



School of Economics

Working Paper 2005-11

*Why was Australia so rich?*

Ian W. McLean

School of Economics  
University of Adelaide University, 5005 Australia

ISSN 1444 8866

# WHY WAS AUSTRALIA SO RICH?<sup>1</sup>

Ian W. McLean<sup>2</sup>

16 August 2005

## Abstract

Between 1870 and 1890 Australian incomes per capita were 40 percent or more above those in the United States. About half this gap is attributable to Australia's higher labor input per capita, and half to its higher labor productivity. The higher labor input is due in part to favorable demographic attributes stemming especially from the gold rush era, and partly to a favorable workforce participation rate. The higher labor productivity appears to result from an advantageous natural resource endowment. By 1914 the income lead over the U.S. had all but disappeared. This is ascribed to declines in Australia's advantages both in labor input per capita and in labor productivity. It is argued that these declines are due neither to the effects of the 1890s depression, nor to changes in trade policy, but to the transitory or unsustainable nature of Australia's earlier sources of income advantage.

Keywords: comparative growth, Australian economic history

JEL classification: N10, N17, O30

---

<sup>1</sup> I am grateful to Greg Clark, Richard Damania, Brad DeLong, Barry Eichengreen, Tim Hatton, Chad Jones, Jim Robinson, Alan Taylor, Jeff Williamson and participants in seminars at Adelaide, ANU, Berkeley, Melbourne, and UC Davis for helpful comments, and to Evan Borkum, Pipat Luengnaruemitchai, Jay Ly, Greg Paterson and Choon Wang for excellent research assistance.

<sup>2</sup> School of Economics, University of Adelaide, Adelaide SA 5005, Australia. Email: ian.mclean@adelaide.edu.au

Australia's economic growth is something of an outlier in the range of national growth experiences. Australia was born rich, attaining an income per capita higher than any other country after little more than half a century of European settlement.<sup>3</sup> Further, for nearly two centuries Australia has remained (relatively) rich, despite some short-term slippages. Why?

The focus here is primarily on the periods in which Australia appears to have recorded the highest incomes (1870-1890) and in which this lead was lost (1890-1914) in an effort to uncover the reasons for both. The approach adopted compares the Australian experience with that of the United States, as income per capita in the latter caught up with the former by the First World War, and the U.S. is the usual benchmark in comparative growth analysis. The contributions of two determinants of income levels – labor input per capita and labor productivity – are estimated. This helps identify the forces underlying Australia's income advantage over the U.S. before 1890, and also the reasons for the loss of that advantage thereafter. It is found that Australia's income lead was the result of relatively favorable conditions in both determinants, and its loss of that lead the result of relative declines in both these initial advantages.

Contrary to the views of many growth economists that it is a curse to be resource rich, natural resource abundance must figure prominently in any persuasive answer to the question posed in the title of this paper. Indeed periods of weakest Australian growth, relative to benchmark economies, occur when the resource-based sectors of the economy have languished. It follows that institutions appear to have been vital to Australian growth inasmuch as they ensured that resource abundance became a blessing rather than a curse. I also suggest that attributes of Australian demography, arising in particular from the gold rushes of the 1850s, have a role in accounting both for the relatively high incomes per capita recorded in the late nineteenth century, and for the later loss of Australia's leading position. However, I question the prominence trade policy is sometimes assigned in accounts of how Australians lost their status as the world's richest citizens at the beginning of the twentieth century.

---

<sup>3</sup> Maddison (1995) provides the most widely cited estimates of comparative incomes per head since the nineteenth century. For a discussion of these, and presentation of alternative estimates, see Prados de Escosura (2000).

There has been surprisingly little discussion of Australian long-run growth in these terms. One attempt to explore the possibility that there might have been especially favorable demographic attributes or labor force participation rates behind Australia's income lead in the late nineteenth century is that by Butlin (1970). He was writing prior to the availability of detailed cross-country income estimates; his attention is focused primarily on the explanation for the long period of slower per capita growth within Australia between 1890 and 1940; and where he reports comparative statistics they relate to the experience of the United Kingdom rather than the United States. However, he identified important questions about Australia's comparative growth performance, understood that productivity and labor input per capita could independently account for changes in relative levels of income per capita between countries, and listed the natural resource sector as exerting a significant influence on the long-run growth performance of the Australian economy. This paper advances discussion of these same issues.

The Australian lead in income per capita and labor productivity before 1914 has been documented at least since Maddison (1982), but has typically provoked only passing comment. For example, in his discussion of convergence trends among the advanced economies, Abramovitz (1986) chose to treat the Australian productivity lead 1870-1913 as an anomaly – though his explanation for doing so is revealing: “Since Australia's high standing in this period mainly reflected an outstandingly favorable situation of natural resources relative to population, it would be misleading to regard that country as the technological leader or to treat the productivity changes in other countries relative to Australia's as indicators of the catch-up process” (p.392, footnote 11). In fact, his suggestion that the income or productivity lead was due to its natural resource endowment has not been rigorously examined in the literature, and remains an untested hypothesis.<sup>4</sup>

## 1. Evidence

Australia's long-run comparative economic performance is summarized in Figure 1, which reports the Maddison (1995) estimates of per capita GDP relative to those for

---

<sup>4</sup> Compare the remark by Maddison (1982, p.258, footnote 1): “In defining productivity leadership, I have ignored the special case of Australia, whose impressive achievements before the First World War were due largely to natural resource advantages rather than to technical achievements and the stock of man-made capital.”

the United States for selected years between 1820 and 1990, and for a group of countries with which Australia is most frequently compared. Care must be exercised in placing too much weight on evidence for any individual year, but the trends are clear enough. Australia in the late nineteenth century was ahead of both the U.K. and the U.S., but that changed after 1890. Although the decline relative to the U.K. was soon over, it was a different story when comparing Australia with the U.S. Relative to American incomes, those in Australia declined for several decades, before stabilizing at about three-quarters of the U.S. levels for the last half century.

The analysis that follows uses the U.S. as the benchmark for Australia, and in Figure 2 use is made of the annual estimates available from Maddison (1995) to show Australian GDP per capita relative to that of the United States for each year from 1870 to 1994. The fluctuations in the annual estimates – especially before 1950 – are a reminder of the dangers of relying too heavily on a few key years (as in Figure 1) when engaged in a comparative exercise of this sort. To complement the year-to-year evidence, and assist detection of underlying trends in the relative experience of the two economies, a smoothed (five-year moving average) series is also shown.<sup>5</sup> Viewing the two series, some fairly clear trends in relative incomes can be detected.

Across the decades of the 1870s and the 1880s, and in spite of marked short-run movement, Australian incomes averaged 51 percent above American incomes. But this enviable record ended in the depression of the 1890s wherein the income lead over the U.S. was all but eliminated. From the late 1890s until the First World War, Australian incomes averaged just 2.5 percent above those in the U.S. Then another step down in relative incomes occurs, with Australia averaging 11 percent below the U.S. for the quarter century to 1939. With the Second World War, a third step appears in Australia's relative income decline, to some 30 percent below that of the U.S. in the years immediately following the war, although a modest recovery reduces the gap to about 25 percent after 1970. Thus the very long 'transition' (from 51 percent above U.S. income levels to 25 percent below) occurs in three stages. The first and by far the most important – 64 percent of the full transition – occurs in the 1890s; a further 18

---

<sup>5</sup> Particular caution needs to be exercised when the two countries were experiencing very different short-run economic conditions. For example, in the late 1890s the U.S. had recovered from its earlier downturn whereas Australia had not; in the late 1920s the U.S. was booming while Australia was moving into recession; and during the 1930s the more severe U.S. (than Australian) depression may partially account for the small lift in the relative incomes in the latter.

percent occurs in the First World War; and the remaining 18 percent in the second war (allowing for the slight postwar ‘convergence’).<sup>6</sup>

Although the Maddison (1995) estimates are the most widely cited of international income comparisons, and the only set providing annual estimates, there are others. The most recent is by Prados de la Escosura (2000), who also reports earlier comparisons due to Bairoch, and a set based on exchange rate conversions. Given the very different bases of their construction, the size of the gap between Australian and American incomes in any benchmark year differs significantly among these estimates. But the generalizations that Australian incomes are initially above those in the U.S., experience relative decline after 1890, and then stabilize by the postwar period, are all preserved.<sup>7</sup> The margin of Australian incomes over those in the U.S. may be debated, but on present evidence, Australians before 1890 seem on average to have been better off than anyone else.<sup>8</sup>

In this paper most attention will be given the period before the First World War – that is, from 1870 to 1890 when Australian incomes exceeded American incomes (Sections 3 and 4), and from 1890 to 1914 when the Australian superiority was lost (Section 5). The reasons for the subsequent falling behind in Australian incomes between 1914 and 1945 – and why that relative decline came to an end – are the subject of more speculative discussion (Section 6).

---

<sup>6</sup> Of course, the causes of Australia’s relative decline will not necessarily be located neatly within these three brief periods of depression or war. It is at least as important to consider why there was no fully offsetting recovery or bounce-back after each downward step, as it is to ask whether prior negative influences may have been slowly accumulating but manifest only in periods of economic stress. Further, since relative income levels are being examined, one may as validly adopt the alternative perspective of asking why the U.S. first converged on, then forged ahead of, Australian incomes. These points are further considered in later sections.

<sup>7</sup> Moreover, for the crucial decades before 1914, there are independent estimates of relevance. Allen (1994) uses real wage data to compare Australia with the U.S., Canada and the U.K. Comparisons between Australia and the U.K. based on different income data (Haig 1989, Thomas 1995) also tell a story broadly consistent with the Maddison GDP per capita comparisons. It is unlikely that the trend in Australia’s relative economic performance since the late nineteenth century is due to measurement error, or to any serious degree is an artifact of the varying quality of the underlying data.

<sup>8</sup> That is, if the comparison is made across countries rather than regions within them. California’s income per capita was 93 per cent above that of the United States in 1880 (and 62 percent in 1900), even after allowing for differing price levels. Indeed the U.S. West (the Pacific and Mountain states) had incomes 66 and 38 percent respectively above the U.S. average in these two years (Mitchener and McLean 1999). These margins are above those reported for Australia in Figures 1 and 2.

## 2. Decomposing the Relative Income Gap: Method

To better identify the sources both of Australia's income advantage over the U.S. in the late nineteenth century, and of its loss of this advantage by the First World War, a helpful starting point is that income per capita ( $Y/N = y$ ) is the product of labor productivity ( $Y/L = q$ ) and the ratio of employment to population (or labor input per capita,  $L/N = l$ ):

$$Y/N = (Y/L)(L/N) \quad \text{or} \quad y = ql \quad (1)$$

It follows that Australian incomes may have been above American incomes for reasons unrelated to productivity. Indeed, Australian labor productivity could be somewhat below U.S. levels, but income higher, so long as there existed an offsetting advantage in labor input per capita.

