AUSTRALIAN SQUATTERS, CONVICTS, AND CAPITALISTS:
DIVIDING UP A FAST-GROWING FRONTIER PIE 1821-1871

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ABSTRACT

Compared with its nineteenth century competitors, Australian GDP per worker grew exceptionally fast, about twice that of the US and three times that of Britain. This paper asks whether the fast growth performance produced rising inequality. Using a novel data set we offer new evidence supporting unambiguously the view that, in sharp contrast with US, Australia underwent a revolutionary levelling in incomes between the 1820s and the 1870s. This assessment is based on our annual estimates of functional shares in the form of land rents, convict incomes, free unskilled incomes, free skill premiums, British imperial transfers and a capitalist residual.

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1. Distribution Changes in a Frontier Economy

Compared with the standards of the first half of the nineteenth century, Australian Gross Domestic Product per worker grew exceptionally fast, 2.4 percent per annum between the 1820s and the 1870s, about twice that of the American juggernaut, and about three times that of the alleged imperial leader, Britain (Panza and Williamson 2017: p. 11). In the United States the fast growth years between independence and 1860 were coupled with a steep rise in inequality, steep enough to join the very unequal and land scarce Old World countries (Lindert and Williamson 2016). Did Australia undergo the same steep rise in inequality over the half-century before 1871? Perhaps not, since while the United States was undergoing impressive industrial growth, Australia was specializing in the export of minerals (small scale extraction) and wool. Both countries used coerced labor extensively, slaves in the southern United States and convicts in Australia, but their share of the labor force was much higher in Australia (more than half) than in America (about a fifth) early in the nineteenth century. More importantly, another key difference between the two countries was the timing of the emancipation of forced labor and the duration of their coerced employment. In Australia the convicts were gradually "emancipated" following the 1820s in the sense that existing convicts eventually got their freedom, that the new convict inflow fell sharply after the 1830s (except for Tasmania), and that Britain had practically ceased its convict transportation policy by the 1850s. In contrast, the slaves in the American south were used as coerced labor for much longer, and emancipated only at the very end of the period, in 1865.[2]

In this paper we offer new evidence supporting unambiguously the view that, in sharp contrast with US, Australia underwent a revolutionary leveling in incomes between the 1820s and the 1870s. These contrasting trajectories seem to have left their mark on the distributional character of the two economies into the twentieth century and even today.[3] Specifically, we contribute to the literature by providing a comprehensive picture of inequality trends in young Australia over the half-century before the 1870s. First, we analyze the development of earning

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[2] Slavery was legal in all Thirteen Colonies at the time of the Declaration of Independence in 1776.

[3] In 1980, the top 1 percent had 4.8 percent of Australian income, while the figure was 8.2 percent in the US. In 2010, the Australian figure was 9.2 percent, and the US one 17.5 percent. While the two countries, and the rest of the OECD, underwent the same laws of motion, Australia remained the more egalitarian.

gaps between land and labor (section 2) by reporting trends in the wage-rental ratio by documenting the rate of land settlement, the behavior of land values and land rents, as well as trends in land-labor ratios. Moreover, we compute trends in relative factor scarcities by documenting relative factor prices as well as relative factor quantities. These are measured by wage-land value (per acre) and by wage-land rent (per acre) ratios. Finally we explore the forces driving land rents and thus the income share accruing to landowners and squatters.[4] Here we assess the role of relative wool prices (and thus global commodity markets), interest rates (and thus global financial markets), and the exploitation rate of convicts, *de facto* constituting a cheap labor subsidy of landed interests in agriculture and capitalists in towns. With this background in hand, Section 3 reports our estimated functional income shares across the half-century for agricultural land rents, free unskilled labor (including the unskilled labor content of skilled labor), coerced convict labor, free skilled labor (or the premium received for skilled work), the imperial British income transfer, and that of residual claimants (capitalist income). Given where these categories fit in the income ranks – rental and capitalist incomes in the top quarter, skilled labor incomes in the second quarter, free unskilled labor in the third quarter, and coerced convict labor at the bottom – this exercise traces out the evolution of overall inequality. When combined with what we already know about trends in relative factor prices (Panza and Williamson 2017), This new evidence speaks to the question of rising or falling inequality, and of its magnitude: our findings point unambiguously to a steep decline. Section 4 concludes, by highlighting Australia's exceptional experience of egalitarian leveling of incomes.

