

> *While multipliers can be a useful way of summarising and quantifying interlinkages within the economy, they are more often abused than used correctly.*
>
> *Multipliers are used to suggest that an industry is more valuable to Western Australia than its current size would suggest. They are used to show substantial flow-on benefits to the broader economy and to justify claims for government support for that activity.*
>
> *However, multipliers do not provide a measure of net economic benefit of expanding activity in a particular area.*
>
> *They are based on limiting assumptions and dated information. It is in assessing claims for government assistance that the potential for misuse of multipliers is greatest.*

5.2.2 Option 2 and Regulatory Failure

The recent history of live sheep export trade has been characterised by repeated cycles of animal welfare incidents provoking public outrage followed by government-commissioned reviews and subsequent adjustments to the regulatory arrangements that fall short of the recommended changes followed after a period of time by further revelations of animal welfare incidents, exposing wholesale regulatory failure.

The live sheep export industry has been living on borrowed time in terms of its capacity to maintain its social licence to operate. In 1985, the Senate Select Committee on Animal Welfare (1985, p. xiii) came to the following conclusion on the live sheep export trade:

> *The Committee came to the conclusion that, if a decision were to be made on the future of the trade purely on animal welfare grounds, there is enough evidence to stop the trade. The trade is, in many respects, inimical to good animal welfare, and it is not in the interests of the animal to be transported to the Middle East for slaughter.*

On 5 August 2003 the MV *Cormo Express*, a live sheep export transport ship was loaded with 57,937 sheep departed Fremantle and arrived at Jeddah in Saudi Arabia on 21 August 2003 (Keniry, Bond, Caple, Gosse, & Rogers, 2003, p. 29). However, a veterinarian from the Saudi Arabian Ministry of Agriculture subsequently rejected the shipment on the grounds that 6 per cent of the sheep were infected with 'scabby mouth', which was above the 5 per cent normal acceptance level for the trade to Saudi. The shipment was eventually donated to Eritrea where they were finally unloaded in

Massawa on 24 October 2003 after 80 days on the vessel with a total of 5,691 deaths. The shipment was labelled as the *ship of death* (Agence France Presse, 2003).

In the aftermath of the MV *Cormo Express* incident, the Minister for Agriculture Fisheries and Forestry established a review into the livestock export industry that was chaired by Dr John Keniry (Keniry Review) (Keniry, Bond, Caple, Gosse, & Rogers, 2003). The Keniry Review concluded:

> *… recent incidents which have had unacceptable welfare and mortality outcomes, with the unexpected rejection of the Cormo Express shipment being the latest, have attracted widespread criticism of the trade within Australia and internationally. (Keniry, Bond, Caple, Gosse, & Rogers, 2003, p. 4)*

The Keniry Review eventually led to the enactment of the first iteration of the ASEL in 2005 (Brand, 2015, p. 4).

The day after revelations of cruel treatment of Australian beef cattle being slaughtered in a number of Indonesian abattoirs on the Australian Broadcasting Corporation (ABC) Four Corners program on 30 May 2011, the Minister for Agriculture, Fisheries and Forestry announced an independent review into the livestock export trade chaired by Bill Farmer AO (Farmer Review) (Farmer, 2011). In response to the recommendations of the Farmer Review, the Commonwealth Government instituted the ESCAS. The ESCAS operates to create a farm-to-killing-floor assurance of animal welfare by placing a greater onus on the exporter to ensure that the animal welfare conditions inside the importing nation are at an acceptable standard (Brand, 2015, p. 5).

In response to the *Awassi* incident, the Minister for Agriculture and Water Resources established the independent review of the conditions for the export of sheep to the Middle East during the during the Northern Hemisphere summer chaired by Dr Michael McCarthy (McCarthy Review) (McCarthy, 2018). According to the McCarthy Review (2018, p. 3):

> *The recent release of footage covering on-board treatment of sheep, over a series of voyages to the Middle East, last year shocked the Australian community, undermining public confidence in the trade. For the livestock export trade to continue, the public expects the Australian industry to uphold and comply with the highest animal welfare standards throughout the entire supply chain.*

The McCarthy review provided recommendations on conditions and actions required to improve health and welfare outcomes for sheep being transported to the Middle East during the Northern Hemisphere summer (HSRA Technical Reference Panel, 2019, p. v).

Following up on the McCarthy Review, the heat stress risk assessment (HSRA) Technical Reference Panel (HSRA Review) (2019, p. iv) was established to provide advice to the Department of Agriculture on the assessment of heat stress risk in the live sheep export trade from Australia to, or through, the Middle East during the Northern Hemisphere summer and undertook consultation and testing of analysis of the HSRA-related recommendations arising from the McCarthy review. The HRSA Review (2019, p. 22) recommended the development of a new HSRA framework that is focused on animal welfare, moving away from the framework based on mortality.

The Commonwealth Government's response to animal welfare incidents in the live export trade have a familiar pattern surrounding them. Even when the subsequent reviews following animal welfare incidents have made sensible recommendations, political expediency has ensured those recommendations have not always been fully adopted. For example, the Keniry Review recommended:

> *The Review concluded that there must be recognition that the livestock export industry cannot afford more bad outcomes and therefore all higher risk voyages should be eliminated. In those circumstances where there is clear evidence of a risk that demonstrably contributes to adverse outcomes on a predictable basis, exports should not be permitted. (Keniry, Bond, Caple, Gosse, & Rogers, 2003, p. 42)*

The Keniry Review (Keniry, Bond, Caple, Gosse, & Rogers, 2003, p. 42) went on to recommend that in order to better manage heat stress in live sheep export shipments there should be a prohibition on exports from areas such as Portland and Adelaide during periods of the year that the risks are greatest, principally May-October inclusive. However, this recommendation was not accepted by the Commonwealth Government (Farmer, 2011, p. 51).