This way of partitioning the sources of relative income difference between two countries may be helpful in directing attention to what is to be explained.<sup>9</sup> Many international comparisons of per capita income levels are made on the assumption that productivity differences alone are responsible, in which case the challenge is to explain why productivity levels vary between countries (Hall and Jones 1999). From Equation (1) it is clear that this is true only if labor input per capita is the same in both economies. Does this equality hold in the present study? That is, for an answer to the question as to why Australia was so rich, should we be looking for its especially favorable demographic and labor market characteristics, for the sources of its higher levels of labor productivity, or for both of these? Similarly, with this framework we can determine whether Australia's (relative) decline in incomes after 1890 was due to a (relative) decline in its productivity performance, to changes in its labor market conditions, or some combination of the two.<sup>10</sup>

In considering the possible role of labor input per capita ( $l$ ), a further partitioning between demographic and labor market conditions may be made. The average labor input per capita is determined by the age structure of the population

---

<sup>9</sup> I have used this decomposition procedure in another context: see Mitchener and McLean (1999).

<sup>10</sup> An complementary approach to that followed here would be to derive labor productivity estimates by sector in the two countries, then see how far differences in economy-wide productivity levels resulted from sector-specific productivity differences and in differences in the relative size of the sectors in each economy. This is the approach adopted by Broadberry (1998) in his comparison of the historical experience of Britain, Germany and the United States.

(specifically, the proportion of the population of working age,  $a$ ), and the workforce participation rate (the proportion of the working age population who are employed,  $w$ ). Since each of these may vary between males and females, it is helpful to take account of the gender ratio (let  $g$  be the proportion of males in the population). Then labor input per capita can be expressed as

$$l = g [(a_m) \times (w_m)] + (1 - g) [(a_f) \times (w_f)] \quad (2)$$

where  $m$  and  $f$  refer to male and female respectively. This enables a decomposition to be made of any differences in labor input per capita between countries or across time, into that due to two aspects of demography ( $g$  and  $a$ ) and to one feature of the labor market ( $w$ ).

The importance of this decomposition resides in the different sources of change underlying the components of  $l$ . Changes in the gender ratio or age distribution of a population do not happen suddenly, are not directly amenable to policy in normal circumstances, and, when they do occur, are likely to be the result of some exogenous event such as a war (in which the casualties are mainly male), or large-scale migration (in which young adults are most likely to be over-represented). In contrast, changes in work-force participation can fluctuate over a shorter time horizon, can be influenced by a wide range of economic and social policies, and might vary across countries for cultural or institutional reasons. It would be advantageous to identify which of these possible determinants of changes in the ratio of Australian to American labor input were occurring in any period.

An assessment of the contributions of labor productivity differences, and of differences in labor input per capita, to the gap between Australian and American income levels, may be obtained by substituting U.S. values for either  $y$  or  $l$  into Equation (1) for Australia, then comparing the resulting counterfactual Australian income so obtained with (actual) U.S. income levels. The difference between this counterfactual income gap, and the unadjusted income gap, indicates the contribution of that source to the income difference between the two countries. Similarly, the importance of differences in the gender ratio, age distribution, or workforce participation rate between Australia and the U.S. to an explanation of the difference in their incomes, can be assessed by substituting the American values for any one of

these into the right hand side of Equation (2) for Australia, then re-estimating Australia's (hypothetical) labor input per capita.

### 3. The Contribution of Labor Input Per Capita, 1870-1890

The convict origins of (much of) Australia bequeathed a high masculinity ratio; the gold rushes of the 1850s reinforced this legacy. And convicts, gold miners, and other immigrants tended to be relatively young. Hence it is possible these characteristics interacted to produce a favorable labor input per capita in the period between the gold rushes and 1890 when incomes per capita were so high. In addition we can look for evidence that, after 1890, these favorable characteristics faded, thereby suggesting a possible cause of Australia's changing relative income position – a question deferred to Section 5.

Estimates of labor input per capita, covering 1871 to 1961, are shown in Table 1, Panel A (columns headed *Aust l* and *U.S. l*).<sup>11</sup> These indicate that Australian labor input per capita was 25.3 percent above that of the U.S. in 1871. This advantage decreased in each of the following decades until 1911 when it was just 2.4 percent, then varied little for the next half century (Panel B).

The significance of these differences for explaining the gap in relative incomes can readily be demonstrated. If the U.S. and Australia had the same labor productivity levels, the percentage differences in their labor input would also be the percentage difference in their income levels. In this limiting case the relative income gap between the two countries would be fully explained by demographic and labor market characteristics. But their labor productivities differed (columns headed *Aust q* and *U.S. q* in Table 1, Panel A).<sup>12</sup>

Australian incomes are then re-estimated using American values of labor input. The resulting counterfactual Australian incomes per capita (reported in the column headed *Aust y\** in Table 1, Panel A) are, in the early decades of the period covered, far below the actual, unadjusted values. In 1871, for example, more than half

---

<sup>11</sup> The underlying data are reported in the Appendix Table, where it can be seen that the original census-based estimates were not always available for the same years. To better compare the estimates in the two countries, values of labor input for Australia for 1931, 1941 and 1951 were obtained by linear interpolation. It was also assumed that we could compare the estimates for the two countries although the censuses relate to adjacent years rather than the same year.

<sup>12</sup> The levels of labor productivity for each country are derived residually from the estimates of income per capita (three-year averages are used) and of labor input per capita.

the Australian income lead vanishes – the advantage over the U.S. falls from 48 to 19 percent. As can be seen from a comparison of the first two rows in Table 2 (Panel A), a similar result holds for both 1881 and 1891, the income lead declining, respectively, from 41 to 20 percent, and from 33 to 16 percent. Thus, across the two decades before 1890, when Australians' incomes were well above those of Americans, at least half of the difference is accounted for not by a higher Australian productivity performance, but by aspects of Australia's demography and labor market.

The sources of this significant income advantage to Australia at this time can be identified more closely. Labor input can be decomposed into its components, as identified in Equation 2. (The underlying values are reported in the Appendix Table.) Because of interaction among these components, it is best to proceed directly to re-estimate (counterfactual) Australian income by substituting one component of labor input at a time and observing the variation in the income estimates obtained. The outcome from this procedure is reported in Table 2 (in relative terms in Panel A, and as percentage differences in Panel B). It is also shown in Figure 3 where, to assist interpretation, the unbroken bold line refers to the unadjusted Australian income per capita, and the broken bold line to the counterfactual Australian income per capita obtained after substituting American values for all components of labor input. The Australian gender ratio ( $g$ ), and the workforce participation rates ( $w_m$  and  $w_f$ ) both operate to raise Australian income relative to American, as reflected in the fact that when any of these is replaced with the American values, Australian income falls. The one component of labor input that works in the other direction, though weakly, is the age distribution of the population. In both 1871 and 1891 (but not 1881) Australian incomes would have been slightly higher had the age structure of the Australian population been the same as that in the U.S.

Thus the relative income advantage enjoyed by Australia due to its higher labor input at this time does not derive from a favorable age distribution, but from favorable masculinity and participation rates. As evident from the Appendix Table, the proportion of males in the Australian population was 4.1 percentage points above the American figure in 1871 (and 2.4 percentage points higher in 1891). Australia's male labor force participation rate was 11.0 percentage points above the American rate in 1871 (and 7.0 percentage points higher in 1891). The former will reflect principally the lagged effect of the gender mix of the immigrants attracted by the

1850s gold rushes.<sup>13</sup> The latter is more difficult to source, and could lie in a number of differences between Australian and American labor market conditions during this period, including the rural-urban mix, or the immigrant share of the population. Differences in the definitions of the workforce in the two countries might also have a levels effect, though this should not change the trends over time in relative participation rates. Margo (2000, p.210) reports how participation in the U.S. in 1880 varied little between males 20 and over whether they were rural or urban, foreign or native-born, and black or white, but female participation rates did differ markedly for each of these categories. A breakdown of participation rates for Australia at this time is not available beyond gender and colony estimates: these suggest little variation across colonies in the late nineteenth century male workforce participation rates other than where a gold mining boom is underway.<sup>14</sup>

#### 4. Why Was Productivity So High Before 1890?

The counterfactual estimates of income per capita also indicate the extent of Australian superiority in labor productivity. In Figure 4 the first three sets of bars show this by a simple decomposition of the income lead between 1871 and 1891. The half (approximately) of the income gap not accounted for by the higher Australian labor input has also to be explained. So, why was Australian labor productivity above that in the U.S. at this time?

Proximate determinants: Simple growth analysis suggests three proximate explanations for higher Australian labor productivity before 1890: Australian production methods on average may have been more capital intensive; Australians may have had more skills or education on average; and the stock of natural resources per worker may have been higher in Australia.

There are no comprehensive estimates of the value of the stock of physical capital for Australia in the late nineteenth century, but there are annual estimates of investment. These do not suggest that Australia was investing more than the U.S in

---

<sup>13</sup> Characteristics of the resource base (alluvial gold attracting immigrants who are predominantly male and young) thus made an indirect contribution to the higher relative incomes. The direct contribution is considered below.

<sup>14</sup> See Withers, Endres and Perry (1985), pp.30 and 109-117. For discussion of the factors impinging on Australian participation rates at this time, see Butlin and Dowie (1969), pp.141-142.

the late nineteenth century. In fact, gross domestic capital formation as a proportion of GDP is slightly higher in the U.S. This ratio averages 20.6 percent 1869-1888 and 21.4 percent 1889-1908, whereas for Australia it averages 16.1 and 17.1 percent respectively in 1861-1880 and 1881-1900 (Kuznets 1966, pp.237-238). For Australia at this time to have accumulated a capital stock per worker above American levels would require offsetting evidence. Since the two economies were broadly similar in the nature of their development at this time, I conclude that capital intensity in Australia was no higher than in the U.S.

The possibility that labor productivity was unusually high without correspondingly high levels of capital per worker in mid-nineteenth century Australia is consistent with the production methods characteristic of the two natural resource-intensive industries driving growth at this time – wool and gold. The (fixed) capital requirements of the squatting era of wool production on natural grasslands are well documented as being extraordinarily low. The principal investment was in sheep, an asset that has the useful attribute of being self-reproducing. With respect to alluvial gold, the capital requirements of miners were similarly modest.<sup>15</sup>

It is also unlikely that the explanation for Australia's higher productivity is due to its workforce having an average level of human capital greater than that of American workers, as some dramatic differences in skill acquisition or educational attainment would have to be observed in Australia's favor. Elementary school enrolment rates in 1870 are comparable – 69.6 percent for Australia and 72 percent in the U.S.<sup>16</sup> A comparative analysis of high school attendance (MacKinnon 1989a, 1989b) beginning in 1910, shows retention rates in Australia at that time were about one quarter those in the U.S. It is improbable that data for earlier years would show a reversal of this wide disparity that, in theory, favors American productivity levels.

Among possible sources of Australia's higher productivity levels resulting directly from higher factor intensity, this leaves natural resources, and the Australians may indeed have had more resources per worker at this time. This is difficult to establish empirically, however, as there are no measures of the value of aggregate resource stocks for this period. Facing similar difficulties, growth economists construct indirect measures of resource abundance, and historical estimates of two of

---

<sup>15</sup> The capital requirements of both agriculture and gold production rose during the course of the late 19<sup>th</sup> century as a consequence of changes in production methods, and this may have reduced any productivity advantage over the U.S. arising from this source.

