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SECTORAL TRENDS AND SHOCKS IN AUSTRALIA'S ECONOMIC GROWTH

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Abstract

This paper examines the extent to which sectoral trends and fluctuations in the Australian economy can be understood using international trade theory and knowledge of key policy developments. It suggests they are consistent with theory, but it also reveals several features that make Australia's economy unusual. The most striking are the facts that (1) the agricultural sector's share of GDP remained fairly constant rather than falling during 1860-1960 and even during the latest mining boom; and (2) the farm sector continued to enjoy a strong comparative advantage despite periodic spurts of growth in mining exports.

JEL Classification: F13, F63, N47, O13, Q17

Keywords: agricultural development, mining booms, structural transformation, Trade Costs, manufacturing protection

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Sectoral Trends and Shocks in Australia's Economic Growth

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Sectoral Trends and Shocks in Australia's Economic Growth¹

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INTRODUCTION

During the first dozen years of this century, Australia enjoyed its largest and longest improvement ever in its international terms of trade (Figure 1). This improvement triggered the country's biggest mining investment boom ever, funded mostly by foreign capital. Mineral and energy exports, which accounted for 45 percent of Australia's merchandise exports in 2000, rose to more than 70 percent by 2011. The real exchange rate appreciated accordingly over the period, attaining a record height previously reached only briefly during 1973-74 (Figure 2). The rise in the nominal Australian-United States dollar exchange rate was especially marked, with the AUD more than doubling from just under 50 US cents during 2001 to a peak of 108 US cents in February 2012.

[Insert Figures 1 and 2 on next page]

A boom in one sector of the economy typically raises national income, but not everybody is certain to gain.² This is true regardless of whether the boom and currency strengthening is demand driven, by a terms of trade improvement, or supply driven by, for example, a new discovery of minerals. Either way, the real exchange rate appreciation resulting from a boom in one sector makes it more difficult for sectors producing other tradable goods and services to compete in domestic and foreign markets. In the absence of strong re-distributional policies, there are likely to be both gainers and losers when one sector

¹ Revision of a paper presented as the Noel Butlin Memorial Lecture, Asia Pacific Economic and Business History Conference, Adelaide, 11 February 2016. It draws on the author's Ed Shann Memorial Lecture, University of Western Australia, Perth, 25 September 2014 and his Opening Plenary Paper for the sixtieth AARES Annual Conference, Canberra, 3 February 2016. Helpful comments by conference participants are gratefully acknowledged.

² A rise in national income is less likely, the poorer the government's macroeconomic management and the more distorting are its sectoral and trade policies (Anderson 1998). Adverse outcomes are so common among developing countries as to have given rise to the term 'resource curse' (coined by Auty 1993). Extensive reviews of that literature as it pertains to developing countries can be found in Smith (2015) and Venables (2016).

of the economy booms. Conversely, a slump in international prices of a major export sector's outputs (or the exhaustion of a natural resource) lowers national income but may cause a real exchange rate depreciation sufficient to benefit producers of other tradables.

The normal pattern of structural change in growing economies is for the primary sector's shares of GDP and employment to diminish as the industrial sector expands, and for manufacturing to subsequently diminish as service sectors increasingly dominate the economy (Kuznets 1966; Syrquin 1988; Syrquin and Chenery 1989). In Australia's case, however, that normal pattern has been disrupted periodically by major fluctuations in the international terms of trade (Figure 1), and by spurts of discoveries of large reserves of minerals and energy raw materials (Blainey 2003). Thus its long-run sectoral trends have been shocked numerous times. The sectoral structure of the Australian economy also has been affected by a long-standing policy of protection from import competition, particularly for manufactures (Anderson and Garnaut 1986; Lloyd and MacLaren 2015; Lloyd forthcoming). One result of high levels of protection has been to reduce the share of GDP traded internationally and the range of products traded, which has in turn contributed to fluctuations in the terms of trade.

The purpose of this paper – which benefits greatly from the pioneering research of Noel Butlin (1962, 1986) – is to shed light on the extent to which Australia's agricultural, mining and manufacturing sectors have altered their contributions to GDP, employment, and exports in the course of Australia's economic growth over the past two centuries, with a particular focus on periods of mining booms and slumps.³ It begins by reviewing the branch of international trade theory that deals with sectoral comparative advantage changes in growing economies that are resource-rich and subject to occasional mining booms. It then examines the extent to which data on Australia's sectoral trends and fluctuations are consistent with the theory of comparative advantage for countries with trade-restrictive policies. The data reveal a number of unusual patterns in the sectoral composition of Australia's economy. Understanding these patterns requires some Australian policy and institutional background, in addition to the variables suggested by standard trade theory such as trade costs, relative factor endowments, and international terms of trade.

³ It leaves aside the question of how these structural changes and shocks contributed to the growth and fluctuations in the country's *aggregate* output, employment, and income. The reasons for high per capita income in Australia in the nineteenth century, and continued prosperity to date, is the subject of a recent study by McLean (2013).

PERTINENT THEORY

One of the best-known facts about growing economies is that their agricultural sector's shares of GDP and employment tend to fall over time. The reasons for those declines in a closed economy are well known: domestic prices and quantities of farm relative to non-farm products fall because of low and falling income elasticities of demand for food plus relatively rapid advances in farm production technologies. It is less obvious that the farm sector of a small *open* economy – especially one with an abundance of farm land relative to labour and capital – would have to face relative decline as its economy grows. The fact that it nonetheless almost always does is due to rising demand for nontradable goods and especially services as incomes rise. Being nontradable, enough of those products can be produced only by drawing mobile resources from sectors producing tradables. Thus agriculture's shares of national GDP and employment tend to fall with expansion, even in open, land-abundant economies (Anderson 1987a). Eventually even the absolute number of farm workers may shrink, but delays in labour out-migration from farming mean that agriculture's declining share of national employment typically exceeds the sector's declining share of GDP.

Agriculture's share of national *exports* depends on the country's comparative advantage, however, and so need not fall as the world economy expands. Indeed the tradability of the sector's output is likely to increase as trade costs are lowered through investments in transport-related infrastructure. If a country's trade costs fall relative to the rest of the world, and if farm products gain more from the decline of trade costs than non-farm products, the country may strengthen its agricultural comparative advantage over time (Venables 2004).

According to the workhorse theory of comparative advantage developed in the nineteenth and twentieth centuries, we should expect agricultural and mineral trade to occur between relatively lightly populated economies that are well-endowed with agricultural land and/or mineral resources and those that are densely populated with few natural resources per worker (Krueger 1977, Deardorff 1984). Leamer (1987) develops this model further and relates it to paths of economic development. If the stock of natural resources is unchanged, rapid growth of produced capital (physical plus human skills and technological knowledge) per unit of available labour tends to strengthen comparative advantage in non-primary products. By contrast, a discovery of minerals or energy raw materials would strengthen that country's comparative advantage in mining and weaken its comparative advantage in

agricultural and other tradable products, *ceteris paribus*. It would also boost national income and hence the demand for nontradables, which would cause mobile resources to move into the production of nontradable goods and services, further reducing farm and industrial production (Corden 1984). Conversely, a depletion or fall in the prices of minerals or energy would strengthen the comparative advantage of agricultural and other sectors producing tradables and weaken the demand for nontradables.

At early stages of economic development, a country with high trade costs typically is agrarian, with most GDP and employment in the agricultural sector (when home-produced food is included in the estimates). If such a country has a relatively small stock of agricultural land and other natural resources per worker, labour rewards will be low. As its trade costs fall or governmental trade restrictions are removed, it will develop a comparative advantage in unskilled labour-intensive, standard-technology manufactures (as in Japan during the Meiji Restoration, 1868-1912). Then as the stock of industrial and human capital per worker grows, there will be a gradual move toward exporting manufactures that are relatively intensive in their use of physical capital, skills, and knowledge.

Natural resource-abundant economies, however, may attract migrants from more-densely populated countries who seek to become farmers in frontier regions, thereby raising the settler economy's total if not per capita GDP. In such economies, the primary sector's share of GDP falls slower than in economies that are growing equally rapidly but are less abundant in natural resources. If resource-rich economies invest relatively more in capital (including new technologies) specific to primary production rather than manufacturing, they would not develop a comparative advantage in manufacturing or services until a later stage of development, at which time their exports from those sectors would be relatively capital intensive. This is all the more likely if new technologies developed for the primary sector become increasingly labour-saving as real wages rise – leading potentially to what are known as factor intensity reversals, whereby a primary industry in a high-wage country can retain competitiveness against a low-wage country by adopting capital-intensive new technologies. The primary sector's share of GDP would also decline slower if its productivity growth outpaced that of other sectors by more than the average global rate.