Recommendation 6 from Farmer Review (2011, p. XXV) was for a comprehensive review of the ASEL to be undertaken including an examination of the policy on export of sheep from southern ports to the Middle East in winter months, with a view to:

- mitigate feedlot and shipboard losses in adverse weather conditions
- mitigate losses from heat stress and inanition during the voyage.

The review of the ASEL completed in 2013 said there was a lack of consensus on the part of the ASEL Steering Committee established on the policy of exporting sheep from southern ports to the Middle East in winter months and hence no recommendation was made on the matter (Department of Agriculture, Fisheries and Forestry, 2013, p. 16).

The established familiar pattern continues to the present day with the current RIS with the Department of Agriculture now seeking to water down the recommendations from the McCarthy and HSRA reviews through its pursuit of option 2 rather than option 3.

If history is any guide, then any reprieve provided to the live sheep export trade from the pursuit of the new regulatory arrangements in option 2 is only likely to be temporary before yet another animal welfare incident entails. On this basis, the implications of option 2 may ultimately not be all that dissimilar from option 1.

5.3 Option 3

Option 3 is consistent with the recommendations from the McCarthy Review and the HSRA Review. According to the Department of Agriculture (2019, p. 28):

> *Under option 3, the revised HSRA model is expected to reduce stocking rates on all voyages between 1 May to 31 October either completely or to such an extent that the voyage would not be economical. Therefore, while not explicitly stated, option 3 would effectively prohibit sheep exports for the entire Northern Hemisphere summer.*

The economic issues raised are the same as previously discussed in relation to option 2, it is just that they would relate to a longer period of cessation for the live sheep export industry. However, the draft RIS appears to strongly focus upon the negative aspects of the pursuit of option 3 while brushing over the benefits, such as a greater overall net increase in employment due to higher levels of employment in the meat processing sector.

The draft RIS even expresses concern that the reputations of live sheep exporters could be more seriously damaged by their inability to service demand for half the year (Department of Agriculture,

2019, p. 57), without considering that further animal welfare incidents in relation to the live sheep export trade poses a massive reputational risk to the rest of Australian agriculture from being tarred with the same brush.

References

Agence France Presse. (2003). "Ship of death" carrying "diseased" Australian sheep docks in Kuwait - report. *Agence France Presse Wire Service*, 3 October.

Al A'ali, M. (2017, June 11). New alert over buying animals. *Gulf Daily News*.

AuctionsPlus. (2015). *Submission to the Senate Standing Committee on Rural and Regional Affairs and Transport Inquiry on the Effect of market consolidation on the red meat processing sector.* Sydney.

AuctionsPlus Pty Limited. (2013). *Sheep Assessment Manual Effective July 2013.* Sydney.

Australian Bureau of Agricultural and Resource Economics and Sciences. (2019). *Agricultural commodity statistics 2019.* Canberra.

Australian Bureau of Agricultural and Resource Economics and Sciences. (2019a). *Farm survey data for the beef, slaughter lambs and sheep industries.* Canberra.

Australian Bureau of Statistics. (1994). *Agriculture Western Australia Season 1992-93 - ABS Cat no. 7113.5.* Canberra.

Australian Bureau of Statistics. (2012). *Interpreting Time Series: Are you being misled by the Seasons, 2012 - ABS Cat. no. 1346.0.55.003.* Canberra.

Australian Bureau of Statistics. (2013). *Historical Selected Agricultural Commodities, by State (1861 to Present), 2010-11, ABS Cat. no. 7124.0.* Canberra.

Australian Bureau of Statistics. (2019). *Agricultural Commodities, Australia, 2017-18 - ABS Cat no. 7121.0.* Canberra.

Australian Bureau of Statistics. (2019a). *Labour Force, Australia, Detailed, Quarterly, Nov 2019, ABS Cat no. 6291.0.55.003.* Canberra.

Australian Bureau of Statistics. (2019b). *Livestock Products, Australia, Sep 2019, ABS Cat. no. 7215.0.* Canberra.

Australian Bureau of Statistics. (2020). *Consumer Price Index, Australia, Dec 2019, ABS Cat no. 6401.0.* Canberra.

Australian Bureau of Statistics. (2020a). *Livestock and Meat, Australia, November 2019 - ABS Cat. no. 7218.0.55.001.* Canberra.

Australian Competition and Consumer Commission. (2007). *Examination of the prices paid to farmers for livestock and the prices paid by Australian consumers for red meat - A report to the Minister for Agriculture, Fisheries and Forestry.* Canberra.

Australian Livestock Export Corporation Limited (LiveCorp). (2016). *Annual Report 2015-16.* North Sydney.

Australian Livestock Export Corporation Limited (LiveCorp). (2017). *Annual Report 2016-17.* North Sydney.

Australian Meat Industry Council. (2014). *Submission to the Joint Standing Committee on Foreign Affairs, Defence and Trade in response to the Inquiry into Australia's trade and investment relationships with countries of the Middle East.* Sydney.

Australian Meat Industry Council. (2015). *Submission to the Senate Standing Committee on on Rural and Regional Affairs and Transport Inquiry into the effect of market consolidation on the red meat sector.* Sydney.

Australian Surveying and Land Information Group. (1990). *Tactual Atlas of Australia: Volume 2 - People and Industry, Maps.* Canberra: Department of Administrative Services.

Bailey, R., & Willoughby, R. (2013). *Edible Oil: Food Security in the Gulf.* London: Chatham House.

Biosecurity Tasmania. (2014). *Sheep: Guide for Hobby Farmers and Smallholders - Some basic health and welfare tips from DPIPWE.* Hobart: Department of Primary Industries, Parks, Water and Environment.

Boëthius, G. (2011). *Demand Security – The GCC's Side of the Energy Security Coin.* Singapore: Middle East Institute, National University of Singapore.