<sup>16</sup> The enrolment data are cited in Bravo-Ortega and de Gregorio (2003), p.24.

those frequently employed can be derived for Australia and the U.S. One measure is the ratio of resource exports to total exports; a second is the ratio of resource exports to GDP (Figure 5). Resource exports dominate total exports in both countries in 1870, but to a greater extent in the case of Australia (Panel A). The remarkable feature of this measure is that whereas it falls away steadily in the U.S., down to 40 percent by 1900, it remains at very high levels (usually over 90 percent) for Australia. The ratio of resource exports to GDP (Panel B) is very much higher in Australia from the beginning. The earliest possible comparison is for 1890, when American resource abundance by this measure was only 28 percent of the Australian ratio.

Another partial indicator of relative resource abundance in the two countries is the per capita endowment of farmland taking some account of the variation in its quality. The exercise is fraught with problems, not least because comprehensive land-use information is only available for more recent decades.<sup>17</sup> Nonetheless, this tells us something of the land endowment and its productive potential. Of course, Australia has a much larger area of ‘uncultivated’ and ‘natural’ grassland than does the U.S., though 70 percent of this is classified as arid and would have had very low stocking rates at any time in the past. Thus Australia is much more abundant in this low-quality farming land. By contrast the U.S. has by far the larger area of ‘cultivated’ or ‘improved’ farmland or ‘cropland’. However, converted to a per capita basis, Australia’s endowment of this higher quality agricultural land is actually above that of the U.S., perhaps by as much as 75 percent for recent decades.<sup>18</sup>

We also can utilize the inter-state variation in resource abundance and productivity levels *within* the U.S. at the end of the nineteenth century to check for any systematic relationship between labor productivity and resources. This evidence strongly indicates that states having a prominent mineral sector had higher productivity levels, and this positive relationship persists when other conditioning variables are included (Mitchener and McLean 2003). Since at this time the Australian economy more closely resembled that of California (or of the West) than the U.S. as a

---

<sup>17</sup> See McLean and Taylor (2003), Table 3.

<sup>18</sup> Whether the trends in land use since the late nineteenth century have deviated sufficiently in the two countries such that this advantage is of recent origin is unclear. And even if this is not a problem, the productive potential of cultivated land can vary so much that the assumption that the average is (and was) the same in both countries may not be accurate.

whole, it is noteworthy that in these regions productivity (and incomes) in 1880 were well above the average levels for the U.S.<sup>19</sup>

Even if the direct contribution of natural resources per worker to labor productivity in Australia at this time was as hypothesized, this is not the end of the story as to why Australia was so rich. The resources-growth nexus is complex. One issue relates to the possible endogeneity of the natural resource base. Was it because Australia was rich that it had the capacity to discover and/or utilize the ‘natural’ resources with which it was endowed?<sup>20</sup> (After all, the Aborigines had been there for millennia.) A further issue is why Australia at this time did not suffer the so-called resource curse sometimes associated with resource abundance and resource-based booms (Sachs and Warner 1995, 1999). Thus some consideration must be given policies and institutions, especially those influencing access to resources and the distribution of resource rents. This is done here in the context of a brief assessment of whether other, and deeper, determinants of the Australian advantage in productivity can be identified.

**Policy, Institutions, and Geography:** A brisk debate exists among economists as to the relative importance of a number of ‘deeper’ determinants of differences in income and productivity levels across countries.<sup>21</sup> These include institutions and geography, but also cultural attributes and the degree of integration with the world economy. The limited aim here is to ask whether before 1890 one or more of these deeper determinants might have acted to raise dramatically Australian labor productivity relative to that in the U.S.

If economic policies contributed to Australia’s productivity lead over the U.S. there must be some significant difference between those pursued in the two countries that can plausibly be linked to the marked difference in their overall economic efficiency at this time. However, such differences are not readily discerned. The

---

<sup>19</sup> For a similar conclusion regarding U.S. mining states, but covering 1963-1989, see Bernard and Jones (1996).

<sup>20</sup> David and Wright (1997) make this argument with respect to America’s world leadership in mineral production in the nineteenth century, pointing out that the scientific and technical knowledge required to locate and produce minerals was a direct function of U.S. educational and technological developments. Was this true also for the development of the wool and gold industries in Australia? I think for the early and mid nineteenth century experience, the scientific or technological requirements for wool or gold production were few, probably nothing beyond practical folk knowledge. From mid-century this changes in both agriculture and mineral production, as reflected in the rise of schools of mines and an assortment of agricultural research and extension institutions across Australia.

<sup>21</sup> For an overview, see Rodrik (2003).

private sector in the Australian colonial economies at this time was lightly regulated. There was, however, a considerable involvement of the state in the pursuit of colonial development objectives. This included assisting immigration, disposal of the crown lands for settlement, construction and operation of the railways and other public infrastructure and utilities, and raising capital on the London market in part to finance these activities. There is thus some contrast here with the U.S. experience. But since we are looking for evidence of policies that may have produced markedly higher levels of efficiency in Australia than the U.S., a more extensive role by government in the former does not seem a likely candidate.

Turning to international economic policies, the Australian colonies (between self-government in the 1850s and federation in 1901) were generally highly integrated into the international economy. There were essentially no restrictions on capital flows, and Australia was on the gold standard. There were also few restrictions on immigration during this time. As for trade policy, Victoria went furthest down a protectionist path, while New South Wales remained closest to free trade among the colonies. In the U.S. the openness to foreign capital and to immigration was similar to that in Australia. The one notable difference in policy in this area is the earlier move to protection of domestic manufacturing in the U.S. than in Australia (as a whole).

The institutional arrangements within which the Australian economy operated in the late nineteenth century were derivative, as the six colonies were part of the complex financial, trading, political and military fabric of the British Empire. There was wholesale adoption of British law and political institutions, and links with Britain dominated both trade and capital inflows. Nearly all the immigrants came from Britain, were predominantly protestant and spoke English. Most social, business, educational and cultural institutions were also transplanted from Britain. Considering the independent variables typically selected to capture the influence of institutions in cross-country growth regressions, one might anticipate that during this period all of the following would in Australia's case be favorable to growth – language, religion, ethno-linguistic diversity, freedom of the press, the quality of the legal system, security of property rights, and political stability. But the same can be said for the U.S. (or Britain or Canada), and it is not clear that Australia was advantaged by its institutional arrangements relative to any of these three.

As with institutions, it is not easy to see the cultural traits or social norms of Australians relative to Americans as especially growth promoting. Certainly colonial

politics were fluid and grubby, and government had a large role in economic development – a potent combination. But perhaps the accusations of corruption heard in parliaments and the press were not so much evidence of massive waste of resources, but critical parts of the process that restrained the corruption that was inevitable given the state-sponsored nature of colonial development, and the boom conditions in the economy before 1890.<sup>22</sup> The essential contribution of institutional arrangements and social norms to Australia’s economic success may thus have been simply that they were not growth inhibiting. The contribution by Australians to this outcome was to modify their imperial inheritance in an evolutionary and cautious manner. But no efficiency advantage over American institutions or social norms is thereby suggested.

It remains to consider geographic features which could account for Australia’s income or productivity lead over the U.S. at this time. Again, if we think of the proxy measures for various geographical attributes employed in recent empirical growth analyses, most seem in Australia’s case to suggest an unfavorable impact (relative to the U.S.) on the level of income. There are no inland lakes or truly ‘navigable’ river systems into the interior. A significant proportion of the country lies in the tropics. Australia has high climatic variance, one manifestation being recurring droughts and bushfires. And its location relative to world markets was (until the recent development of Japan and other east Asian economies) relatively unfavorable: the high incomes before 1890 were thus achieved despite the so-called tyranny of distance.

Thus none of these ‘deeper’ determinants seem to favor Australia relative to the U.S. at this time, and certainly not so strikingly as to explain its persistent and substantial lead in labor productivity. I conclude, therefore, that the proximate explanation for this lead probably lies in the relative abundance of its natural resource endowment per capita, and in the particular characteristics of those resources that permitted their utilization or extraction at relatively low cost.

---

<sup>22</sup> A recent study of government railway expansion and operation in Victoria, hitherto regarded as an area of political corruption and social waste, claims that parliamentary checks and balances greatly limited the scope for resource misallocation (Frost 2000).

## 5. Converging From Above: 1890-1914

Australia's period as the world's richest economy came to an end in the quarter century after 1890 (Figure 1). What accounts for its 'transition' from income levels 40 percent or more above that of the U.S. before 1890, to approximate parity in the early years of the new century? Even a generous allowance for measurement error would leave a significant relative decline to be explained.

The decline in labor input per capita: The decline in Australia's relative income lead over the U.S. was partly due to the decline in Australia's lead in labor input per capita between 1891 and 1911 (Figure 4). Had there been no change in *relative* labor inputs (that is, Australian labor input in 1911 had been 14 percent higher than the U.S. labor input ratio, as it was in 1891), then Australian incomes in 1911 would have been 20.3 percent above the U.S. figure. Instead, they were only 8 percent above. There would still have been some income convergence between the two countries, but only about half of what actually occurred.

The narrowed gap between the two labor input ratios results from a combination of a slight rise in the Australian ratio and a much bigger increase in the American ratio (Table 1, Panel A). Part of the income convergence is therefore traceable to different demographic and labor market trends in the U.S. and Australia during these two decades. Inspection of the components of labor input reveals that during this period the earlier advantages to Australia from its higher masculinity and workforce participation rates are both eroded. Table 2 and Figure 4 show the effect on the income gap of substituting the American values for these components into alternative hypothetical estimates of Australian income. By 1911 it would have made only a small difference to the income gap had Australia had the same labor input as the U.S.<sup>23</sup>

This analysis of the decline in relative labor input makes no allowance for changes in more subtle aspects of labor effort – hours worked per week, weeks worked per year, annual holidays. If these are the same in both countries throughout the period, no qualification of the results reported so far need be made. However recent evidence suggests that Australia and the U.S. had dissimilar trends in annual

---

<sup>23</sup> Incomes would have been 5.5 percent above the American level rather than 8 percent.

average hours worked between 1870 and 1913. According to Michael Huberman (2004), both Australians and Americans on average worked fewer hours in 1913 compared to 1870, but the decline was much greater among Australian workers. The result was that whereas Australians in 1870 worked 90.2 percent of the annual hours worked by Americans, by 1913 this had fallen to 76.3 percent. The differences in data sources and coverage rule out a direct incorporation of these estimates into the labor input per capita figures compiled here. But their implications are clear. First, the decline in Australia's relative labor input is understated by the omission of the apparent decline in average hours worked, hence understating the contribution of this source to the decline in Australia's relative incomes between 1870 and 1913. A second implication is that, as Huberman stresses, Australians chose to take out a higher proportion of their (potential) income gains in leisure than did Americans. In an effort to put some order of magnitude on this, he reports an "augmented" GDP per capita comparison for 1913, taking account of the increases in leisure over the 1870-1913 period. Whereas his unadjusted income estimates show Australia ahead of the U.S. by only 3.7 percent in 1913, his leisure-augmented estimates increase the margin to 13.4 percent.<sup>24</sup>

Most of the (negative) impact on relative incomes from the decline in relative labor input came in the second of the two decades we are examining. The initial collapse in Australia's income lead over the U.S. was primarily a collapse in labor productivity (Figure 4). In the second decade, relative productivity recovered some of what it had initially lost.<sup>25</sup> However, the positive effect that the productivity recovery had on relative income was offset by the continuing adverse trend in relative labor input. Nonetheless, productivity levels just before the First World War were only 5 percent above the U.S. rather than the margin of 16 percent and higher recorded before 1890. This relative productivity decline must also be explained.