The above theory of sectoral changes and evolving comparative advantages has been used successfully to explain the twentieth century 'flying geese' pattern of comparative advantage and then disadvantage in unskilled labour-intensive manufactures, as some rapidly growing economies expand their endowments of industrial capital per worker relative to the rest of the world – the classic example being clothing and textiles (Anderson 1992, Ozawa

2009). It has also been used to explain the evolving trade patterns between Asia's resource-poor first- and second-generation industrializing economies and their resource-rich trading partners (Anderson and Smith 1981).

A boom in one of the main tradable sectors has the effect of strengthening the real exchange rate. This, in turn, draws resources to that sector, and to the sectors producing nontradables such as services, and thus away from other sectors producing tradables, *ceteris paribus*. It also raises national income and so boosts the domestic demand for both locally produced and imported products. Together those forces reduce the volume of exports from non-booming sectors and the domestic-currency price of those exports, and hence their aggregate value (Corden 1984). Such a boom in a key export sector could be supply driven (e.g. the discovery of a mineral or energy raw material deposit), or demand driven (e.g., a rise in the international price of that sector's output). In the former case it may attract immigrants and so expand the domestic economy, as with Australia's nineteenth century gold rushes. In the latter case it will show up as an improvement in the country's international terms of trade and encourage new investment in the booming sector. The more capital funding for new investment comes in from abroad, the earlier and larger will be the initial appreciation in the real exchange rate. Later the exchange appreciation will reverse as the boom moves from its investment phase to its export phase and starts to return dividends and possibly capital to foreign investors (Freebairn 2015).

The growth and commodity composition of a country's trade also depends on sectoral policies. In those industrializing economies whose growth has been accompanied by increases in protection from agricultural imports, demand for farm products from abroad is diminished, thereby reducing growth prospects for agricultural-exporting countries (Anderson 2009). In resource-rich economies that protect their manufacturers from import competition and ban some mineral exports – as Australia has done for much of its history – their primary product exports are dampened (Lerner 1936).

EXPECTATIONS FROM THEORY FOR AUSTRALIA

The above theory suggests Australia's very lightly populated antipodean continent would have had a strong comparative advantage in primary products from the outset, and have a high (low) share of GDP from and employment in primary (manufacturing) production relative to other high-income countries. Being relatively labour-scarce and one of the world's

highest-wage countries (McLean 2013), Australia also is likely to have been at the frontier of developing and adopting labour-saving technologies. That suggests the agricultural share of the workforce would not be as much above the agricultural share of GDP, relative to other high-income countries.

In the early decades of European settlement before mineral discoveries, Australia's international competitiveness was strongest in non-perishable agricultural products that were not labour intensive in their production (because real wages were high in this labour-scarce economy) and that had a high price per ton (given the high cost of transport to the main markets in Europe) (Blainey 1966). The discovery of mineral reserves and subsequent mining would have altered that picture for the nineteenth century only if mining outputs had high value-to-weight ratios, such as precious metals. A comparative advantage in bulky commodities such as coal, natural gas, and iron ore would not emerge until the 1970s when their historically low prices in international markets were to rise very substantially and new bulk shipping innovations lowered transport costs.

These expectations from theory need to be amended, however, because of the extreme protectionist policies Australia adopted during its first seven decades as a Federation. For example, very high tariffs were imposed on imports of many manufactured goods at the outset, building on those that had gradually been imposed during the nineteenth century (Lloyd forthcoming). These tariffs were raised over time and then supplemented with binding import quotas between 1952 and early 1960; and were especially high for labour-intensive goods such as textiles, clothing, and footwear (Anderson and Garnaut 1987). Australia also had a ban on iron ore exports from April 1938 until it was partially lifted in November 1960 and removed entirely in May 1966.⁴ As well as these severe direct trade restrictions, myriad regulations affecting services sectors and labour markets discouraged services production and raised intermediate input costs for industries producing exportables.

⁴ See Lee 2013. The export embargo was introduced by the Lyons Government when it learnt that a British company owned by the Nippon Mining Company of Japan had obtained a lease in 1938 to export one million tons a year from Yampi Sound in Western Australia. A year earlier Japan had invaded China, and in 1938 the Commonwealth Geologist reported that Australia had only modest reserves of iron ore. BHP supported the continuation of the ban after World War II, because it strengthened its monopoly position in Australia's steel industry. As late as 1955, the then-Minister for External Affairs, R.G. Casey, reiterated the claim that Australia was poorly endowed with iron ore, a message that was repeated in a Bureau of Mineral Resources (1960) report and echoed in the Vernon et al. (1965) report. It was only after the embargo was partly lifted in November 1960 (to allow a small volume of exports and only from newly discovered deposits) that the spectacular discoveries in the Pilbara region of Western Australia were made public. But once BHP decided (in 1965) to become part of this new export industry, the Federal Government began to capitulate and eventually it removed the ban in May 1966.

As a consequence of these policy interventions, the decadal average of Australia's merchandise exports plus imports was barely 20 percent of GDP from the 1930s to the 1970s. Policy reforms began to be implemented with an across-the-board 25 percent cut to import tariffs in 1973 and then with far more comprehensive microeconomic reforms from 1984. The program included not only a virtual phasing out of import tariffs and quotas and other direct industry assistance measures but also a freeing up of markets for labour, capital, foreign currencies and various services, and the privatization of major state-owned enterprises (Productivity Commission 2003; Hatton and Withers 2014). Goods exports plus imports as a share of GDP gradually rose from 21 percent in the 1970s to 25 percent in the 1980s, 28 percent in the 1990s, and 32 percent in the first sixteen years of the present century (or 41 percent when services are included). Although other countries also experienced an increased trade propensity as globalization has proceeded, the extent to which Australia experienced an increase in trade was much greater. Data from WTO (2015) reveal that during 2000-14, international trade grew only marginally faster than world GDP, at 3.7 percent per year compared with 3.2 percent.

WHAT DO THE DATA REVEAL?

When Europeans settled in New South Wales in 1788, production of fresh food was the highest priority. For almost all of the next 60 years, agriculture accounted for more than 85 percent of merchandise GDP (that is, ignoring services) at current prices. With the discovery of gold in 1851, agriculture's share declined to just 26 within a year. Mining's share peaked at 61 percent in 1852 and stayed above 30 percent until the mid-1860s. That first gold rush caused Australia's non-aboriginal population to rise by 140 percent and real GDP to rise by 220 percent in the 1850s. Mining's share of merchandise GDP averaged a more modest 15 percent during 1870-90, before returning to 25 percent by the turn of the century because of a gold rush in Western Australia. But it had halved again by 1914, and from 1918 to 1971 it was never above 9 percent and averaged just under 6 percent.

It is not surprising that sectoral shares in Australia are different from those in other high-income countries. They are different in a number of ways that are consistent with the theory – and qualifications – made above. The features stressed here are: (1) the manufacturing sector's share of the economy was as large as in other high-income countries until trade protectionism began to be cut in the 1970s; (2) the service sector's share of GDP

declined slightly over the 100 years following the first gold rush, contrary to the normal pattern in growing economies; (3) the agricultural and mining sectors' shares of GDP and exports vacillated as the mining sector went through its occasional booms followed by much longer slumps; and (4) the agricultural sector's share of GDP remained relatively constant during 1860-1960 and even during the latest mining boom, whereas in most developed countries it has declined under similar circumstances; and (5) the farm sector continued to enjoy a strong comparative advantage despite periodic spurts of growth in mining exports.

(1) A larger-than-warranted manufacturing sector up to the early-1970s

Australian manufacturing's share of GDP and employment peaked by the early-1960s at rates little different from the average high-income country (both almost 30 percent – see Anderson 1987b, Figure 7.1). Such a high share was possible despite Australia's strong comparative advantage in primary products only because the manufacturing sector was highly protected. The extent of that support for manufacturing at the expense of primary products is shown in Figure 3, which reveals the average nominal rates of assistance or NRAs to those sectors (the percentage by which the average gross value of output has been raised by government policies such as protection from imports). The huge gap between those sectors' NRAs began to diminish only from the 1970s as policy reforms were gradually implemented. The impact of protection on incentives in the primary sectors is indicated by their relative rate of assistance (RRA), defined in percentage terms as:

$$RRA = 100[(1+NRAp^t/100)/(1+NRAm^t/100) - 1]$$

where $NRAp^t$ and $NRAm^t$ are the weighted average percentage NRAs for the tradable parts of the primary and manufacturing sectors, respectively. The RRA suggests the policy regime reduced the gross rewards from primary production by approximately 20 to 30 percent in the first half of the twentieth century relative to what would have been the case under free trade, and by about 10 percent between the mid-1950s and mid-1980s before gradually being eliminated by the turn of the century.

[Insert Figure 3 about here]

Policy reforms in Australia had several impacts on tradable sectors. One was a faster shrinkage in Australia than in other high-income countries in the manufacturing sector's share of GDP. By 2000 that share had fallen to 13 percent and by 2014 to just 7 percent, compared with 18 and then 15 percent for other high-income countries (Figure 4(a)). The

share of the workforce employed in manufacturing had fallen commensurately, and was just 8 percent in 2015. By contrast, the manufacturing employment share in other high-income countries has fallen by less than ten percentage points over the past 25 years. However, as noted below, the halving in Australia's manufacturing shares of GDP and employment after 2000 was in part due to the mining boom.