Box, G. E., & Tiao, G. C. (1975). Intervention Analysis with Applications to Economic and Environmental Problems. *Journal of the American Statistical Association, 70*(349), 70-79.

BP p.l.c. (2019). *BP Energy Outllook 2019 Edition.* London.

Brand, S. (2015). Australian Live Animal Export: A Comparative Exaimination of Viable Alternatives. *UniSA Student Law Review, 1*, 1-17.

Cashburn, G. (2016). *How to tell the age of sheep.* Wagga Wagga: Government of New South Wales Department of Primary Industries.

Centre for International Economics. (2014). *Contribution of live exports to the Australian Wool Industry: Prepared for Australian Wool Innovation .* Canberra.

Cherif, R., Hasanov, F., & Pande, A. (2017). *Riding the Energy Transition: Oil Beyond 2040.* International Monetary Fund.

Clancy, B. (2013, January 3). *Lamb will improve: Fletcher.* Retrieved January 16, 2013, from Weekly Times Now: http://www.weeklytimesnow.com.au/article/2013/01/03/554917_sheep.html

Clarke, M., Morison, J., & Yates, W. (2007). *The Live Export Industry: Assessing the Value of the Livestock Export Industry to Regional Australia.* Sydney: Meat & Livestock Australia Limited.

Dahl, A., Leith, R., & Gray, E. (2013). Productivity growth in the broadacre and dairy industries. *Agricultural commodities: Research by the Australian Bureau of Agricultural and Resource Economics and Sciences*(March Quarter), 200-220.

Davey, A. (2013). *Economic impact of phasing out the live sheep export trade: Report prepared for the World Society for the Protection of Animals - March 2013.* Canberra: Sapere Research Group.

Davey, A., & Fisher, R. (2018). *Economic Issues Associated with the Live Sheep Export Trade.* Canberra: Pegasus Economics.

Deards, B., Leith, R., Mifsud, C., Murray, C., Martin, P., & Gleeson, T. (2014). *Live export trade assessment.* Canberra: ABARES report to client prepared for the Live Animal Exports Reform taskforce of the Department of Agriculture.

Department of Agriculture. (2015). *Exporter Supply Chain Assurance System Report.* Canberra.

Department of Agriculture. (2015a). *Market consolidation and the red meat processing sector - Submission to the Senate Rural and Regional Affairs and Transport References Committtee.* Canberra.

Department of Agriculture. (2019). *Live sheep exports to or through the Middle East—Northern Hemisphere summer: Draft regulation impact statement.* Canberra.

Department of Agriculture. (2020). *All Livestock Exports 2014 to 2019.* Canberra.

Department of Agriculture and Food Western Australia. (2016). *Sheep Notes Issue Number 5 December 2016.* Perth.

Department of Agriculture, Fisheries and Forestry. (2013). *Review of the Australian Standards for the Export of Livestock, Review of the Livestock Export Standards Advisory Group - Final Report 31 May 2013.* Canberra.

Department of Primary Industries and Regional Development and Norman, G J. (2018). *National livestock export industry sheep, cattle and goat transport performance report 2017.* Sydney: Meat & Livestock Australia Limited.

Department of Treasury and Finance - Government of Western Australia. (2002). *Economic Research Articles: March 2002.* Perth.

Drum, F., & Gunning-Trant, C. (2008). *Live Animal Exports: A Profile of the Australian Industry.* Canberra: Australian Government Department of Agriculture, Fisheries and Forestry.

D'Silva, J. (2006). Introduction. In J. Turner, & J. D'Silva, *Animals, Ethics and Trade – The Challenge of Animal Sentience* (pp. xxi-xxvi). Taylor & Francis.

Engle, R. F., & Granger, C. W. (1987). Co-Integration and Error Correction: Representation, Estimation, and Testing. *Econometrica, 55*, 251-276.

Farmer, W. (2011). *Independent Review into Australia's Live Export Trade.* Canberra: Report to the Minister for Agriculture, Fisheries and Forestry.

Fischbach, T. (2018). *Advancing Food Security in the UAE.* Dubai: Mohammed Bin Rashid School of Government.

Gaden, B., Duddy, G., & Irwin, J. (2005). *Identifying live animal condition scoring systems for the Australian livestock export industry.* Sydney: Meat & Livestock Australia.

Granger, C. W. (1981). Some Properties of the Time Series Data and Their Use in Econometric Model Specification. *Journal of Econometrics, 16*, 121-130.

Granger, C. W., & Newbold, P. (1974). Spurious Regressions in Econometrics. *Journal of Econometrics, 2*, 111-120.

Gretton, P. (2013). *On input-output tables: uses and abuses.* Canberra: Productivity Commission.

Herrmann, R., Dalgleish, M., & Agar, O. (2017). *Sheepmeat market structures and systems investigation.* Sydney: Meat and Livestock Australia Limited.

Hobbs, J. E. (1997). Measuring the Importance of Transaction Costs in Cattle Marketing. *American Journal of Agricultural Economics, 79*, 1083-1095.

HSRA Technical Reference Panel. (2019). *Final report by the Heat Stress Risk Assessment Technical Reference Panel.* Canberra: Department of Agriculture and Water Resources.

International Monetary Fund. (2017). *Jordan: Staff Report for the 2017 Article IV Consultation, First Review of the Extended Arrangement under the Extended Fund Facility, and Requests for Waiver of Nonobservance of Performance Criterion and Rephasing of Access.* Washington D.C.

International Monetary Fund. (2019). *Regional economic outlook. Middle East and Central Asia.* Washington D.C.