What might have, but did not happen: We can rule out some explanations for why Australia slipped in relative incomes at this time. There was not a sustained adverse turnaround in the international economic environment impacting on the more open Australian (than U.S.) economy. Although commodity prices had been falling in the

---

<sup>24</sup> Similar considerations have been raised in comparisons of U.S. and European levels of income and hours worked: see, for example, Gordon (2004) and Blanchard (2004, pp.3-9).

<sup>25</sup> Distinguishing cyclical fluctuations in productivity from secular trends is especially difficult at this time.

twenty years prior to the mid-1890s, they turned up thereafter. Indeed, in the two decades to 1914 there was more rapid growth in Argentina and Canada (Figure 1), economies which during this period were similar to Australia in many respects.

Although there was a major change in 1901 in political and institutional arrangements, when the six separate colonies federated to create the Commonwealth of Australia, this was achieved after prolonged negotiation. There was no economically devastating war of independence from Britain. And the consensus is that the immediate economic effects of federation were small.

One consequence of federation, however, was the introduction of a uniform external tariff at rates above those previously applying in some colonies. This raises the possibility that increased protection for manufacturing played a role in this first and most important phase in the decline in Australian relative incomes. But there are difficulties with such a line of reasoning. First, the timing is wrong if the federal tariff is to be held responsible. The income decline that occurred between 1890 and 1914 was almost complete by 1901, prior to federation. Second, subsequent increases in the average level of protection were incremental, and nothing dramatic happened before the 1920s. Third, the possibility that, with the introduction of a federal tariff, Australia rapidly shifted resources out of its high productivity natural resource based industries into lower productivity manufacturing, is not supported by the evidence: there was no dramatic industrialization across these decades.<sup>26</sup>

The 1890s depression: Four decades of expansion in the economy, beginning with the gold rushes, culminated in the 1880s in a boom driven by very high levels of borrowing from the London capital market, which fuelled an asset-price bubble in land (rural and urban), housing and shares. The 1890-91 Barings crisis in Argentina led London investors to reassess economic prospects in Australia, and, by contagion, the flow of capital dried up, precipitating both a financial crisis and an economic collapse. Real aggregate GDP declined by 19 percent between 1891 and 1895, and its pre-depression level was not decisively exceeded until 1904.

This downturn may at first seem a *prima facie* explanation for the decline in Australian incomes relative to those in the U.S. But the focus here is not on explaining the severity or duration of the depression itself, but on the absence of a compensating

<sup>26</sup> Manufacturing as a percent of GDP was 12.1 at federation in 1901, but rose only 1.4 percentage points between 1901 and 1920 (Maddock and McLean 1987, p.19).

recovery or rebound. If the episode was just an especially virulent business cycle, or debt-driven cycle of boom and bust, there need be no permanent trend or level effects on labor productivity. For example, the Argentine boom of the 1880s and bust of the early 1890s were similar in many ways to those in Australia, yet the Argentine economy recovered strongly with the upturn in international conditions from about 1897. Indeed, its income levels converge (from below) on those of the U.S. in both the 1890s and 1900s (Figure 1). Why were the effects of the depression in Australia likewise not transitory, quickly offset in the recovery phase, and leaving no permanent impression on the country's relative economic performance?<sup>27</sup>

One logical possibility is path dependency. In such a view, the depression triggered a sequence of events that cumulatively account for the sustained (relative) decline. However, it is not easy to see how such dramatic, negative and long run productivity consequences arose out of the depression itself. The maintenance of the gold standard, the absence of debt rescheduling, or other policy decisions at most delayed the onset of recovery a few years, as might have the coincidence of severe droughts, or the seriousness of the structural imbalances to be corrected.

An alternative explanation for Australia's relative decline at this time is that the previous level of productivity (and hence incomes) was unsustainable. The depression exposes this feature of the earlier boom period, and in part constitutes the process of adjustment whereby incomes were returned to sustainable levels. And there are two candidates for such a conjecture. The first is that the boom of the 1880s in substantial measure resulted from the high level of British capital inflow augmenting domestic saving and underpinning the high incomes. When the capital inflow dried up and asset prices declined (as occurred in the 1890s), savage economic adjustments were required, at the end of which incomes would be lower than they would have been had the capital inflow (and associated boom conditions) not come to an end. But this line of reasoning does not help with the question posed here, since the relatively high per capita incomes go back at least to 1850 (Figure 1), pre-dating the 1880s boom and the associated flood of foreign capital. Furthermore, world capital markets did not close after 1890. Had there been profitable investment opportunities in Australia they would have been funded – as occurred in Argentina and Canada

---

<sup>27</sup> That this depression may have *permanently* lowered Australian productivity levels relative to other benchmark economies is not a question that has been addressed in the literature on the depression itself. The classic study is by Boehm (1971). For a comparative analysis of the depressions in Argentina and Australia see McLean (1996).

between the mid-1890s and 1914. However, there is a second possible explanation for Australian productivity levels being unsustainable after 1890.

Natural resource utilization and depletion: The natural resources which were so important to the Australian economy, land and minerals, were either exhaustible or non-renewable. The possibility arises, therefore, that the income levels before 1890 derive partly from the depletion of the resource base.

Gold deposits were obviously non-renewable, and production had two peaks in the 1850s and 1890s. After the first (Victorian) rushes, production declined only gradually over the next thirty years: indeed gold was more important than wool as an export until 1870. After the second (Western Australian) gold rush, production declined rapidly (the contribution of the mining sector to GDP falling from 10.3 to 5.1 percent between 1901 and 1914), and minerals played only a minor role in the economy for the next fifty years. Had the second great wave of mineral discoveries and production got underway in the 1900s (rather than in the 1960s), it is hard to imagine the path of Australian growth being other than immensely – and positively – affected. The fairly sudden end to the mineral contribution to output (and especially to export earnings) therefore lowered growth prospects and incomes early in the twentieth century.<sup>28</sup>

The use of agricultural land in Australia varied by period and region, but some trends seem clear. By the 1880s the wool industry had expanded into arid areas that were to prove unsuitable, the droughts of the 1890s pushing back the pastoral frontier, in some places permanently. Part of the agricultural expansion and prosperity of the period 1860-1890 was thus unsustainable in this different sense. There was no comparable retreat from the farming frontier in Argentina, Canada, New Zealand or the United States at this time. Indeed, Canada and Argentina continued to bring new and fertile land under cultivation until the 1920s, and their incomes rose towards those in Australia (Figure 1).

However, Australian farming had never been solely about growing wool, and the expansion of grain cultivation accelerated from the 1850s. Although there is great

---

<sup>28</sup> The decline in the mineral sector's contribution to Australia's prosperity following the West Australian gold rushes may have been policy induced. It has been suggested that Australian mining law and regulations were not conducive to resource development, hence delaying the further discovery and exploitation of its mineral endowment that Australia embarked on fifty years later (David and Wright 1997).

regional diversity, yields per acre on average declined during these decades, and part of this was due to ‘soil mining’ techniques of repeated cropping.<sup>29</sup> By 1890, and in the longest-settled areas close to the coastal cities, farmers were already changing to rotation cropping, fallowing, using more fertilizer, and other devices to sustain yields. State agricultural colleges, experimental farms, and departments of agriculture were established in response to these emerging problems. In the midst of the depression of the 1890s, the secular decline in yields ends and a long-term rise gets underway (Dunsdorfs 1956, chapters 4 and 5). Thus it is suggested that Australian productivity levels, and hence incomes, were sustained before 1890 in part by depleting the resource base of its key industry – agricultural land.

The 1890s therefore marked the end of the ‘frontier’ phase of low-cost/high-productivity agricultural development, particularly the end of ‘soil-mining’ practices. It also coincided with the last significant contribution to growth by the mineral sector for half a century. Therein lies the most likely explanation as to why a larger rebound in productivity levels, relative to those in the U.S., did not occur after the depression had lifted.<sup>30</sup>

## 6. Falling Behind – then Parallel Growth

Between 1914 and 1945 Australian incomes fell from approximate parity with those of the United States to 25 percent behind, whereas since 1945 Australian per capita incomes have risen roughly in parallel with those in the U.S. (Figure 2). However, none of the relative income decline after 1914 is due to any further relative deterioration in labor input per capita (Figure 4). That is, had Australian labor productivity after 1914 stabilized at the U.S. level, and then grown at the American rate thereafter, Australian incomes would have remained (at least to 1960) slightly

---

<sup>29</sup> It cannot be inferred that all the fall in yields was due to over-cropping and monoculture. Grain growing was shifting to areas of lower rainfall and possibly also lower ‘natural’ fertility, lowering the average recorded yield. Even within counties (and on individual farms), the most suitable (i.e. highest yielding) land may have been brought into production first.

<sup>30</sup> Of course, if the rents from a non-renewable resource are appropriately invested, income can in theory be sustained after the resource stock is exhausted. If the resource rents were not so invested, a permanent downward shift in income levels will occur. However wisely or unwisely the ‘rents’ in nineteenth century Australia were used, it is doubtful they were allocated (in either the public or private sectors) in a manner that ensured the sustainability of the level of income enjoyed during the phase when mineral production and ‘soil mining’ agriculture underpinned the country’s prosperity. In particular, the dominant social objective of rapid population expansion probably diverted rents to uses that may have reduced long-run per capita income below that attainable had intensive (rather than extensive) growth been the policy goal.

above those in the U.S. – by the same small percentage by which its labor input remained slightly higher all those decades. Thus the falling behind in incomes between 1914 and 1945 is a story about Australia’s (continuing) decline in relative productivity performance. It follows that the framework developed in Section 3 is of little direct assistance in further identifying the sources of that decline. However, the earlier discussion of comparative productivity performance in the two economies can usefully be extended into the period after 1914.<sup>31</sup>

Much of the falling behind in productivity (and incomes) appears to occur during the two wars. The First World War was certainly a major negative shock to the Australian economy: in 1920, real aggregate GDP was 9.5 percent below what it had been in 1914 whereas in the U.S. it was 11.5 percent higher. There is no mystery about this. Australian prosperity was at this time especially vulnerable to any severe disruption to the international economic system. That prosperity had rested on a narrow production base oriented for export markets – a development strategy that for many decades (other than the 1890s) had delivered the advantages of pursuing growth through trade and specialization. But in 1914 Australia learned the downside of this strategy, with serious disruption not only to its export markets but also to sources of vital imports. But why did a bounce-back not occur with the end of hostilities?

One explanation is that the international economy never recovered its pre-war openness and vigor, hence Australia was unable to regain the level of prosperity it had once enjoyed. Argentine and Canadian incomes, relative to those in the U.S., also fell across the war (Figure 1), but unlike Australia’s, their economies rebounded during the 1920s. Thus over the entire period between 1910 and 1930 relative incomes fell only 4.2 percentage points in Canada, 11.3 in Argentina, but 35.3 in Australia. There was more to Australia’s relative decline at this time than can be attributed to a deteriorating international trading environment.