[Insert Figure 4 about here]

A related consequence of those policy reforms is that agriculture's share of GDP has remained well above that of most other high-income countries, and increasingly so in proportional terms since 1970 – despite the recent mining boom (Figure 4(b)). Note that the fluctuations in that GDP share are far larger for Australia than for other high-income countries, reflecting the greater abandonment of farm price stabilization schemes in Australia than elsewhere since 1970 (Griffith and Watson 2016).

Another consequence of the opening up of the economy was a non-trivial rise in the extent to which Australia's farm production was exported. During 1973-79, the value of rural exports (which includes the post-farmgate costs of getting produce to the port and on ships) was 69 percent of the gross value of farm production at current prices. This rose to 75 percent in 1980-99 and to 83 percent in 2000-15. In addition to an increase in the overall level of exports, there has been a much wider range of farm products exported, and, in some cases, products have switched from net import to net export status, despite the mining boom's recent impact on exchange rates (ABARES 2015).

(2) A non-rising trend in the service sectors' share of GDP for 100 years

The share of services in Australian GDP declined slightly between 1860 and 1960, the opposite of the pattern that is usual in a growing economy. The sector's share rarely moved out of the 50-60 percent range during those ten decades, before rising rapidly over the past half century to 80+ percent as in other high-income countries (Figure 5(a)). True, the initial share around half of GDP was high by the standards of other high-income countries in the mid-nineteenth century, but not 100 years later (Kuznets 1966, Table 3.1; Syrquin and Chenery 1989). That slightly declining trend for services contrasts with the steep upward trend in the GDP share contributed by manufacturing, especially after 1910. The huge degree of government assistance to manufacturing leading up to and following Federation for decades, shown in Figure 3, contributed to that large difference in the two sectors' growth rates.

[Insert Figure 5 about here]

(3) Vacillating importance of agriculture and mining

The most valuable mining output in the nineteenth century was gold, although there were numerous other ores mined as well (Blainey 2003). The first gold rush was centred in Victoria from 1851, followed by one in Western Australia in the 1890s. They show up very clearly as bulges in mining's share of GDP (Figure 5(b)). However, by the time of the First World War, mining's importance had decreased, and its share of GDP remained relatively low for more than five decades. It began to grow again only after the ban on iron ore exports was gradually lifted during 1961-66 and permits began to be issued by the Western Australian government to mine the ore and privately develop new rail and port facilities to allow exports. It grew even more after the OPEC cartel quadrupled the price of petroleum in 1973-74 and then doubled it again in 1979-80, as this made it economically feasible for thermal coal and subsequently natural gas to be exported from Australia to East Asia. Mining expanded even more from 2005 as Chinese demand for imports of coking coal and iron ore increased and ships capable of carrying loads of up to 250,000 tons of ore became available to transport these exports at relatively low cost. That latest expansion caused considerable de-industrialization of the Australian economy, but relatively little de-agriculturalization because farm product prices rose almost as much as mineral prices between 2005 and 2012.

(4) A non-declining trend in the agricultural sector's share of GDP for 100 years

Agriculture's share of GDP slumped sharply at the start of Victoria's gold rush in the early-1850s, as rural workers abandoned their farm activities and headed for the goldfields. But it soon recovered and remained within the 20-30 percent range for the next 100 years (Figure 5(a)). It dipped only during Western Australia's 1890s gold rush and in the First World War, and otherwise just fluctuated with the seasons and with international prices, for example declining during the severe economic depressions of the mid-1890s and early-1930s. That flat trend contrasts markedly with the downward trend in virtually all other high-income economies (Kuznets 1966, Table 3.1). Even during the latest mining boom, agriculture's share of GDP was adversely affected far less than that of manufacturing (Figure 5(b)), despite many farm regions being in a severe drought in the first decade of the century.

Nor did the mining booms of the nineteenth century depress the farm sector for long. That was because they were so large relative to total GDP at the time, and they stimulated major expansions of the economy. The 1850s, for example, saw the continent's non-aboriginal population nearly treble and real incomes per capita rise, so the domestic demand for farm products grew enormously, encouraging men to return from the gold fields to farming (Figures 5 and 6) (Maddock and McLean 1984). The high and rising level of real wages also encouraged the development and widespread adoption of labour-saving farm (and mining) technologies such that the shares of national employment in primary sectors kept in line with their GDP shares (Figure 6), unlike in most other countries where slow labour adjustment has meant the employment share exceeds the GDP share.

[Insert Figure 6 about here]

The relatively minor impact of the recent mining boom on farming was partly a result of international food prices rising at the same time as the price of mining products in those years. However, the price index of Australia's farm exports rose considerably less than the index for the country's mining exports (Figure 7), so that can't be the full explanation. An additional explanation is that a high level of public and private investments in rural research over many decades ensured very high productivity in farming, especially since the 1980s (Figure 8) (Alston and Pardey 2016). Grafton, Mullen and Williams (2015) report also that productivity growth since the turn of this century has been faster for agriculture than for both mining and manufacturing.

[Insert Figures 7 and 8 about here]

(5) Retention of agricultural comparative advantage despite periodic mining surges

Australia's relatively rapid farm productivity growth also helped the rural sector maintain a high share of national exports. In the nineteenth century agricultural exports were dominated by wool, which alone accounted for around half of all exports apart from during the two gold-mining booms (Figure 9(a)). Wool production was the farm enterprise that was perhaps least intensive in its use of scarce labour relative to abundant grazing land (Davidson 1981, Ch. 6). Together with gold it accounted for most of Australia's exports throughout the second half of the 1800s, and even though export concentration was not unusual among economies of the New World, it is clear from Figure 10 that Australia had one of the highest concentrations. During the five decades to 1960 Australia's exports became more diversified, but nonetheless around three-quarters of its value was contributed by the rural sector (Figure 9(b)). Even in

the following five decades the agricultural share of Australia's exports has been more than twice the global average, while the manufacturing share has always been well under half the global average (Figure 11).

[Insert Figures 9, 10 and 11 about here]

CONCLUSION

While this review of sectoral trends and shocks in the course of economic growth over the past two centuries reveals a number of unusual features of Australia's economy, they are fairly consistent with what trade theory would suggest once the country's policies and institutions are taken into account. The data underscore the resilience of Australian farmers in dealing with supply and demand shocks associated not only with their own product markets (due to variability of weather and farm product prices) but also with mining. Manufacturing has not fared as well over the past decade. Even with the recent ending of the country's latest mining investment boom and the associated depreciation of its real exchange rate, manufacturers will have to continue to contend with strong competition for labour and other mobile resources not only from the farm sector but also from those service sectors whose products are becoming increasingly tradable internationally. Future governments may still occasionally provide some direct assistance to struggling firms in marginal electorates (as happened for South Australia's steel and submarine manufacturers during the 2016 Federal election), but much more efficient social safety nets are now available to assist the losers from economic growth to adjust to future sectoral trends and shocks.

APPENDIX: DATA SOURCES

A great deal of historical macroeconomic and sectoral data on Australia's economy has been compiled by Vanplew (1987), and a subset of those data have been updated by Butlin, Dixon and Lloyd (2014). Anderson (2015) has extended some of those series (and added the colonial/state data) by drawing on, among others, Butlin and Sinclair (1986), Sinclair (2009) and the *Statistical Registers* of each Colony. They and many of the other series have been updated from the Australian Bureau of Statistics (www.abs.gov.au) and the Reserve Bank of Australia (www.rba.gov.au).