International Monetary Fund. (2019a, October). *World Economic Outlook Database, October 2019*. Retrieved from International Monetary Fund: https://www.imf.org/external/pubs/ft/weo/2019/02/weodata/weoselser.aspx?c=193&t=1#sGGXCNL_NGDP

Jones, K. G. (2004). *Trends in the U.S. Sheep Industry.* Washington D.C.: United States Department of Agriculture Economics Research Service.

Keniry, J., Bond, M., Caple, I., Gosse, L., & Rogers, M. (2003). *Live Export Review Final Report: A Report to the Minister for Agriculture, Fisheries and Forestry.* Canberra: Department of Agriculture, Fisheries and Forestry.

Keogh, M., Henry, M., & Day, N. (2016). *Enhancing the competitiveness of the Australian livestock export industry.* Sydney: Australian Farm Institute.

Kingwell, R., Cunningham, P., Nath, T., Anderton, L., Xayavong, V., Curis, K., . . . Feldman, D. (2011). *The Economic Importance to Western Australia of Live Animal Exports .* Perth: Department of Agriculture and Food Western Australia.

Lahn, G. (2016). *Fuel, Food and Utilities Price Reforms in the GCC: A Wake-up Call for Business.* London: Chatham House - The Royal Institute of International Affairs.

Lamont, O. A., & Thaler, R. H. (2003). Anomalies: The Law of One Price in Financial Markets. *Journal of Economic Perspectives, 17*, 191–202.

Lindner, R., Darcy, M., Fletcher, R., Griffiths, D., Haynes, G., Minton, G., . . . Burggraaf, W. (2004). *Cattle and Sheep Meat Processing in Western Australia: Ministerial Taskforce Final Report November 2004.* Perth: Department of Agriculture Western Australia.

Manton-Pearce, K. (2013). *Maintaining our share of the lamb meat pie.* Nuffield Australia Farming Scholars.

Martin, P., & Shepheard, M. (2011). What is meant by the social licence? In J. Williams, & P. Martin, *Defending the Social Licence of Farming: Issues, Challenges and New Directions for Agriculture* (pp. 3-12). Melbourne: CSIRO Publishing.

McCarthy, M. (2018). *Independent Review of the Conditions for the Export of Sheep to the Middle East during the Northern Hemisphere.* Canberra: Department of Agriculture and Water Resources.

Meat & Livestock Australia. (2001). *Making the most of mutton.* North Sydney.

Meat & Livestock Australia. (2016b, August 22). *Dry ageing expands sheepmeat's place on the menu.* Retrieved from Meat & Livestock Australia: https://www.mla.com.au/news-and-events/industry-news/dry-ageing-expands-sheepmeats-place-on-the-menu/

Meat & Livestock Australia. (2017). *Sheep Assessment Manual.* Sydney.

Meat & Livestock Australia. (2018). *Market Snapshot: Sheepmeat MENA (Middle East and North Africa).* Sydney.

Meat & Livestock Australia. (2019). *Glossary*. Retrieved from Meat & Livestock Australia: https://www.mla.com.au/general/glossary/

Meat & Livestock Australia. (2019a). *Industry projections 2019 - Australian sheep.* Sydney.

Meat & Livestock Australia. (2019b). *Selling options*. Retrieved from Meat & Livestock Australia: https://www.mla.com.au/research-and-development/preparing-for-market/selling-options/

Mecardo. (2018). *Live Sheep Export – Brief Report.* Ballarat.

Mecardo. (2019). *Value analysis of the Australian live sheep export trade.* Ballarat.

Moffat, K., L. J., Zhang, A., & Leipold, S. (2016). The social licence to operate: a critical review. *Forestry: An International Journal of Forest Research, 89*, 477-488.

Morris, S. T. (2009). Economics of sheep production. *Small Ruminant Research, 86*, 59–62.

Newey, W. K., & West, K. D. (1987). Hypothesis Testing with Efficient Method of Moments Estimation. *International Economic Review, 28*, 777-787.

Nosova, A. (2018). Benefitting when possible, resisting when necessary: Private sector and economic diversification policies in Kuwait. In A. Mishrif, & Y. Al Balushi, *The Political Economy of the Middle East, Volume 1: Economic Diversification in the Gulf Region - The Private Sector as an Engine of Growth.* London: Palgrave Macmillan.

Organisation for Economic Co-operation and Development and Food and Agriculture Organisation of the United Nations. (2019). *OECD-FAO Agricultural Outlook 2019-2028.* OECD Publishing, Paris/Paris/Food and Agriculture Organization of the United Nations, Rome.

Persson, K. (2008, February 10). *The Law of One Price.* Retrieved January 6, 2013, from EH.Net Encyclopedia, edited by Robert Whaples: http://eh.net/encyclopedia/article/persson.LOOP

Pippenger, J., & Phillips, L. (2008). Some pitfalls in testing the law of one price in commodity markets. *Journal of International Money and Finance, 27*, 915-925.

Prakash, S. (2016, April 27). *What's the Difference Between Lamb and Mutton?* Retrieved from kitchn: https://www.thekitchn.com/whats-the-difference-between-lamb-and-mutton-230038

Pritchett, K. (2019). *Implications of management decisions on the WA sheep flock in response to changing markets.* Perth: Department of Primary Industries and Regional Development.

Radford. (2001). *Animal Welfare Law in Britain: Regulation and Responsibility.* Oxford: Oxford University Press.

Sargison, N. (2008). *Sheep Flock Health: a planned approach.* Oxford: Blackwell Publishing Ltd.

Schoenian, S. (2015). *Basic information about sheep.* Retrieved from sheep101.info: http://www.sheep101.info/sheepbasics.html

Senate Select Committee on Animal Welfare. (1985). *Export of Live Sheep from Australia.* Canberra: The Parliament of the Commonwealth of Australia.

Sheep Central. (2019, November 26). *Cruelty charges aim to halt South African sheep exports.* Retrieved from Sheep Central: https://www.sheepcentral.com/cruelty-charges-aim-to-halt-south-african-sheep-exports/

Sheep CRC. (2008). *Taking the mutton out of lamb.* Armidale.