A second hypothesis is that increased protection lowered Australian productivity and incomes. If increases in tariffs on manufacturing in Australia were an important influence we might predict some recovery in Australian relative incomes (compared to pre-war) in the twenties when the tariff increases were modest, and a reversal in this trend in the thirties following the big hike in protection at the

---

<sup>31</sup> Discussion in this section is cursory, as a full assessment of the determinants of the continuing relative productivity decline to 1945, and why it then ended, requires separate treatment. There is a large literature on Australia’s twentieth century growth performance; and alternative (and better) comparative data to those employed here are available for recent decades.

beginning of that decade.<sup>32</sup> In fact we observe the opposite sequence in the income estimates in Figure 2, suggesting other influences swamped any effect from increased protection.<sup>33</sup>

Similarly, it might be expected that the period of highest protection for manufacturing following the Second World War would depress Australia's relative incomes and productivity at that time. But as no further erosion of Australian living standards relative to the U.S. occurred during the immediate post-war decades, the policy of import substituting industrialization behind high tariffs pursued at this time cannot be held responsible for such an outcome. Indeed, in the 1950s and 1960s, decades in which the protected manufacturing sector reaches its peak share of employment and output, there is some limited convergence of Australian on U.S. incomes (Figure 2). Furthermore one should not uncritically read back into Australian history any negative effects of protection on growth detected in, say, the 1970s. Historically, protection may not have had the consequences predicted by theory and confirmed in cross-country growth regressions for more recent decades, though the reasons for this remain unclear.<sup>34</sup>

Another candidate hypothesis is that Australia fell behind the U.S. in human capital formation for much of the twentieth century, as evidence suggests that the U.S. moved earlier than other countries (including Australia) to invest more intensively in high school education.<sup>35</sup> The gap in high school participation rates is so large for so long that it is unlikely to be due to measurement error. Could lower levels of formal schooling in Australia in part explain the lower productivity there? This disparity in education levels between the U.S. and Australia probably had little economic significance during the interwar period, but may more seriously have impacted productivity in the postwar decades. As with the impact of protection, however, the timing does not seem right for the possibility that under-investment in human capital led to the relative productivity decline between 1914 and 1945 but not thereafter.

---

<sup>32</sup> The Carmody index begins in 1907, and shows an increase of 20 percent between the pre-war average (1907-1914) and that for the first part of the 1920s (1919-1924), and a further 19 percent rise for the second part (1925-29). The really significant increases in the average tariff rates on manufacturing occur, however, between 1929 and 1933 when average rates rise 79 percent. They then remain close to their peak levels throughout the 1930s.

<sup>33</sup> Note that manufacturing was only 13.5 percent of GDP in 1921.

<sup>34</sup> In some recent studies which include Australia, the relationship between tariffs and growth is actually *positive* before 1914 (O'Rourke, 2000), with no consistent relationship found for the interwar period (Clemens and Williamson 2001).

<sup>35</sup> MacKinnon (1989a) and (1989b); and Goldin (1998).

One barrier to better understanding the sources of any trend decline in Australia's relative productivity performance is the volatility in macroeconomic time series during the 30-year period before 1945. The boom of the late twenties in the U.S. (when Australia slips into recession), and the deeper U.S. depression in the thirties, together produce the illusion that Australia's relative decline in underlying productivity takes a pause between the early 1920s and 1939 (the interwar plateau). Then, despite the Australian economy growing strongly during the Second World War (in contrast with its experience in the First), the U.S. economy grew faster.

Adopting a long-run perspective, it seems possible that Australia's falling behind after 1914, then parallel productivity performance after 1945, may both result in significant measure from changing conditions in the resource sector. In this view, the slower productivity growth in much of the first half of the twentieth century represents a continuing adjustment to Australia's diminished resource-based productivity advantages, an adjustment that, as noted above, began at the end of the nineteenth century. There were no major mineral discoveries for several decades following the end of the West Australian gold boom. And there were no further undeveloped and fertile areas of agricultural land to be brought into production with only modest prior investment. After World War Two, however, the agricultural sector received a major boost from rising world commodity prices, especially associated with the Korean War. And after an interval of almost half a century in which the mineral sector constituted a very small part of the economy, there began in the 1950s a second wave of resource discoveries and mining developments. The post-war boom in Australia, like the sustained expansion in the nineteenth century, was thus based to a significant degree on natural resources. Hence the end of the relative productivity decline we are examining coincided with a major revival in the resource sector.

To conclude this speculative discussion of the comparative productivity performance of Australia and the U.S., we can turn the question around and ask why the U.S. forged ahead of Australia between 1914 and the 1945. In the nineteenth century the basis of U.S. development was primarily factor accumulation not productivity growth. This accumulation was partly an extensive growth phenomenon, as westward settlement proceeded on the basis of natural resource discovery and utilization, and of the importation of foreign labor and capital. To this point the

American growth narrative resonates with the Australian historical record.<sup>36</sup> In contrast to Australian experience, however, industrialization in the U.S. occurred in the nineteenth century, by the end of which American manufacturers faced the world's largest domestic market. Around this time a fundamental change occurred in the sources of U.S. growth, with productivity improvement thereafter playing a more important role than factor accumulation (Abramovitz and David 1973), although the role of natural resources lingered – perhaps to as late as 1940 – as a major determinant of U.S. comparative advantage (Wright 1990). This transition to growth based on knowledge (broadly defined) thus overlapped the prior bases in resource abundance and scale effects, and extended over several decades. The much earlier expansion of high school participation in the U.S. than elsewhere in the first half the twentieth century is one indicator of this transition (Goldin 1998). The emergence of institutionalized research in corporations, universities or government agencies, spurred during the second world war, furthered this process, forming in turn the basis of America's productivity lead after 1945 (Nelson and Wright 1992). Australia, however, seems not to have undergone a comparable shift in its sources of growth towards greater reliance on productivity than factor accumulation – at least through the 1970s (Kaspura and Weldon 1980). Industrial development was modest until the 1940s.<sup>37</sup> The domestic market was tiny compared with that of the U.S. And we have noted the lag in schooling rates that lasted well into the postwar era. In this perspective, Australia in the twentieth century remained significantly more reliant upon the fortunes of its resource sector for improvements in its relative productivity and living standards.<sup>38</sup>

---

<sup>36</sup> See Abramovitz and David (2000) for an overview of the American growth experience, and Crafts (1998) for a comparative analysis from a British perspective.

<sup>37</sup> Between 1939 and 1949 the share of manufacturing in GDP rose from 18.5 to 26.2 percent.

<sup>38</sup> By pursuing its comparative advantage an economy may become locked in to a lower growth trajectory if the products in question (say, primary products) have less potential for creating future spillover benefits and productivity gains throughout the economy than some alternative (say, industrial products). Models such as these (e.g. Matsuyama, 1992) not only draw attention to the possible importance of assumptions concerning the relation between trade and growth that often go unexamined. They also serve to prompt fresh assessments of some long-standing questions in Australian economic history.

## 7. Conclusion

About half the substantially higher Australian incomes per capita than those of the U.S. before 1890 is the result of higher labor input per capita in the former. This in turn appears to result partly from the demographic shock associated with the gold rushes of the 1850s, and partly to (as yet unexplained) higher workforce participation rates. The other half of the income gap is attributable to higher labor productivity. And this, I suggest, is probably the consequence of especially favorable conditions of resource abundance at that time. My conjecture is that the high Australian incomes recorded before 1890 were either inherently transitory (insofar as they were based on earlier demographic shocks whose positive implications for income per capita would gradually fade), or were unsustainable (insofar as they derived from labor productivity levels that were based, in turn, on the depletion of non-renewable resources such as gold or of exhaustible resources such as pastoral and agricultural land).

These favorable demographic and resource conditions were fading before 1890 but the impact of this was obscured by the 1880s boom in foreign capital inflow and the depression of the 1890s, then delayed by the Western Australian gold rushes. By 1914 Australia had lost its clear income superiority. Labor input per capita was no longer above U.S. levels. Mineral output was in decline. And further gains in farming productivity would not be obtained from cheaply bringing new land into production, as that phase of rural settlement was by then complete.

The further, but much smaller, decline in relative income that occurred between 1914 and 1945 is solely a productivity phenomenon, there being no further decline in relative labor input per capita. And it coincides with a period of no major booms in the resource sector, and with the earlier transitions in the U.S. first to an industrialized and then to a knowledge-based economy. But further analysis of comparative performance during this post-1914 period requires a different approach to that which has been employed here with respect to the 1870-1914 period.

## Data Appendix

The estimates of GDP per capita for both Australia and the United States used throughout the paper were taken from Maddison (1995), Appendix D, as were the

estimates for Argentina, Britain, Canada and New Zealand underlying Figure 1. Maddison reported these as 1990 Geary-Khamis dollars.

The estimates of labor input per capita for Australia and the United States, as reported in the Appendix Table, and used in the construction of Tables 1 and 2 as well as Figures 3 and 4, required data for each of the years used in the study on the workforce and/or workforce participation rates by sex, and on the population by sex and by age groups.

For Australia, estimates of the workforce, by sex, and for census years 1871-1961, are reported in Withers, Endres and Perry (1985), pp.90-94. The workforce is defined to include employed and unemployed wage and salary earners; those employed on their own account; 'helpers' not receiving salary or wages; and those in the 'occupation not stated' category in each census. Population data by age and sex for Australia for census years 1861 to 1891 were obtained from Vamplew (1987), pp.23-41, and for subsequent census years from the Australian Bureau of Statistics' *Commonwealth Census Reports* and *Australian Demography Bulletins*. The working age was defined as 10 and above to 1941 and 15 and above to 1961. This was done to make them consistent with the U.S. definitions of working age. Finally, Australian workforce participation rates were calculated by dividing the male (or female) workforce by the male (or female) working age population for each year. Note that this varies from the age range 14 to 65 used by Butlin and Dowie (1969), Table 1, p.141, in their estimates of workforce participation rates for Australia after 1861. It varies also from the workforce participation rates reported by Withers, Endres and Perry (1985), pp.109-117, who use the total (not working-age) population.

For the United States, estimates of the labor force from 1870 to 1940, by sex, are reported in Miller and Brainerd (1957), who also report labor force participation rates for these years (on pages 587 and 598 for males and females respectively). The labor force is defined as those 'gainfully occupied' and 10 years of age and over. For 1950 and 1960 the labor force and labor force participation rates are from U.S. Department of Commerce (1975), Series D30 and D36 (for males and females respectively). For these two years the labor force is defined in relation to those 16 years of age and over. U.S. population estimates by age and sex were obtained from U.S. Department of Commerce (1957), Series A119-134. The working-age definition adopted was 10 years and over from 1870 to 1940, and 15 years of age and over in 1950 and 1960 – not 16 – because of the grouped form in which the population data

are reported. Thus for these two years a small (one year) discrepancy exists between the age ranges underlying the estimates of the proportion of the population in the working-age groups on the one hand, and on the other the age definitions on which the labor force participation rate estimates are based. This was not considered a serious issue as the principal focus in this paper lies in the period before 1921.