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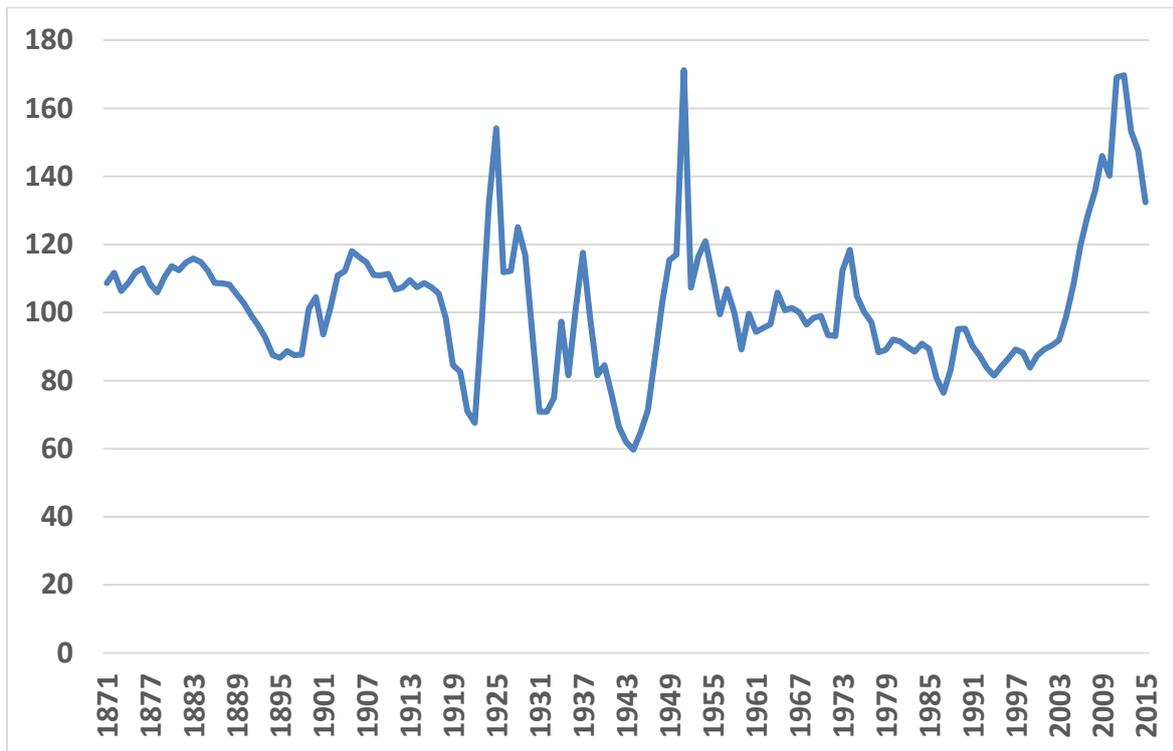
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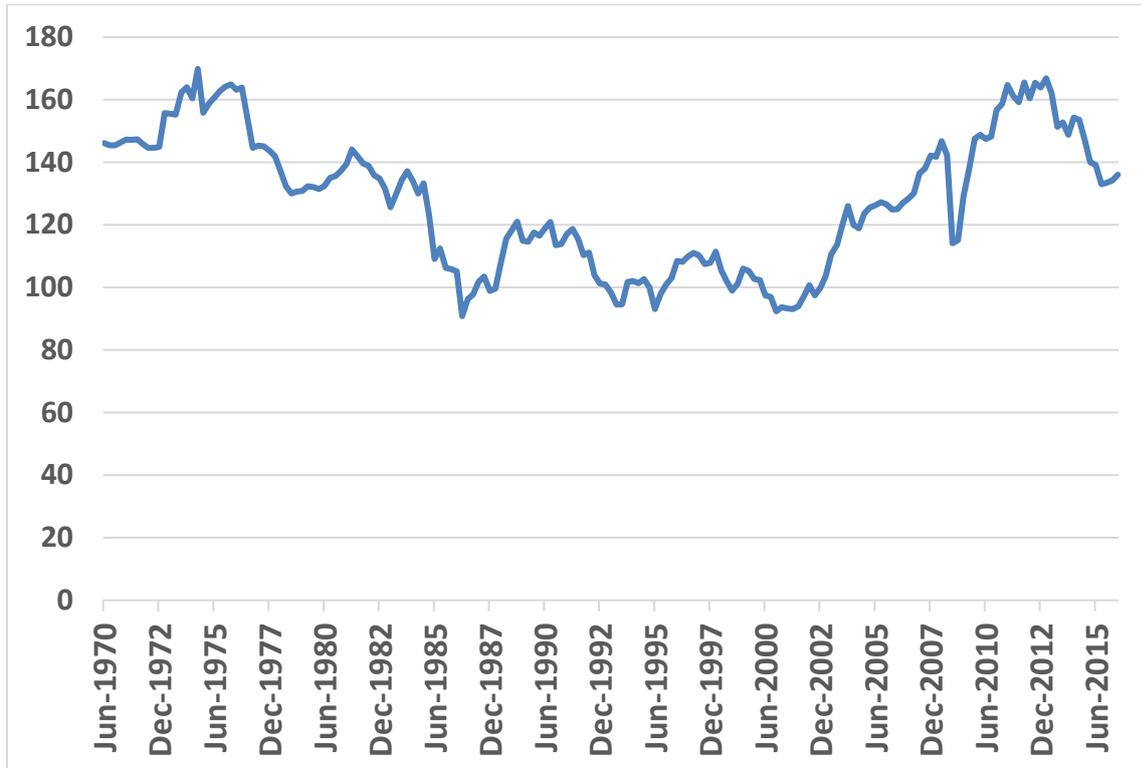
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Figure 1: International terms of trade, Australia, 1871 to 2015 (1967 = 100)



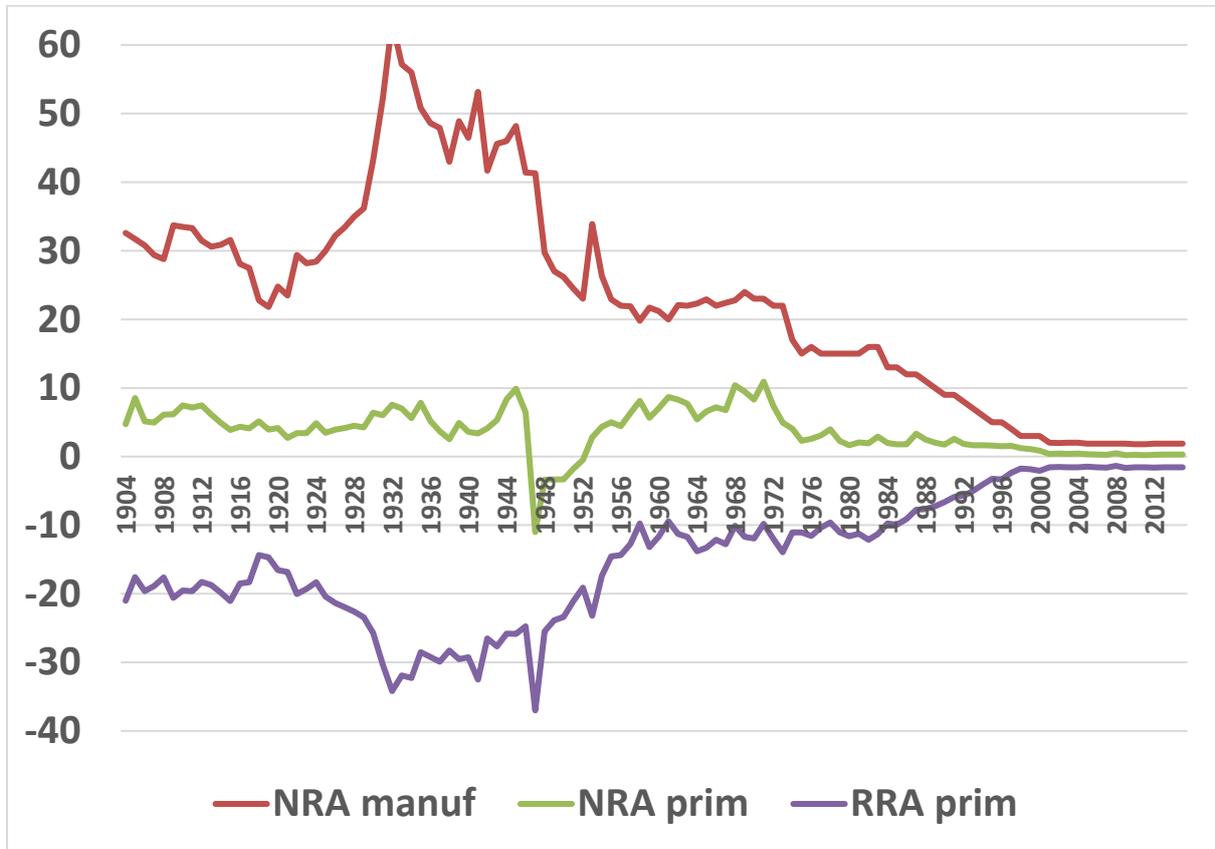
Source: Gillitzer and Kearns (2005), updated for 2005-15 from ABS Cat No 5206.0, Table 34.