Sheepmeat Council of Australia. (2012). *Livestock Exports.* Retrieved January 21, 2013, from Sheepmeat Council of Australia: http://www.sheepmeatcouncil.com.au/index.php/Sheep-Meat-Council-of-Australia/Policy-Issues/Livestock-Exports.html

State of Kuwait Ministry of Finance Budget Public Affairs. (2018). *The General Budget For the Fiscal Year 2018/2019.* Kuwait City.

Stock, J. H., & Watson, M. W. (1988). Variable Trends in Economic Time Series. *The Journal of Economic Perspectives, 2*, 147-174.

Stoutjesdijk, P. (2013). *Plant genetic resources for food and agriculture: second national report - Australia.* Canberra: Department of Agriculture.

The Treasury (NSW Government). (2017). *NSW Government Guide to Cost-Benefit Analysis (TPP17-03).* Sydney.

Times Kuwait. (2019, December 23). Government continues lavish subsidies on citizens. *Times Kuwait*.

Times News Service. (2017, September 25). Oman slashes subsidies by more than OMR500 million in a single year. *Times of Oman*.

Turner, J. (2006). *Stop Look Listen - Recognising the Sentience of Farm Animals.* Compassion in World Farming Trust.

Valdini, C. (2012, September 5). Thousands of sheep stranded off Bahrain coast. *ArabianBusiness.com*, 5 September. Retrieved December 11, 2012, from ArabianBusiness.com.

Varischetti, B. (2012). Bahrain live sheep trade on hold Bahrain rejects live sheep Alison Penfold, CEO, ALEC. *Australian Broadcasting Corporation (ABC) News*, 12 September.

White, A., Shands, C., & Casburn, G. (2001). *Making the most of Mutton.* Sydney: Meat & Livestock Australia.

Widam Food Company Q.S.C. (2019). *Widam Food Company Q.S.C. Financial Statements 31 December 2018.* Doha.

Woertz, E. (2017). Agriculture and Development in the Wake of the Arab Spring. *International Development Policy, 7*. Retrieved from http://journals.openedition.org/poldev/2274

World Organisation for Animal Health. (2019). *Terrestrial Animal Health Code.* Retrieved from World Organisation for Animal Health: https://www.oie.int/index.php?id=169&L=0&htmfile=chapitre_aw_introduction.htm

Econometric Appendix

Basic Models

The Department of Agriculture (2019) in its draft RIS compared saleyard trade lamb prices in WA to those in eastern Australia. Consistent with the approach adopted by the Department of Agriculture, we will analyse saleyard trade lamb and mutton prices in WA to those in eastern Australia.

Monthly average saleyard sheep and lamb indicator prices for trade lamb and mutton for WA and eastern Australia were sourced from MLA from January 2009 until December 2019. Nominal prices were converted into 2018-19 real prices using the all groups consumer price index (Australian Bureau of Statistics, 2020). We have assumed straight line changes between quarterly index numbers in order to derive monthly index numbers.

This resulted in the development of the following four price series:

- *WAMR* – WA mutton in real 2018-19 prices
- *WATLR* – WA trade lamb in real 2018-19 prices
- *EAMR* – eastern Australia mutton in real 2018-19 prices
- *EATLR* – eastern Australia trade lamb in real 2018-19 prices.

A series is stationary if its mean and variance is time invariant. However, any series that is not stationary is said to be nonstationary or to contain a unit root. If a first difference is taken of a nonstationary time series and found to be stationary then the series is said to be integrated of the first order or I(1), or to contain a unit root.

All of the price series along with their first differences were tested for stationarity using the Phillips-Perron (PP) test. The PP test performs the test of a null hypothesis that a series contains a unit root against the alternative hypothesis that the series is stationary. The PP test was run using all three test specifications – with a constant, a constant and a linear time trend, and neither. Results from the PP tests are provided in Table 2 below. The results show there is a unit root in all price series at level, but that the first differences of all the price series are stationary.

Table 2: Phillips-Perron (PP) Test Mutton and Trade Lamb Price Series and 1st Differences

Variable	PP Test with a Constant	PP Test with a Constant and Linear Time Trend	PP Test
WAMR	-2.489*	-2.557*	-0.126*
	(0.121)	(0.301)	(0.721)
ΔWAMR	-10.596#	-10.542#	-10.610#
	(0.000)	(0.000)	(0.000)
WATLR	-2.674*	-2.865*	-0.309*
	(0.081)	(0.178)	(0.774)
ΔWATLR	-11.767#	-13.058#	-11.419#
	(0.000)	(0.000)	(0.000)
EAMR	-1.857*	-1.992*	-0.195*
	(0.352)	(0.600)	(0.741)
ΔEAMR	-9.513#	-9.475#	-9.511#
	(0.000)	(0.000)	(0.000)
EATLR	-2.035*	-2.408*	-0.265*
	(0.272)	(0.374)	(0.761)
ΔEATLR	-7.284#	-7.190#	-7.274#
	(0.000)	(0.000)	(0.000)

Note: Figures in brackets are the corresponding probabilities. * indicates the null hypothesis of a unit root has been accepted at the 5 per cent level. # indicates the null hypothesis of a unit root has been rejected at the 5 per cent level.