The two measures of resource abundance displayed in Figure 5 are constructed as follows. For Australia prior to 1900, natural resource exports are the value of 13 agricultural and mining export items reported in Vamplew (1987), p.188, including wool, gold, wheat, meats, copper, butter, sugar, silver, coal and hides. These are only reported as three-year averages for the years 1871-73, 1881-83, and 1888-90. The value of total exports is the total current account credit series in Butlin (1962), Table 247, pp.410-411; and the GDP estimates are from Butlin (1962), Table 2, pp.10-11. From 1900, the two Australian measures of resource abundance are based directly on estimates provided by Freebairn (1987), Table 6.2, p.160, and are centered three-year averages. For the United States, all data are from U.S. Department of Commerce (1975): natural resource exports are the sum of crude materials, crude food, gold and silver (Series U214, 215, 197 and 199); the total exports figure is Series U1; and the GNP figure is Series F1.

## References

- Abramovitz, Moses (1986). "Catching Up, Forging Ahead, and Falling Behind", *Journal of Economic History*, Vol. 46, No. 2 (June 1986), pp.385-406.
- Abramovitz, Moses and Paul A. David (1973). "Reinterpreting American Economic Growth: Parables and Realities", *American Economic Review*, Vol. 63, No. 2 (May), pp.428-437.
- Abramovitz, Moses and Paul A. David (2000). "American Macroeconomic Growth in the Era of Knowledge-Based Progress: The Long-Run Perspective." In *The Cambridge Economic History of the United States, Vol. 3*, edited by Stanley L. Engerman and Robert E. Gallman (Cambridge: Cambridge University Press), pp.1-92.
- Allen, Robert C. (1994). "Real Incomes in the English-Speaking World, 1879-1913." In *Labour Market Evolution: The Economic History of Market Integration, Wage Flexibility, and the Employment Relation*, edited by George Grantham and Mary MacKinnon (London: Routledge), pp.107-138.
- Bernard, Andrew B. and Charles I. Jones (1996). "Productivity and Convergence Across U.S. States and Industries", *Empirical Economics*, Vol.21, No. 1, pp.113-135.
- Blanchard, Olivier (2004). "The Economic Future of Europe", *Journal of Economic Perspectives*, Vol. 18, No. 4 (Fall), pp.3-26.

- Boehm, E.A. (1971). *Prosperity and Depression in Australia 1887-1897* (Oxford: Clarendon Press).
- Bravo-Ortega, Claudio and Jose De Gregorio (2003). "The Relative Richness of the Poor? Natural Resources, Human Capital and Economic Growth". Unpublished paper, University of California, Berkeley.
- Broadberry, Stephen N. (1998). "How Did the United States and Germany Overtake Britain? A Sectoral Analysis of Comparative Productivity Levels, 1870-1990", *Journal of Economic History*, Vol. 58, No. 2 (June), pp.375-407.
- Butlin, N.G. (1962). *Australian Domestic Product, Investment and Foreign Borrowing 1861-1938/39* (Cambridge: Cambridge University Press).
- Butlin, N.G. (1970). "Some Perspectives of Australian Economic Development, 1890-1965." In *Australian Economic Development in the Twentieth Century*, edited by Colin Forster (London: George Allen & Unwin), pp.266-327.
- Butlin, N.G. and J.A. Dowie (1969). "Estimates of Australian Work Force and Employment, 1861-1961", *Australian Economic History Review*, Vol. 9, No. 2 (September), pp.138-155.
- Clemens, Michael A. and Jeffrey G. Williamson (2001). "A Tariff-Growth Paradox? Protection's Impact the World Around", Working Paper 8459, National Bureau of Economic Research.
- Crafts, Nicholas (1998). "Forging Ahead and Falling Behind: The Rise and Relative Decline of the First Industrial Nation", *Journal of Economic Perspectives*, Vol. 12, No. 2 (Spring), pp.193-210.
- David, Paul A. and Gavin Wright (1997). "Increasing Returns and the Genesis of American Resource Abundance", *Industrial and Corporate Change*, Vol. 6, No. 2 (March), pp.203-245.
- Dunsdorfs, Edgars (1956). *The Australian Wheat-Growing Industry* (Melbourne University Press).
- Freebairn, John W. (1987). "Natural Resource Industries." In *The Australian Economy in the Long Run*, edited by Rodney Maddock and Ian W. McLean (Cambridge: Cambridge University Press), pp.133-164.
- Frost, Lionel (2000). "Government and the Colonial Economies: An Alternative View", *Australian Economic History Review*, Vol. 40, No. 1 (March), pp.71-85.
- Goldin, Claudia (1998). "America's Graduation from High School: The Evolution and Spread of Secondary Schooling in the Twentieth Century", *Journal of Economic History*, Vol. 58, No. 2 (June), pp.345-374.
- Gordon, Robert J. (2004). "Two Centuries of Economic Growth: Europe Chasing the American Frontier", National Bureau of Economic Research, Working Paper 10662 (August).
- Hall, Robert E. and Charles I. Jones (1999). "Why Do Some Countries Produce So Much More Output Per Worker Than Others?", *Quarterly Journal of Economics*, Vol. 114, No. 1 (February), pp.83-116.
- Haig, Bryan (1989). "International Comparisons of Australian GDP in the 19<sup>th</sup> Century", *Review of Income and Wealth*, Series 35, No. 2 (June), pp.151-162.
- Huberman, Michael (2004). "Working Hours of the World Unite? New International Evidence of Worktime, 1870-1913", *Journal of Economic History*, Vol. 64, No. 4 December, pp.964-1001.
- Kaspura, Andre and Geoff Weldon (1980). "Productivity Trends in the Australian Economy 1900-01 to 1978-79", Working Paper No. 9, Department of Productivity, Canberra.

- Kuznets, Simon (1966). *Modern Economic Growth: Rate, Structure and Spread* (New Haven: Yale University Press).
- MacKinnon, Mary (1989a). "Schooling: Examining Some Myths." In *Australia's Greatest Asset: Human Resources in the Nineteenth and Twentieth Centuries*, edited by David Pope and Lee Alston (Annandale NSW: The Federation Press), pp.102-129.
- MacKinnon, Mary (1989b). "Years of Schooling: The Australian Experience in Comparative Perspective", *Australian Economic History Review*, Vol. 29, No. 2 (September), pp.58-78.
- Maddison, Angus (1982). *Phases of Capitalist Development* (Oxford: Oxford University Press).
- Maddison, Angus (1995). *Monitoring the World Economy 1820-1992* (Paris: Organisation for Economic Co-Operation and Development).
- Maddock, Rodney and Ian W. McLean (1987). "The Australian Economy in the Very Long Run." In *The Australian Economy in the Long Run*, edited by Rodney Maddock and Ian W. McLean (Cambridge: Cambridge University Press), pp.5-29.
- Margo, Robert (2000). "The Labor Force in the Nineteenth Century." In *The Cambridge Economic History of the United States, Vol. 2*, edited by Stanley L. Engerman and Robert E. Gallman (Cambridge: Cambridge University Press), pp.207-243.
- Matsuyama, K. (1992). "Agricultural Productivity, Comparative Advantage, and Economic Growth", *Journal of Economic Theory*, Vol. 58, pp.317-334.
- McLean, Ian W. (1996). "Recovery from the 1890s Depression: Australia in an Argentine Mirror". Unpublished paper, University of Adelaide.
- McLean, Ian W. and Alan M. Taylor (2003). "Australian Growth: A California Perspective." In *In Search of Prosperity: Analytic Country Studies on Growth*, edited by Dani Rodrik (Princeton University Press), pp.23-52.
- Miller, Ann Ratner, and Carol P. Brainerd (1957). "Labor Force Estimates." In *Population Redistribution and Economic Growth: United States, 1870-1950, Vol. 1*, edited by Everett S. Lee, et al. (Philadelphia: The American Philosophical Society), pp.362-633.
- Mitchener, Kris James and Ian W. McLean (1999). "U.S. Regional Growth and Convergence, 1880-1980", *Journal of Economic History*, Vol. 59, No. 4 (December), pp.1016-1042.
- Mitchener, Kris James and Ian W. McLean (2003). "The Productivity of U.S. States since 1880", *Journal of Economic Growth*, Vol. 8, No. 1 (March), pp.73-114.
- Nelson, Richard R. and Gavin Wright (1992). "The Rise and Fall of American Technological Leadership", *Journal of Economic Literature*, Vol. 30, No. 4 (December), pp.1,931-1,964.
- O'Rourke, Kevin H. (2000). "Tariffs and Growth in the Late 19<sup>th</sup> Century", *Economic Journal*, Vol. 110 (April), pp.456-483.
- Prados de la Escosura, Leandro (2000). "International Comparisons of Real Product, 1820-1990: An Alternative Data Set", *Explorations in Economic History*, Vol. 37, No. 1 (January), pp.1-41.
- Rodrik, Dani (2003). "Institutions, Integration, and Geography: In Search of the Deep Determinants of Economic Growth." In *In Search Of Prosperity: Analytic Country Studies on Growth*, edited by Dani Rodrik (Princeton University Press), pp.1-19.

- Sachs, Jeffrey D. and Andrew M. Warner (1995). "Natural Resource Abundance and Economic Growth", Working Paper 5398, National Bureau of Economic Research, December.
- Sachs, Jeffrey D. and Andrew M. Warner (1999). "The Big Push, Natural Resource Booms and Growth", *Journal of Development Economics*, Vol.59, No. 1, pp.43-76.
- Thomas, Mark (1995). "A Substantial Australian Superiority: Anglo-Australian Comparisons of Consumption and Income in the Late Nineteenth Century", *Australian Economic History Review*, Vol. 35, No. 2 (September), pp.10-38.
- U.S. Department of Commerce (1975). *Historical Statistics of the United States, Colonial Times to 1970* (Washington DC: GPO).
- Vamplew, Wray (1987). (editor) *Australians: Historical Statistics* (Sydney: Fairfax, Syme & Weldon).
- Withers, Glenn, Tony Endres, and Len Perry (1985). "Australian Historical Statistics: Labour Statistics", Source Paper in Economic History No. 7, Australian National University (December).
- Wright, Gavin (1990). "The Origins of American Industrial Success, 1879-1940", *American Economic Review*, Vol. 80, No. 4 (September), pp.651-668.

TABLE 1  
CORE DATA: AUSTRALIA AND U.S. 1871-1961

<i>Panel A: Original Values</i>							
Year	Aust $y$ (\$)	U.S. $y$ (\$)	Aust $l$	U.S. $l$	Aust $q$ (\$)	U.S. $q$ (\$)	Aust $y^*$ (\$)
1871	3714	2503	0.4053	0.3243	9163.6	7718.8	2971.5
1881	4571	3252	0.4075	0.3469	11217.1	9374.0	3891.4
1891	4685	3533	0.4140	0.3632	11315.2	9728.2	4109.3
1901	4169	4330	0.4268	0.3827	9766.9	11315.2	3737.5
1911	5484	5076	0.4252	0.4154	12898.1	12220.0	5357.7
1921	5284	5478	0.4040	0.3936	13080.1	13916.6	5148.7
1931	4664	5611	0.4101	0.3974	11372.1	14120.6	4518.8
1941	6600	8329	0.4173	0.4017	15816.8	20735.3	6353.3
1951	7241	10169	0.4161	0.4049	17400.2	25117.6	7044.6
1961	8517	11425	0.4021	0.3956	21183.4	28883.2	8379.3

<i>Panel B: Australian Ratios (U.S. = 100)</i>			
	$y$	$l$	$q$
1871	148.4	125.0	118.7
1881	140.6	117.5	119.7
1891	132.6	114.0	116.3
1901	96.3	111.5	86.3
1911	108.0	102.4	105.5
1921	96.5	102.6	94.0
1931	83.1	103.2	80.5
1941	79.2	103.9	76.3
1951	71.2	102.8	69.3
1961	74.5	101.6	73.3

*Notes:* The symbols are defined as follows:  $y$  is GDP per capita;  $l$  is labor input per capita;  $q$  is labor productivity;  $y^*$  is 'counterfactual' GDP per capita. For a fuller explanation of the symbols used, see text. The Australian and U.S. GDP per capita figures ( $y$ ) and labor productivity estimates ( $q$ ) are three-year centered averages, and are 1990 Geary-Khamis dollars.