Figure 2: Real exchange rate, Australia, June 1970 to June 2016 (March 1995 = 100)



Source: Reserve Bank of Australia (www.rba.gov.au/statistics/historical-data.html)

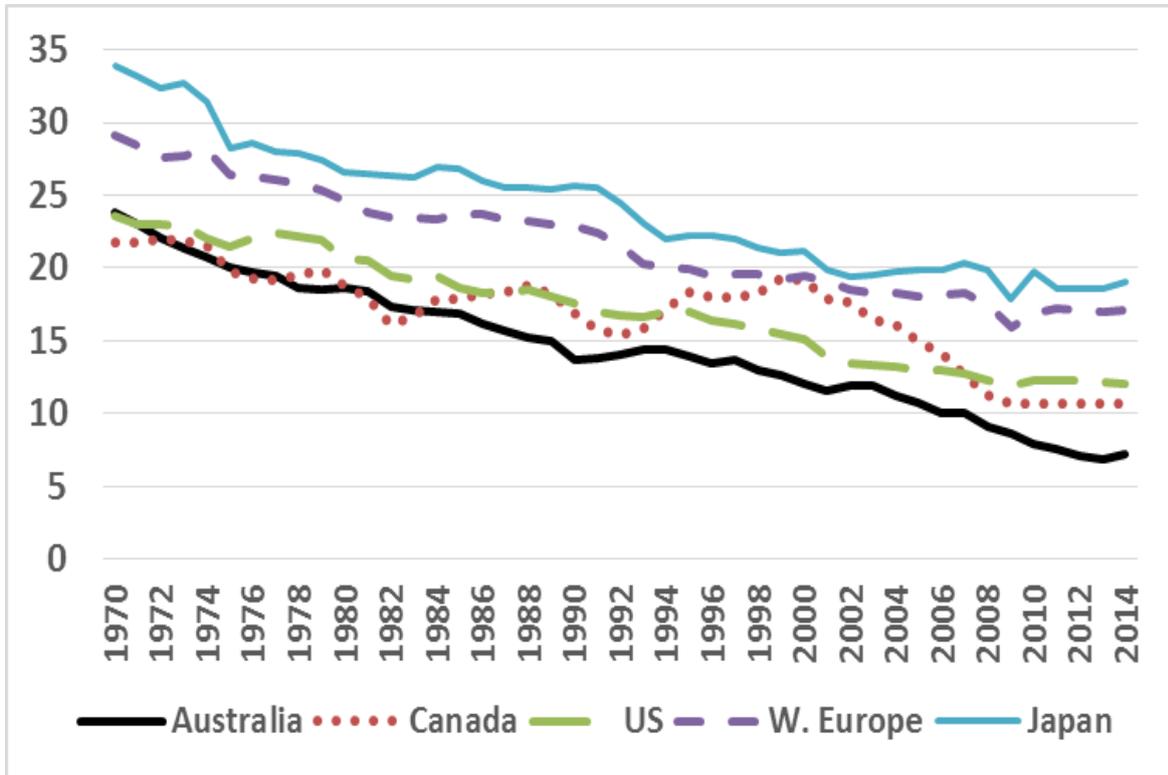
Figure 3: Nominal rates of government assistance (NRA) to manufacturing and primary production and relative rate of assistance (RRA) to primary sectors, 1904 to 2015 (percent)



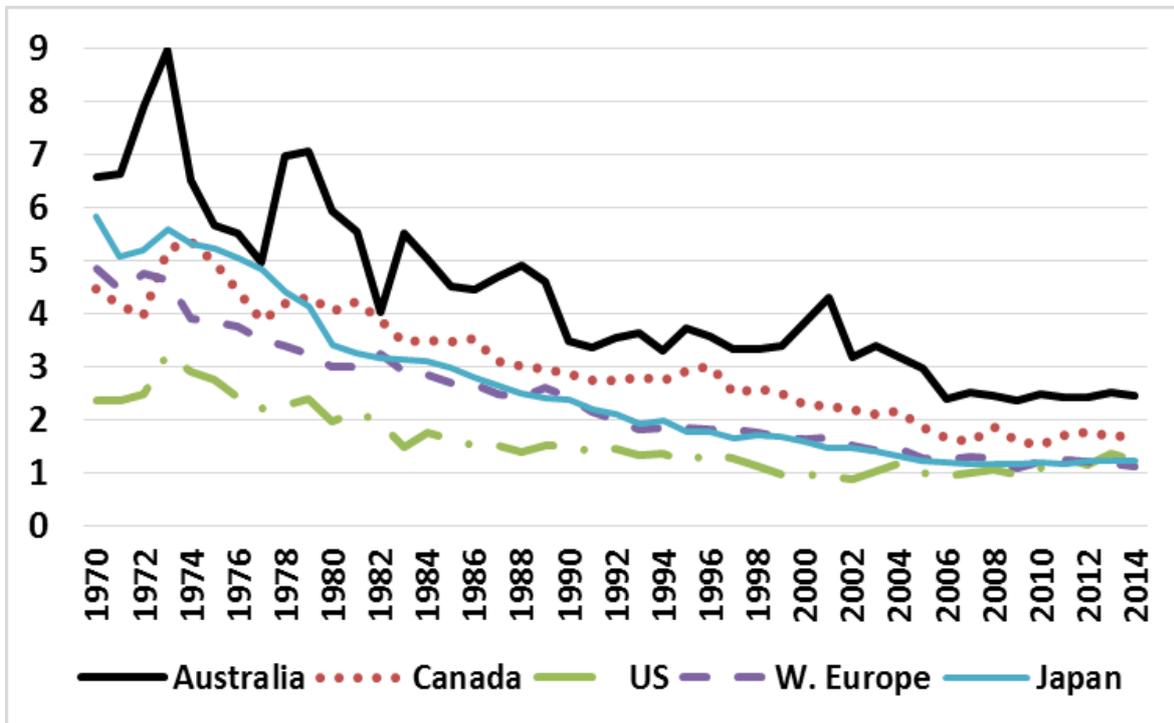
Source: Author's compilation based on data in Anderson, Lloyd and MacLaren (2007) and Lloyd and MacLaren (2015) and assuming the NRA for mining was zero each year.

Figure 4: Sectoral shares of GDP, Australia and other high-income countries, 1970 to 2014 (percent)