Equation (1) models *WAMR* on a constant term (β_0), *EAMR* and an error term (ε) with the subscript (t) representing the time period:

$$WAMR_t = \beta_0 + \beta_1 EAMR_t + \varepsilon_t \qquad (1)$$

Equation (2) models *WATLR* on a constant term (β_0), *EATLR* and an error term (ε) with the subscript (t) representing the time period:

$$WATLR_t = \beta_0 + \beta_1 EATLR_t + \varepsilon_t \qquad (2)$$

In order to account for monthly seasonal variation, 11 seasonal dummy variables for each of the 12 months excluding December have been included in equations (1) and (2). A dummy variable is a numeric variable that represents categorical data used to quantify qualitative attributes. Under the intervention analysis proposed by Box and Tiao (1975), an indicator or dummy variable is included in the model which usually takes only the values of 0 and 1 to denote the non-occurrence and occurrence of the intervention as long as the timing of the intervention is known. The effect of any seasonal variation in regard to December will be reflected in the constant term (β_0). The 11 monthly seasonal dummy variables should be interpreted in the first instance as any seasonal variation from the month of December.

Equations (1) and (2) were initially run as an ordinary least square (OLS) regressions.

Diagnostic tests using the Durbin-Watson statistic and the Breusch-Godfrey LM test suggest that autocorrelation is present for both equations (1) and (2), while the White test for heteroskedasticity also suggests that heteroskedasticity is present in equation (2).

Estimates of relationships between nonstationary variables could lead to spurious regression by suggesting significant relationships between wholly unrelated variables (Granger & Newbold, 1974). A standard approach to addressing the problem of nonstationary data has been to specify models as relationships between differences. However, the major drawback from this approach is that a model based solely on difference terms can only capture the short-run dynamics in a process and therefore fails to identify any long-run relationships between the variables.

Given that all variables are integrated of the same order, it is possible a linear combination of these variables could in fact be stationary. Granger (1981) coined the term cointegration to describe a stationary combination of nonstationary variables. Where a linear combination of nonstationary variables are cointegrated then ordinary least squares analysis can still provide a satisfactory framework for evaluating econometric evidence (Stock & Watson, 1988, pp. 164-165).

In order to test for cointegration between the variables, equations (1) and (2) were re-estimated as dynamic ordinary least squares (DOLS) regressions using the heteroskedasticity and autocorrelation-consistent (HAC) standard errors as developed by Newey and West (1987) as evidence of autocorrelation was found using both the Durbin-Watson statistic and Breusch-Godfrey LM test for both equations (1) and (2) while evidence for the presence of heteroskedasticity was found in relation to equation (2). This will ensure the standard errors are robust in the event of both heteroskedasticity and autocorrelation of an unknown form.

DOLS enables a cointegrating relationship to be modelled as a single equation incorporating the structural relationship between the variables, as well as dynamic elements using OLS, rather than the two equation error-correction model (ECM) approach where the residuals from the long-run equilibrium regression are entered into the ECM in the place of the levels terms along with short-run dynamics as proposed by Engle and Granger (1987). In DOLS, the static cointegrating regression is augmented by leads and lags of the first differences of the integrated regressors. In this case we chose 1 lead and 1 lag.

A backward elimination process was then conducted for equations (1) and (2) whereby one explanatory variable with the highest p-value greater than 0.1 was eliminated at a time, until the point was reached where all the remaining variables were making a statistically significant contribution to predicting the dependent variable at least at the 10 per cent level. This is equivalent to the removal of the explanatory variable with the lowest t statistic that is not statistically significant at the 10 per cent level.

The results for equations (1) and (2) are presented below in Tables 3 and 4.

Table 3: Dynamic Ordinary Least Squares for Equation (1) (HAC t-statistic probabilities in brackets)

Variable	
EAMR	0.895
	(0.000)
Mar	28.939
	(0.012)
Apr	26.792
	(0.026)
Sep	-42.912
	(0.000)
Oct	-60.543
	(0.000)
Nov	-34.498
	(0.001)
R^2	0.843
Adjusted R^2	0.832

Note: Figures in brackets are the corresponding probabilities.

For equation (1) the monthly dummy variables for January, February, May, June, July and August along with the constant term (β_0) were eliminated during the backward elimination process. The dummy variables for March and April were statistically significant at less than 5 per cent, while all of the remaining variables were statistically significant at less than 1 per cent including *EAMR.* The R-squared and adjusted R-squared indicates equation (1) fits the data reasonably well.

Equation (1) was tested for cointegration using various diagnostic tests and found to be cointegrated without exception. The Engle-Granger and Phillips-Ouliaris residual-based tests for cointegration were used and the null hypothesis of no cointegration was rejected at the 1 per cent level of statistical significance in relation to all of the test statistics. Hansen's Instability Test also accepted the null hypothesis of cointegration against the alternative of no cointegration.

Table 4: Dynamic Ordinary Least Squares for Equation (2) (HAC t-statistic probabilities in brackets)

Variable	
EATLR	0.959
	(0.000)
Jun	23.825
	(0.036)
Jul	35.411
	(0.096)
Sep	-68.671
	(0.000)
Oct	-86.609
	(0.000)
Nov	-54.998
	(0.000)
R^2	0.775
Adjusted R^2	0.760

Note: Figures in brackets are the corresponding probabilities.

For equation (2) the monthly dummy variables for January, February, March, April, May and August along with the constant term (β_0) were eliminated during the backward elimination process. The

dummy variable for July was statistically significant at the 10 per cent level, the dummy variable for June was statistically significant at the 5 per cent level, while all of the remaining variables were statistically significant at less than 1 per cent including *EATLR.* The R-squared and adjusted R-squared indicates equation (2) fits the data reasonably well.

Equation (2) was tested for cointegration using various diagnostic tests and found to be cointegrated without exception. The Engle-Granger and Phillips-Ouliaris residual-based tests for cointegration were used and the null hypothesis of no cointegration was rejected at the 1 per cent level of statistical significance in relation to all of the test statistics. Hansen's Instability Test also accepted the null hypothesis of cointegration against the alternative of no cointegration.