*Sources:* See the Data Appendix.

TABLE 2

## AUSTRALIAN GDP PER CAPITA RELATIVE TO U.S. 1871-1921: DECOMPOSITION

	1871	1881	1891	1901	1911	1921
<i>Panel A: Counterfactual Australian GDP per capita 1871-1921 (U.S. = 100)</i>						
Actual (ie unadjusted)	148.4	140.6	132.6	96.3	108.0	96.5
Counterfactual based on U.S. values of:						
(i) labour input per capita ( $l$ )	118.7	119.7	116.3	86.3	105.5	94.0
(ii) males as proportion of population ( $g$ )	141.5	135.7	129.1	95.0	107.5	96.7
(iii) proportion of population in working age groups						
- total ( $a$ )	154.1	140.1	135.7	96.1	108.4	96.9
- males ( $a_m$ )	151.5	139.2	134.4	96.0	108.3	96.9
- females ( $a_f$ )	151.0	141.4	133.9	96.5	108.2	96.5
(iv) workforce participation rate						
- total ( $w$ )	121.4	125.4	117.2	87.9	105.6	93.3
- males ( $w_m$ )	132.6	134.9	123.7	93.7	104.9	93.2
- female ( $w_f$ )	137.1	131.0	126.1	90.4	108.8	96.6
<i>Panel B: Percentage Difference between Actual and Counterfactual Australian GDP per capita 1871-1921</i>						
Counterfactual based on U.S. values of:						
(i) labour input per capita ( $l$ )	25.0	17.5	14.0	11.5	2.4	2.6
(ii) males as proportion of population ( $g$ )	4.9	3.6	2.7	1.4	0.5	-0.2
(iii) proportion of population in working age groups						
- total ( $a$ )	-3.7	0.3	-2.2	0.1	-0.4	-0.5
- males ( $a_m$ )	-2.0	0.9	-1.3	0.3	-0.3	-0.5
- females ( $a_f$ )	-1.7	-0.6	-0.9	-0.2	-0.1	0.0
(iv) workforce participation rate						
- total ( $w$ )	22.2	12.1	13.1	9.6	2.3	3.3
- males ( $w_m$ )	11.9	4.2	7.2	2.7	3.0	3.5
- female ( $w_f$ )	8.2	7.3	5.1	6.5	-0.7	-0.1

*Notes:* See text for discussion of estimation procedures.

*Sources:* See the Data Appendix.

APPENDIX TABLE

DEMOGRAPHIC AND LABOUR INPUT COMPONENTS:  
AUSTRALIA 1871-1961 AND U.S. 1870-1960

	$a_m$	$w_m$	$g$	$1-g$	$a_f$	$w_f$	$l$
<i>Panel A: Australia 1871-1961</i>							
1871	0.7135	0.8583	0.5472	0.4528	0.6659	0.2328	0.4053
1881	0.7428	0.8279	0.5400	0.4600	0.7076	0.2318	0.4075
1891	0.7470	0.8427	0.5356	0.4644	0.7181	0.2305	0.4140
1901	0.7684	0.8281	0.5241	0.4759	0.7536	0.2603	0.4268
1911	0.7798	0.8435	0.5192	0.4808	0.7699	0.2260	0.4252
1921	0.7801	0.8163	0.5081	0.4919	0.7796	0.2097	0.4040
1933	0.8189	0.7761	0.5079	0.4921	0.8198	0.2196	0.4114
1947	0.7444	0.8771	0.5010	0.4990	0.7531	0.2518	0.4217
1954	0.7112	0.8835	0.5059	0.4941	0.7170	0.2655	0.4120
1961	0.6931	0.8598	0.5055	0.4945	0.7008	0.2909	0.4021
<i>Panel B: United States 1870-1960</i>							
1870	0.7315	0.7480	0.5060	0.4940	0.7328	0.1310	0.3243
1880	0.7342	0.7870	0.5090	0.4910	0.7316	0.1470	0.3469
1890	0.7594	0.7730	0.5120	0.4880	0.7547	0.1700	0.3632
1900	0.7652	0.8000	0.5110	0.4890	0.7598	0.1880	0.3827
1910	0.7823	0.8130	0.5150	0.4850	0.7740	0.2340	0.4154
1920	0.7846	0.7820	0.5100	0.4900	0.7807	0.2110	0.3936
1930	0.8039	0.7620	0.5060	0.4940	0.8043	0.2200	0.3974
1940	0.8368	0.7240	0.5020	0.4980	0.8407	0.2330	0.4017
1950	0.7246	0.8160	0.4970	0.5030	0.7381	0.2990	0.4049
1960	0.6790	0.8040	0.4930	0.5070	0.6986	0.3570	0.3956

*Notes:* The symbols (discussed in the text) are defined as follows:  $a_m$  and  $a_f$  are the proportions of the male and female populations (respectively) in the working age groups;  $g$  is the proportion of the population that is male;  $w_m$  and  $w_f$  are the workforce participation rates of males and females respectively; and  $l$  is labor input per capita.

*Sources:* See the Data Appendix.

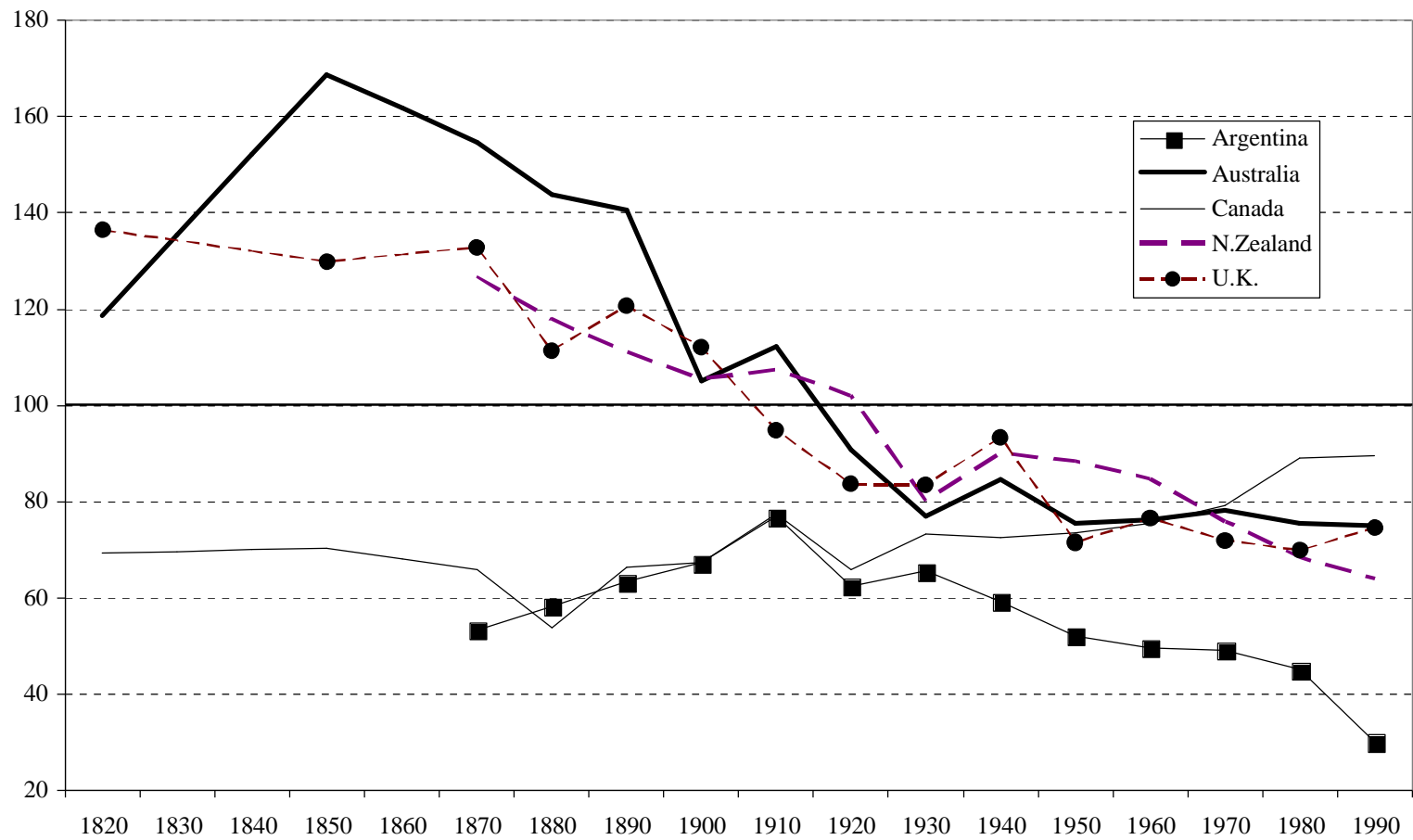


FIGURE 1. GDP PER CAPITA RELATIVE TO THE U.S. 1820-1990: SELECTED COUNTRIES AND YEARS (U.S. = 100)  
*Sources and Notes:* Based on 1990 Geary-Khamis dollars, reported by Maddison (1995), Appendix D.