(a) Manufacturing



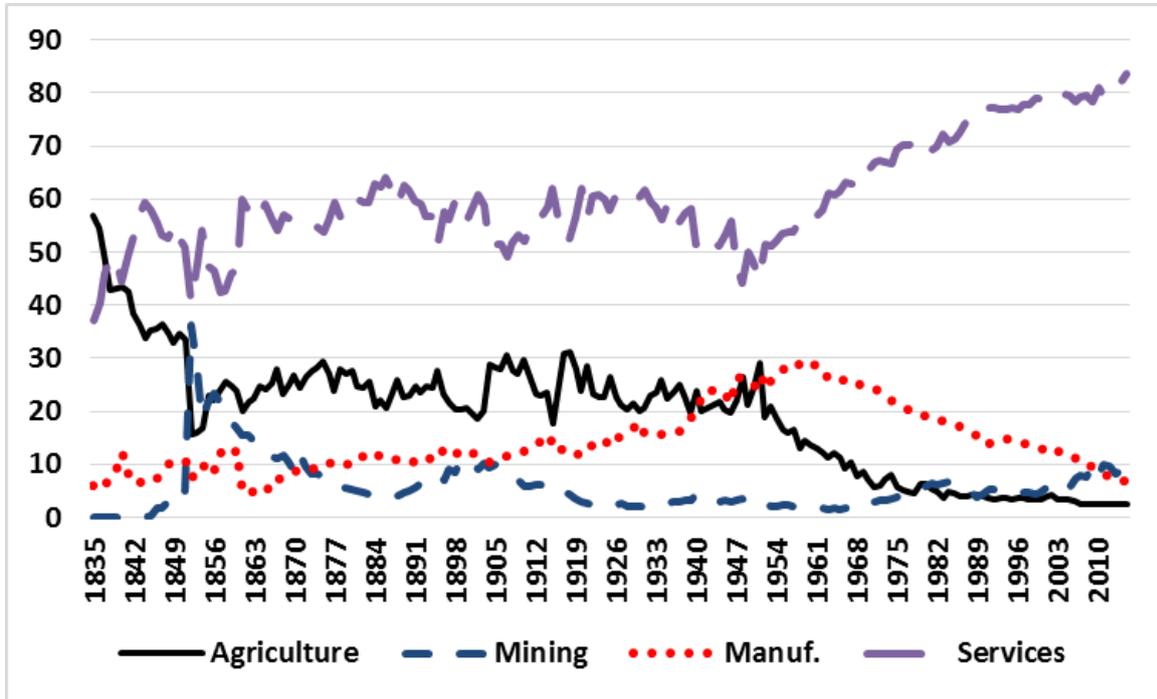
(b) Agriculture



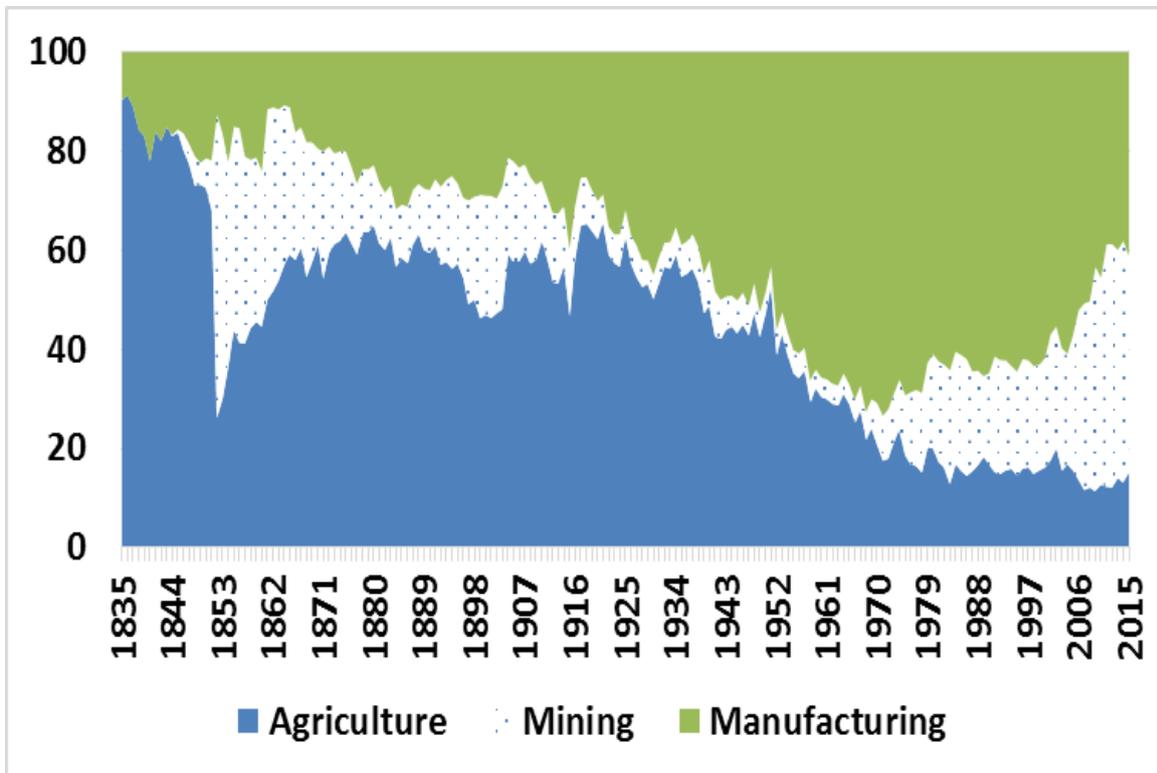
Source: World Bank (2016).

Figure 5: Sectoral shares of total GDP and merchandise GDP at current prices, Australia, 1835 to 2015 (percent)

(a) All goods and services

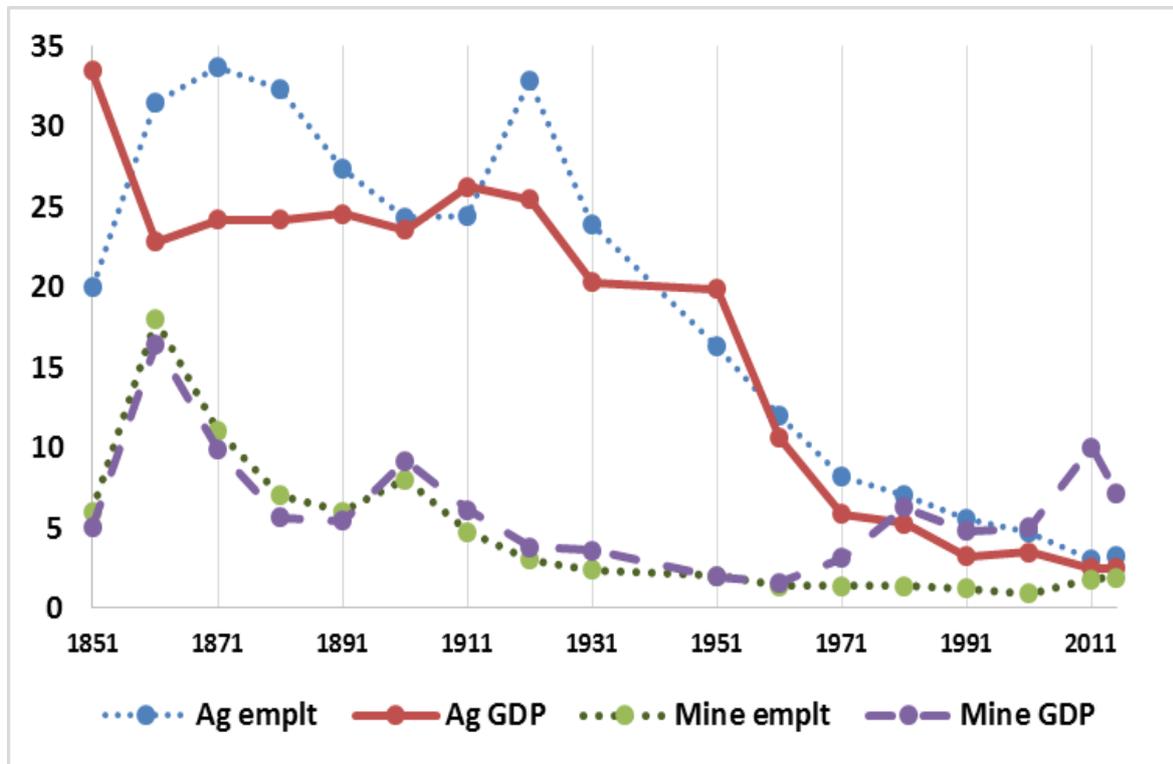


(a) Merchandise only (i.e. excluding services)



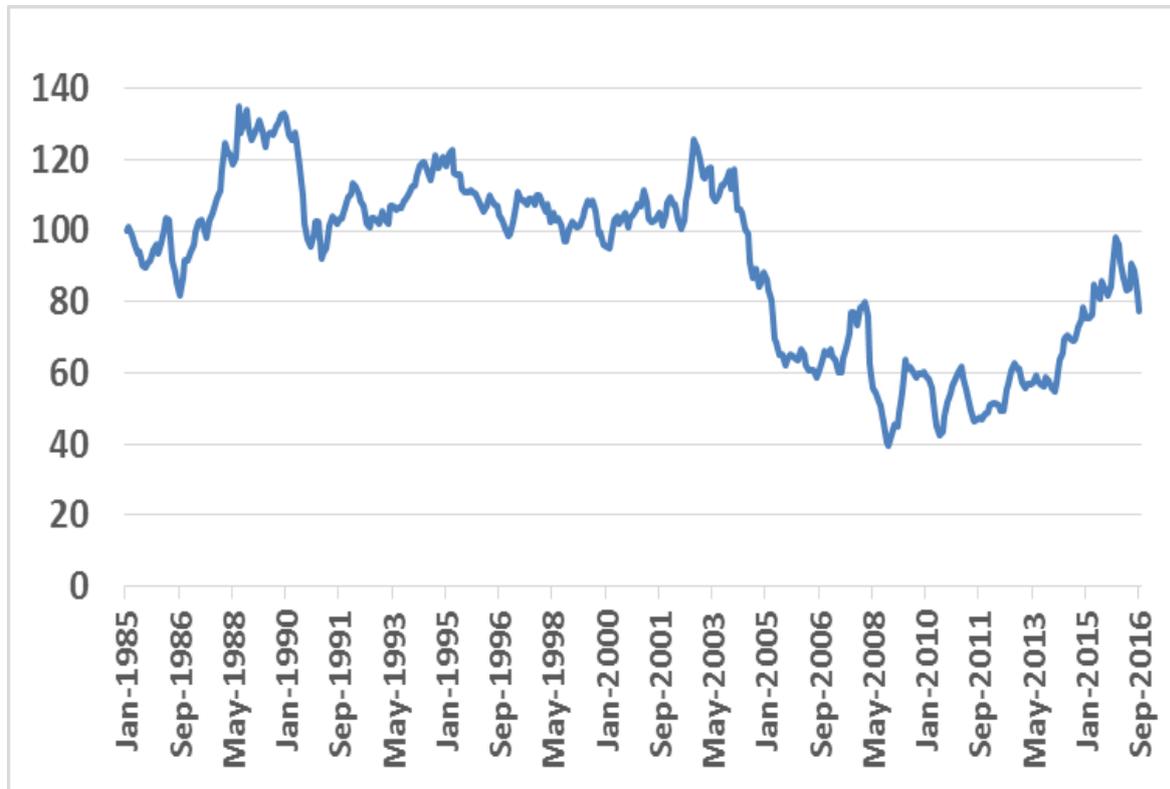
Source: Butlin Dixon and Lloyd (2014), updated for 2011-15 from ABS Cat No 5204.0

Figure 6: Agricultural and mining sectors' share of national employment and GDP, 1851 to 2015 (percent)