Testing for the Price Impact Associated with the Live Sheep Export Trade

Equations (1) and (2) including the monthly dummy variables were extended with the inclusion of a dummy variable to represent the time period in which live sheep exporters were active participants in WA saleyards purchasing sheep. The construction of the dummy variable representing the activity of live sheep exporters has been based on the presence or not of a weekly export wether indicator for all of the weeks from January 2009 until December 2019 that is produced by MLA.

Two specifications for the construction of the dummy variable have been used:

- LED_1 – a live export dummy variable that takes the value of:
  - 1 when live sheep exporters were active for the entire month
  - 0.75 when live sheep exporters were active for three of the four weeks of the month
  - 0.5 when live sheep exporters were active for two of the four weeks of the month
  - 0.25 when live sheep exporters were active for only one of the four weeks of the month
  - 0 when live sheep exporters were not active at all for the month
- LED_2 – a live export dummy variable taking the value of 1 if live sheep exporters were active at all during the month and zero otherwise.

The extension of equation (1) for the inclusion of the two dummy variables representing how active live sheep exporters were in WA saleyards is outlined below as equations (3) and (4):

$$WAMR_t = \beta_0 + \beta_1 EAMR_t + \beta_2 LED_1 + \varepsilon_t \quad (3)$$

$$WAMR_t = \beta_0 + \beta_1 EAMR_t + \beta_2 LED_2 + \varepsilon_t \quad (4)$$

The extension of equation (2) for the inclusion of a dummy variable representing how active live sheep exporters were in WA saleyards is outlined below as equations (5) and (6):

$$WATLR_t = \beta_0 + \beta_1 EATLR_t + \beta_2 LED_1 + \varepsilon_t \quad (5)$$

$$WATLR_t = \beta_0 + \beta_1 EATLR_t + \beta_2 LED_2 + \varepsilon_t \quad (6)$$

A backward elimination process was then conducted for equations (3), (4), (5) and (6) whereby one explanatory variable with the highest p-value greater than 0.1 was eliminated at a time, until the point was reached where all the remaining variables were making a statistically significant contribution to predicting the dependent variable at least at the 10 per cent level.

The LED_1 variable for equation (3) and the LED_2 variable for equation (6) were eliminated before the backward elimination process were completed, hence the results of equations (3) and (6) are not reported.

The results for equation (4) are presented below in Table 5.

Table 5: Dynamic Ordinary Least Squares for Equation (4) (HAC t-statistic probabilities in brackets)

Variable	
EAMR	0.846
	(0.000)
Mar	25.797
	(0.026)
Apr	21.850
	(0.014)
Sep	-45.701
	(0.000)
Oct	-65.457
	(0.000)
Nov	-37.132
	(0.001)
LED_2	24.022
	(0.010)
R^2	0.851
Adjusted R^2	0.840

Note: Figures in brackets are the corresponding probabilities.

As was the case for equation (1), for equation (4) the monthly dummy variables for January, February, May, June, July and August along with the constant term (β_0) were eliminated during the backward elimination process. The dummy variables for March and April were statistically significant at less than 5 per cent, while all of the remaining variables were statistically significant at less than 1 per cent including LED_2.[28] The R-squared and adjusted R-squared indicates equation (4) fits the data reasonably well.

Equation (4) was also tested for cointegration using various diagnostic tests and found to be cointegrated without exception. The Engle-Granger and Phillips-Ouliaris residual-based tests for cointegration were used and the null hypothesis of no cointegration was rejected at the 1 per cent level of statistical significance in relation to all of the test statistics. Hansen's Instability Test also accepted the null hypothesis of cointegration against the alternative of no cointegration.

The results for equation (5) are presented below in Table 6.

[28] LED_2 is statistically significant at the 1 per cent, but does not appear to be in Table 6 due to rounding.

Table 6: Dynamic Ordinary Least Squares for Equation (5) (HAC t-statistic probabilities in brackets)

Variable	
EATLR	0.937
	(0.000)
Jun	18.066
	(0.089)
Sep	-75.000
	(0.000)
Oct	-92.810
	(0.000)
Nov	-62.623
	(0.000)
LED_1	28.397
	(0.057))
R^2	0.776
Adjusted R^2	0.761

Note: Figures in brackets are the corresponding probabilities.

Similar to equation (2), for equation (5) the monthly dummy variables for January, February, March, April, May, and August along with the constant term (β_0) were eliminated during the backward elimination process. In addition, the monthly dummy variable for July was also eliminated during the backward elimination process.

The dummy variable for June and LED_1 were statistically significant at the 10 per cent level, while all of the remaining variables were statistically significant at less than 1 per cent. The R-squared and adjusted R-squared indicates equation (5) fits the data reasonably well.

Equation (5) was also tested for cointegration using various diagnostic tests and found to be cointegrated without exception. The Engle-Granger and Phillips-Ouliaris residual-based tests for cointegration were used and the null hypothesis of no cointegration was rejected at the 1 per cent level of statistical significance in relation to all of the test statistics. Hansen's Instability Test also accepted the null hypothesis of cointegration against the alternative of no cointegration.

Extension to Other Categories of Lamb

Equations (5) and (6) were extended to three other categories of lamb with the following six price series:

- *WARFR* – WA restocker/feeder lamb in real 2018-19 prices
- *WALLR* – WA light lamb in real 2018-19 prices
- *WAHLR* – WA heavy lamb in real 2018-19 prices
- *EARFR* – eastern Australia restocker/feeder lamb in real 2018-19 prices
- *EALLR* – eastern Australia light lamb in real 2018-19 prices
- *EAHLR* – eastern Australia heavy lamb in real 2018-19 prices.