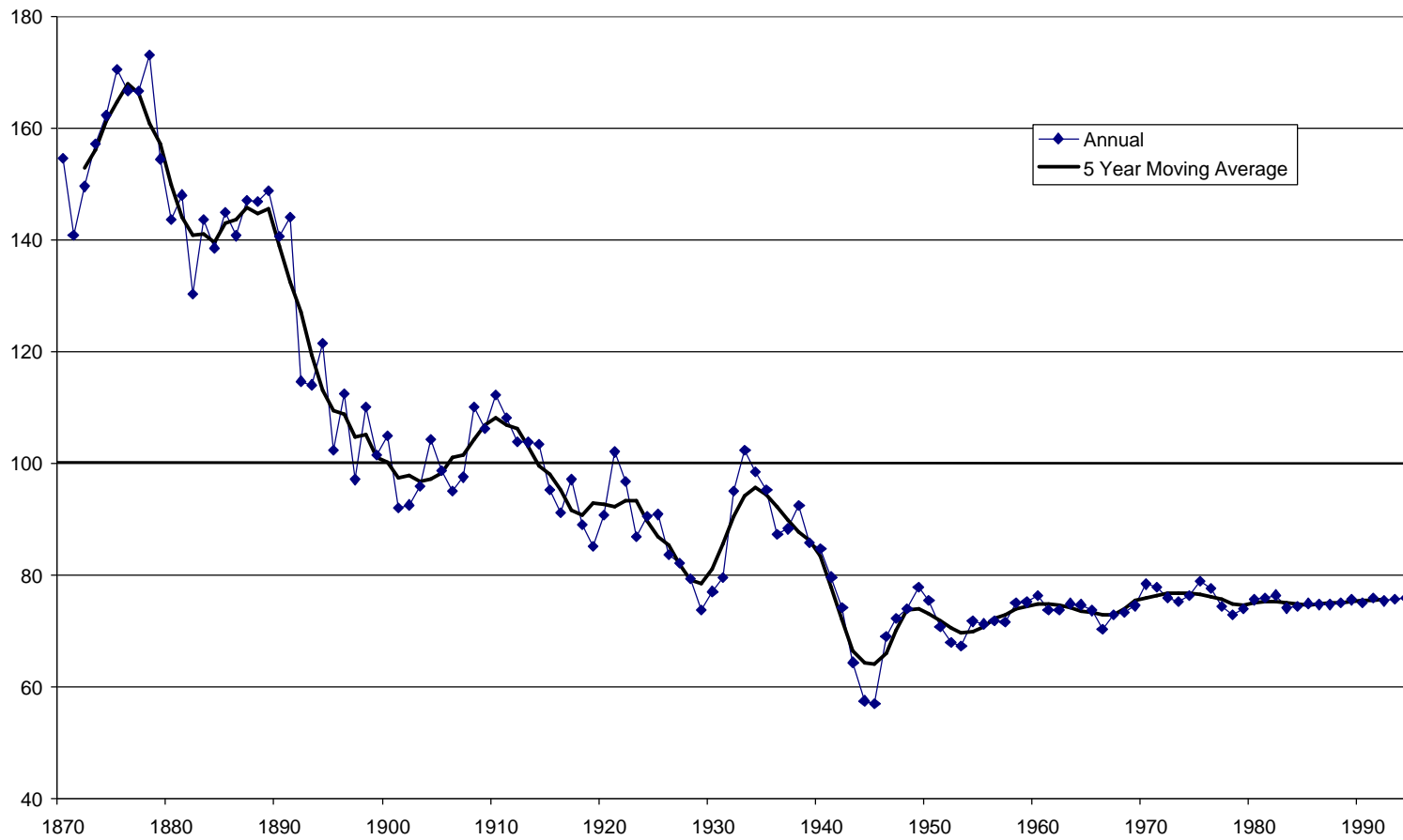


FIGURE 2. AUSTRALIAN GDP PER CAPITA RELATIVE TO THE U.S. 1870-1994 (U.S. = 100)  
*Sources and Notes:* Based on 1990 Geary Khamis dollars, reported by Maddison (1995), Appendix D



FIGURE 3. AUSTRALIAN GDP PER CAPITA RELATIVE TO THE U.S. 1871-1921: ACTUAL AND COUNTERFACTUAL (U.S. = 100)

*Notes:* For an explanation of the symbols, see the text.

*Sources:* See the Data Appendix.

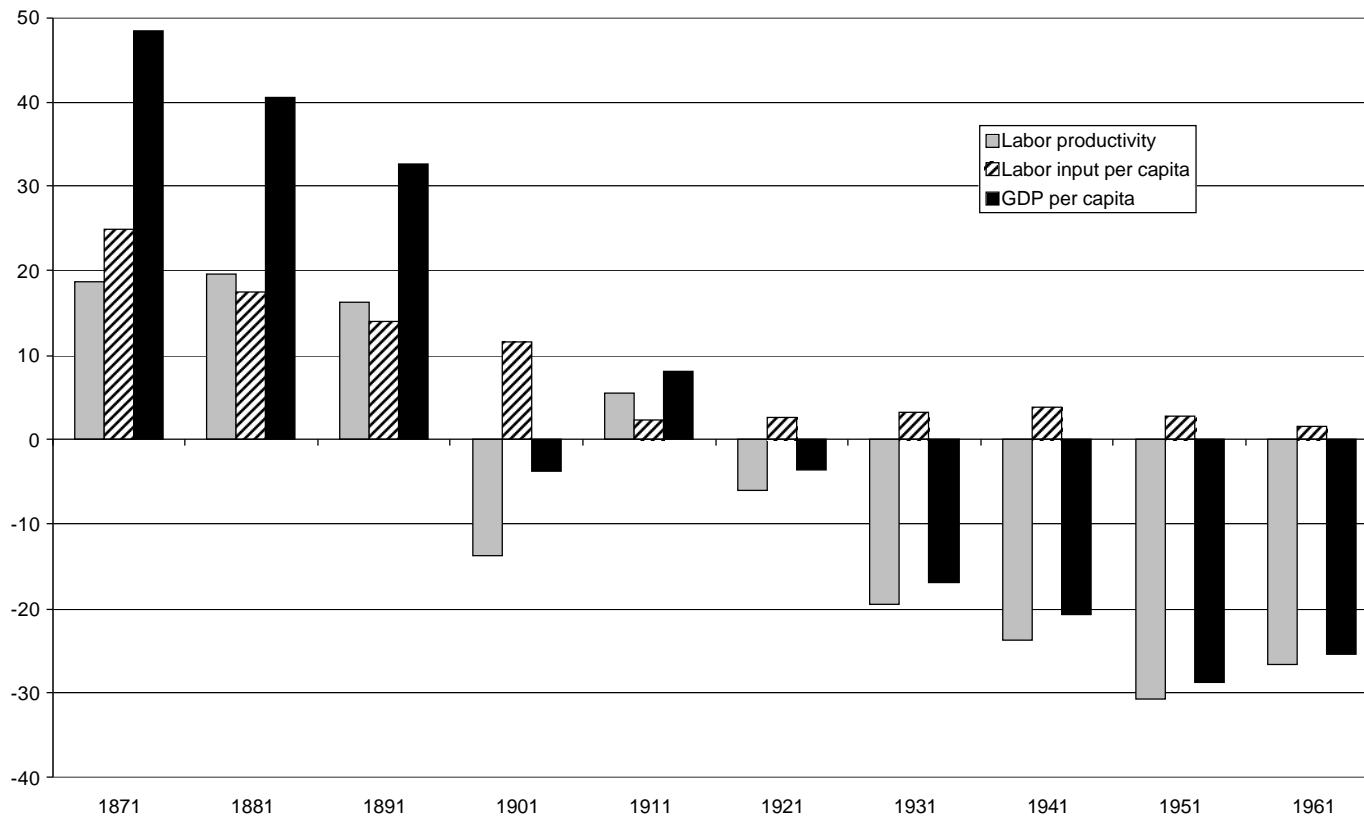
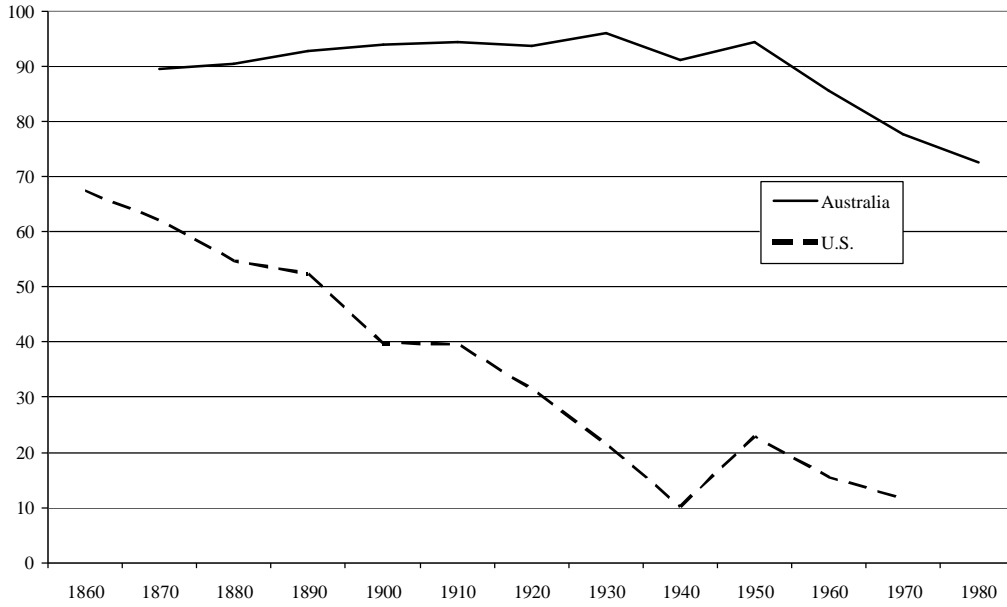


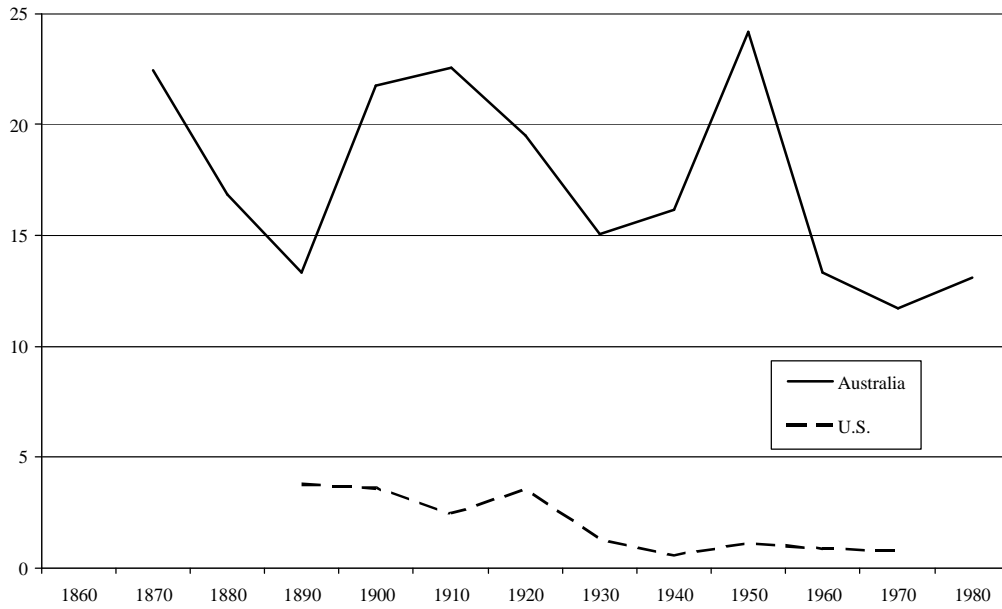
FIGURE 4. DECOMPOSITION OF AUSTRALIAN GDP PER CAPITA RELATIVE TO U.S. 1871 – 1961 (PERCENT)

*Notes:* The differences between Australia and the U.S. in labor productivity and in labor input per capita sum (taking account of sign) to the difference in GDP per capita.

*Source:* Table 1, Panel B.



PANEL A: RESOURCE EXPORTS AS PERCENT TOTAL EXPORTS



PANEL B: RESOURCE EXPORTS AS PERCENT GDP

FIGURE 5. MEASURES OF RESOURCE ABUNDANCE: AUSTRALIA AND U.S. 1860-1981  
*Notes and Sources:* See the Data Appendix.