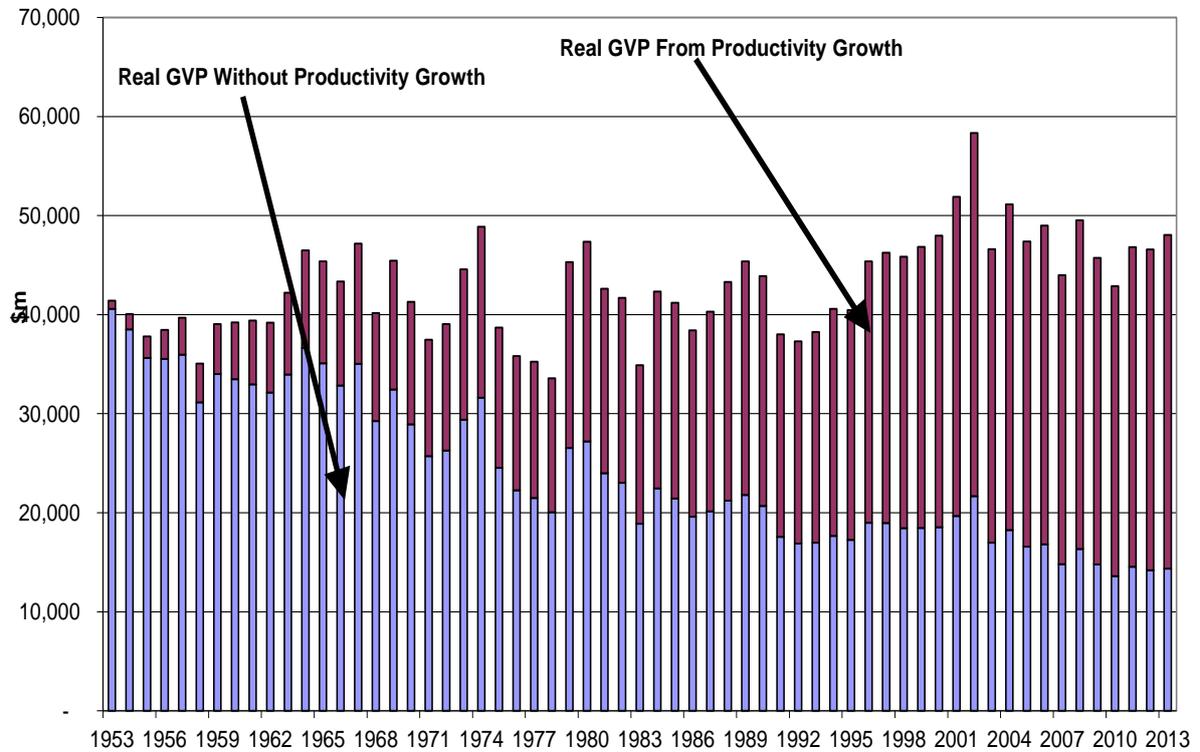
Sources: ABS Cat. No. 6291.0 and Anderson (2015).

Figure 7: Ratio of the price indexes for Australia's agricultural and mineral exports, 2000 to 2016 (January 1985 = 100)



Source: Reserve Bank of Australia (www.rba.gov.au, accessed 21 October 2016).

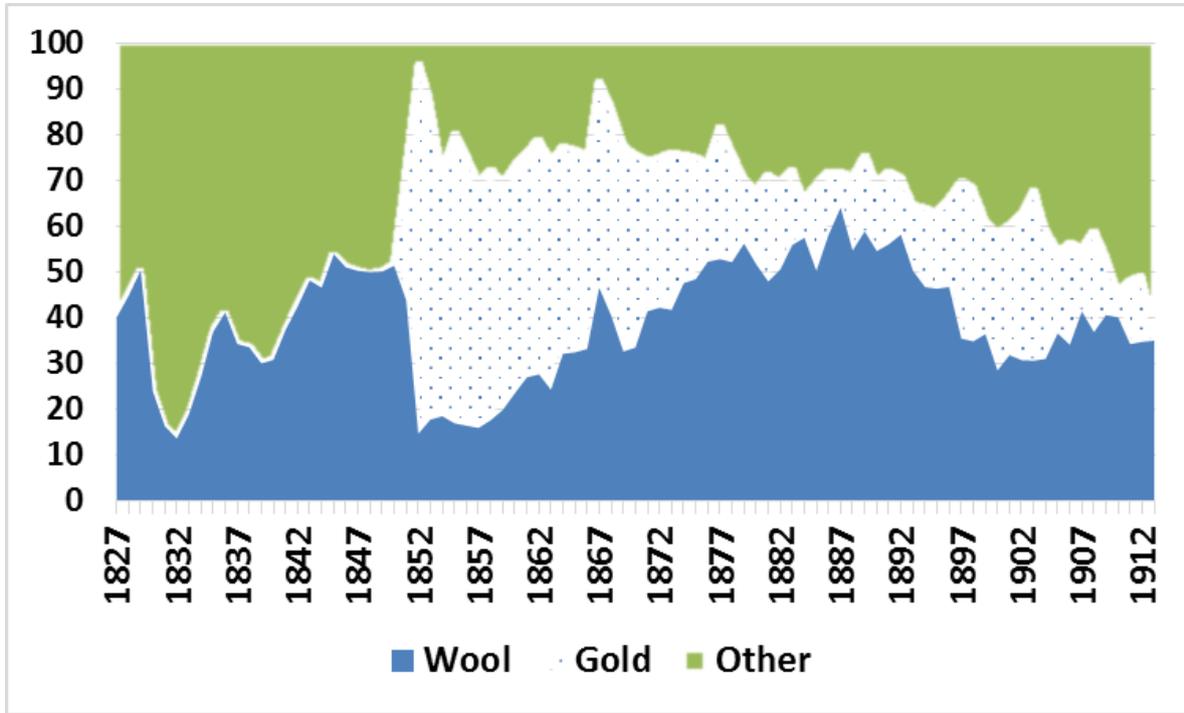
Figure 8: Contribution of productivity growth to real gross value of Australian farm output, 1953 to 2013 (AUD million)



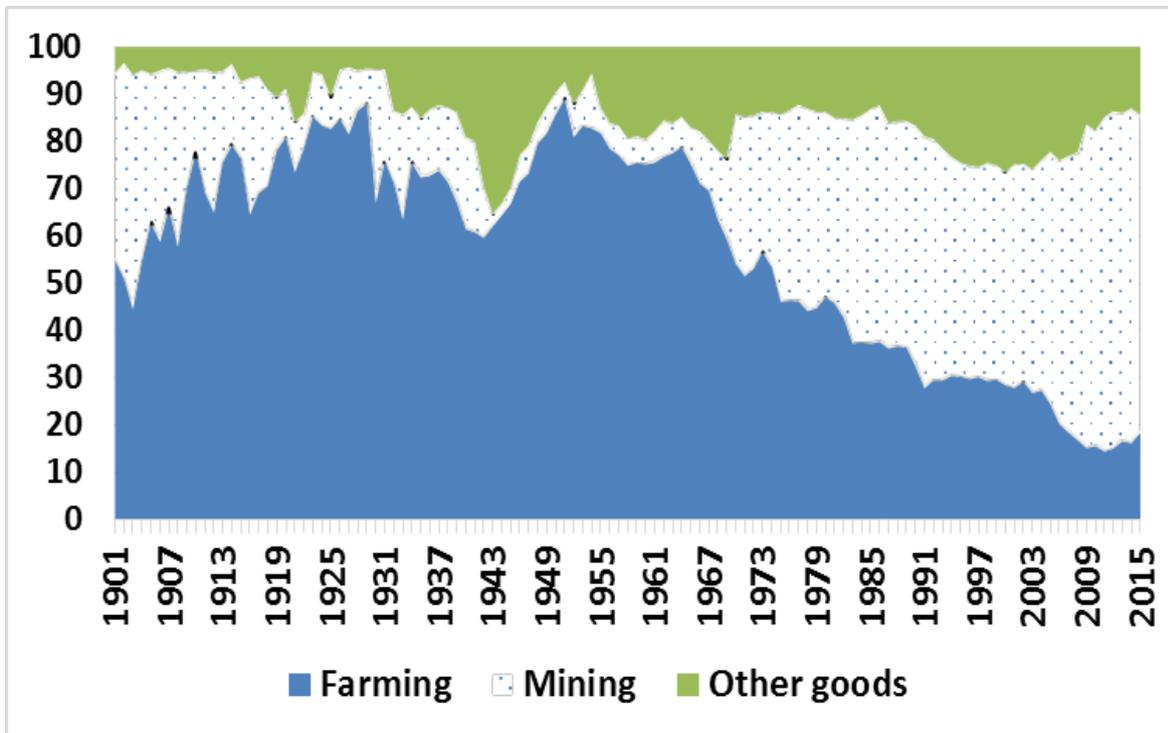
Source: Grafton, Mullen and Williams (2015), as reported in ACOLA (2015).