Equations (5a) to 6(c) are outlined below:

$$WARFLR_t = \beta_0 + \beta_1 EARFLR_t + \beta_2 LED_1 + \varepsilon_t \quad (5a)$$

$$WALLR_t = \beta_0 + \beta_1 EALLR_t + \beta_2 LED_1 + \varepsilon_t \quad (5b)$$

$$WAHLR_t = \beta_0 + \beta_1 EAHLR_t + \beta_2 LED_1 + \varepsilon_t \quad (5c)$$

$$WARFLR_t = \beta_0 + \beta_1 EARFLR_t + \beta_2 LED_2 + \varepsilon_t \quad (6a)$$

$$WALLR_t = \beta_0 + \beta_1 EALLR_t + \beta_2 LED_2 + \varepsilon_t \quad (6b)$$

$$WAHLR_t = \beta_0 + \beta_1 EAHLR_t + \beta_2 LED_2 + \varepsilon_t \quad (6c)$$

The modelling could not be extended to merino lamb prices as it was found the WA and eastern Australia price series were integrated of a different order.[29]

A backward elimination process was also conducted for equations (5a) to (6c) as outlined above. Equations (5a), (5b), (6a) and (6b) were estimated using DOLS as it was found all the price series were integrated of the first order. Equations (5c) and (6c) were estimated using OLS as it was found that WA and eastern Australia heavy lamb price series were both stationary.[30]

The results are reported in Tables 7, 8 and 9 below.

Table 7: Dynamic Ordinary Least Squares for Equations (5a) and 6(a) (HAC t-statistic probabilities in brackets)

Variable	Equation (5a)	Equation (6a)
EARFLR	0.802	0.785
	(0.000)	(0.000)
Aug	-28.622	-27.343
	(0.076)	(0.087)
Sep	-40.173	-41.911
	(0.015)	(0.014)
Oct	-35.520	-42.785
	(0.024)	(0.009)
Nov	-38.989	-33.494
	(0.046)	(0.093)
LED_1	51.955	
	(0.002)	
LED_2		49.596
		(0.011)
R^2	0.717	0.709
Adjusted R^2	0.698	0.689

Note: Figures in brackets are the corresponding probabilities.

[29] The PP test found the WA merino lamb price series was stationary at less than the 1 per cent level of statistical significance under two specifications (constant and constant with a linear time trend) while it found the eastern Australia merino lamb price series was integrated of the first order.

[30] The PP test found the *EAHLR* series to be stationary at the 1 per cent level of statistical significance and the *WAHLR* series was found to be stationary at the 5 per cent level of statistical significance under two specifications (constant and constant with a linear time trend).

Table 8: Dynamic Ordinary Least Squares for Equations (5b) and 6(b) (HAC t-statistic probabilities in brackets)

Variable	Equation (5b)	Equation (6b)
EALLR	0.918	0.911
	(0.000)	(0.000)
Sep	-55.804	-54.888
	(0.000)	(0.001)
Oct	-58.323	-62.466
	(0.002)	(0.000)
Nov	-48.929	-43.003
	(0.005)	(0.009)
LED_1	49.138	
	(0.002)	
LED_2		39.188
		(0.018)
R^2	0.767	0.752
Adjusted R^2	0.754	0.738

Note: Figures in brackets are the corresponding probabilities.

*Table 9: Ordinary Least Squares for Equations (5c) and 6(c) (HAC t-statistic probabilities in brackets)**

Variable	Equation (5c)	Equation (6c)
Constant (β_0)	99.801	82.464
	(0.078)	(0.039)
EAHLR	0.751	0.757)
	(0.000)	(0.000)
Sep	-63.780	-63.690
	(0.000)	(0.001)
Oct	-68.222	-71.209
	(0.000)	(0.000)
Nov	-34.715	-32.360
	(0.022)	(0.098)
LED_1	21.536	
	(0.236)	
LED_2		30.664
		(0.104)
R^2	0.668	0.671
Adjusted R^2	0.654	0.657
Durbin-Watson statistic	0.516	0.512
Breusch-Godfrey LM test (4 lags)	68.895	63.257
	(0.000)	(0.000)
White Heteroskedasticity test	11.054	10.529
	(0.682)	(0.570)

Note: Figures in brackets are the corresponding probabilities.

* Sample taken from August 2009 until December 2019 due to data limitations.

For equations (5a) and (5b), LED_1 was statistically significant at the 1 per cent level, while for equations (6a) and (6b) LED_2 was statistically significant at the 5 per cent level. For equations (5c) and (6c) neither LED_1 nor LED_2 were statistically significant even at the 10 per cent level.

Equations (5a), (5b), (6a) and (6b) were also tested for cointegration using various diagnostic tests and found to be cointegrated without exception. The Engle-Granger and Phillips-Ouliaris residual-based tests for cointegration were used and the null hypothesis of no cointegration was rejected at the 1 per cent level of statistical significance in relation to all of the test statistics. Hansen's Instability Test also accepted the null hypothesis of cointegration against the alternative of no cointegration.

For equations (5c) and (6c), while diagnostic tests fail to identify heteroskedasticity, both the Durbin-Watson statistic and the Breusch-Godfrey LM test suggest that autocorrelation is present.

For choosing the preferred model specification where both LED_1 and LED_2 were found to be statistically significant in alterative models, it was decided to show preference towards the model specification with the highest adjusted R-squared as this provides the better representation of the available data which were equations 5(a) and 5(b).

Further Extension of the Modelling to Over-the-Hooks Sales

The modelling was further extended to OTH sales, whereby a number of categories of lamb and mutton sheep prices in WA were run as a function of NSW prices for the same lamb and mutton sheep categories, along with a constant and seasonal dummy variables, alternate model specifications using LED_1 and LED_2 and utilising backward elimination. While the NSW OTH lamb and mutton sheep price variable was statistically significant at less than the 1 per cent level in every instance, along with varying degrees of statistical significance in relation to the remaining constant and seasonal dummy variables, in none of the models were the LED_1 and LED_2 dummy variables statistically significant. As a consequence, the results from these equations have not been reported.