Figure 9: Shares of agricultural, mineral and other goods in Australia’s merchandise exports, 1827 to 2015 (percent)

(a) Wool and gold, to 1913



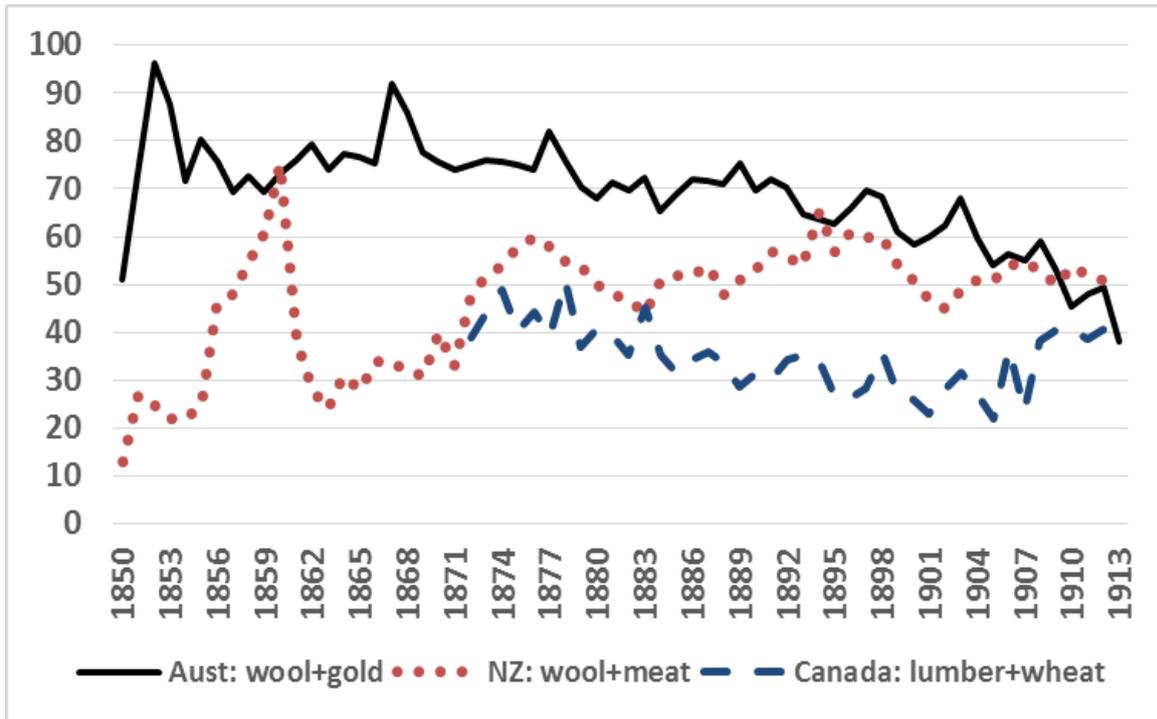
(b) All farming, mining and other merchandise, from 1901



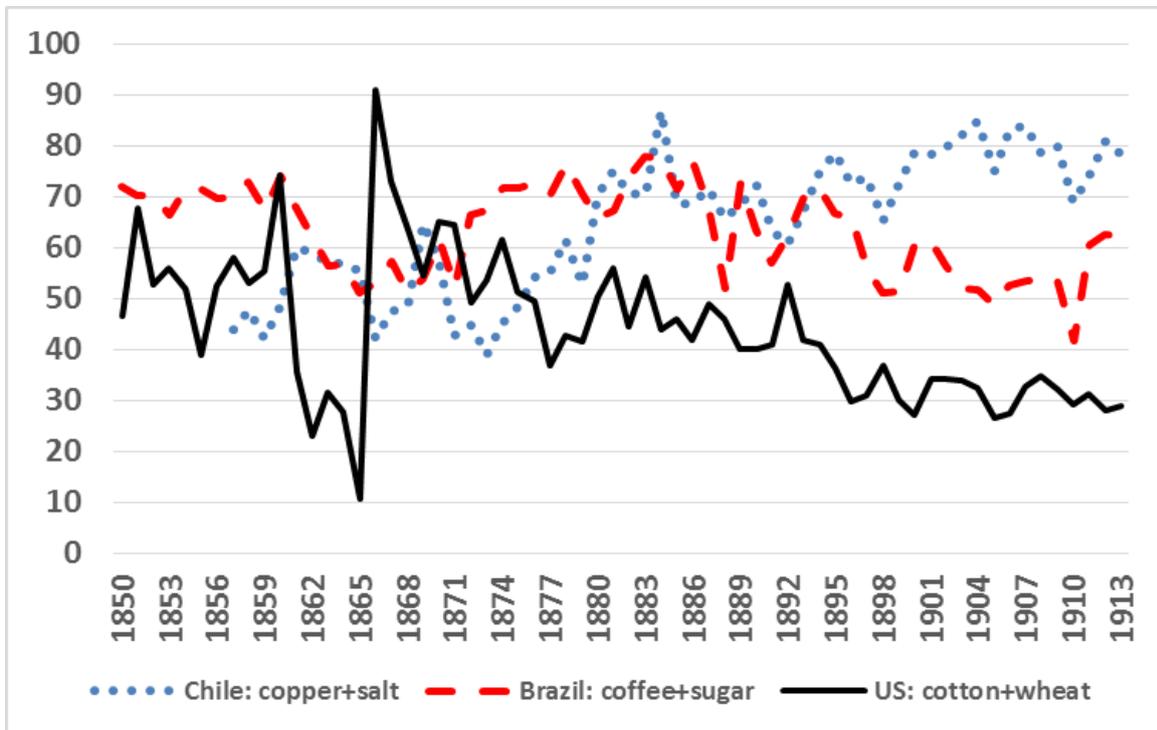
Source: Compiled by the author as reported in Anderson (2015, Section IV).

Figure 10: Share of top two goods in settler economies' exports, 1850 to 1913 (percent)

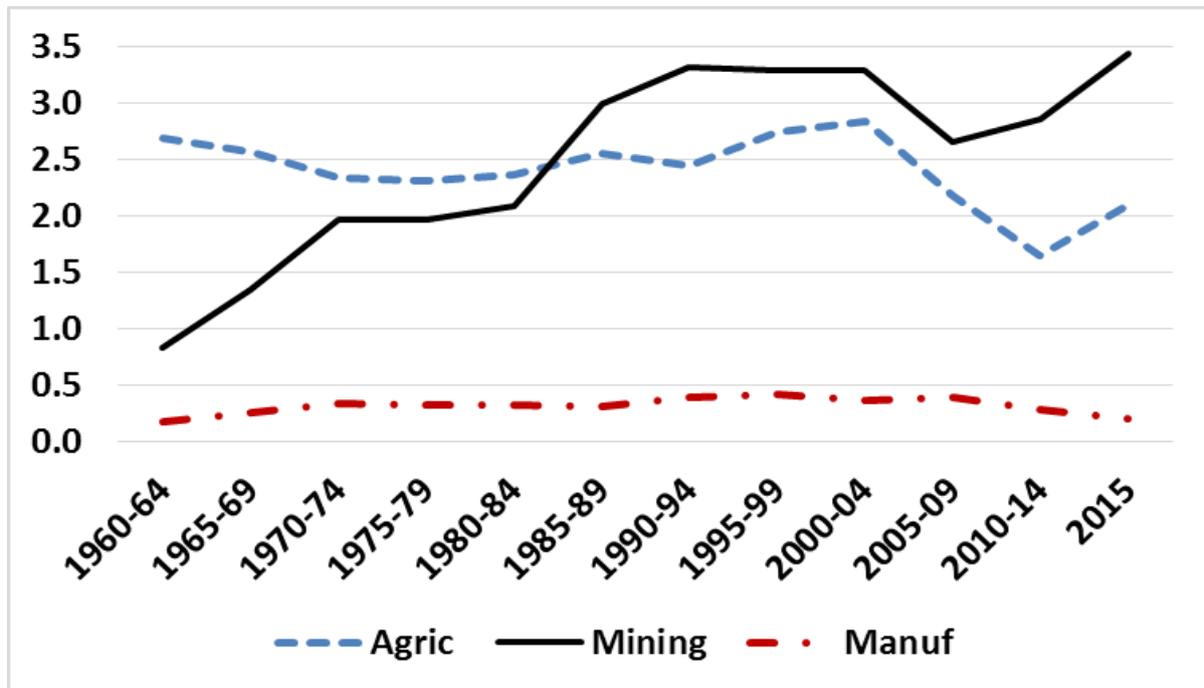
(a) Australia, New Zealand and Canada



(b) Brazil, Chile and the United States



Source: Author's compilation based on data in Mitchell (2005).

Figure 11: Index of ‘Revealed’ Comparative Advantage,^a key sectors, Australia, 1960 to 2015

^a The RCA is defined as a sector's share of Australian exports divided by that sector's share of global exports of merchandise.

Source: Author's compilation based on data from WTO online database accessed 12 August 2016 at www.wto.org