2. Squatters, Land Values, and Rents

2.1 Crown Lands, Squatters and Acreage Exploited

Table 1 reports pastoral and cultivated acreage from 1828 (when the data become available) to 1860 for New South Wales (which includes what would become Victoria in 1851 and Queensland in 1859), and 1861-1871 for all Australia except the colonies of Western Australia and Queensland, the data for which are too limited. As is well known, the rate of settlement, driven mainly by pastoral expansion and sheep flocks, was spectacular (Roberts 1969; Butlin 1994; Madsen 2015)**.** Acreage annual growth rates per annum were 6.5 percent in 1828-1839, an

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[4] Land was owned by the Crown, and it was sold at public auction when the colonial government needed the revenue. For the first three or four decades after 1815, squatters simply settled the land without purchase.

impressive 17.5 percent across the 1840s and 1850s, and even faster in the 1860s. However, these rates are likely to greatly exaggerate the rate of growth of quality-adjusted land, due to the fact that most of these years were dominated by squatter settlement (those who used Crown Land but never bought it). In fact, the earliest squatters settled on the best land as judged by distance from major ports of export (wool, Australia's main export, had to be carted to port by bullock and wagon over rough terrain); by water accessibility (Australia had a dry climate then as now); and thus by grass yield and sheep load per acre. While the acreage figures in Table 1 overstate quality-adjusted land growth,[5] there is no doubt about the fact that land endowments grew very fast across the half-century, faster than the US.[6] However, as any distributional inference must be guided by *relative* scarcity or abundance, we compare land expansion with both farm and total labor force growth. The former grew at per annum rates of 4.4 percent from 1828 to 1839, 4.1 percent in the 1840s and 1850s, but fell during the post-gold rush in the 1860s. Bearing in mind again the unmeasured decline in land quality, the ratio of acreage (A) to farm labor (La) rose by a whopping 11.7 percent per annum between 1828 and 1860, and by 6.3 percent per annum across the 1860s. The ratio of acreage to the total labor force (L) grew slightly more slowly, but still very fast. All of this implies, of course, greater labor scarcity and land abundance. But does it also imply a leveling of incomes between classes? The answer depends on trends in the gap between factor income shares. Indeed, the relevant comparison is between average annual earnings per worker (w) and average annual rental income per farmer (not per acre). In other words, rental income accruing to landed interests (rA) compared with that accruing to unskilled workers (rA/wL) = (r/w)(A/L). As we have seen, A/L soared, but greater labor scarcity implies that r/w fell. Was the fall enough to lower rA/wL and also rA/Y?

[Table 1 about here]

As we shall elaborate below, empirical progress on these questions is confronted by two data problems. First, land rent series are not available for any colony during these early decades. However, we can derive an estimate of land rents per acre (r) by drawing on land values per acre (v) estimates, given the interest rate (i) and under the assumption that land values or land prices

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[5] Future research could explore land quality trends by hedonic adjustments based on distance to wool market, rainfall, and sheep load per acre, but we have not made the attempt here.

[6] US western settlement between 1800 and 1860 was driven much more by cultivation than by pastoral activity, and the major commodity exports were grain and cotton, not beef, hides or wool.

are simply the capitalized value of rents ($v = r/i$).[7] Second, the quality of the land value evidence is much debated (Taylor 1992). Land values were determined by market forces since Crown Lands were auctioned off by colonial authorities. While squatters did not purchase their land at these Crown land sales, at least initially, we have no other option but to assume that the market value of farm and pastoral land was the same as the prices recorded at Crown Land sales. Another difficulty arises from the fact that these sales described the value per acre of new land (a flow), not the average value of all land sold, new and old (a stock). This is problematic as levels and even trends of stock and flow land prices may have diverged during this half-century. If the new land was of poorer quality and more distant from ports than the old land sold previously, it would fetch lower prices than the average in a stock dominated by previous sales of better land.[8] If true, then the reported (new) land values in Table 2 would have a steeper downward trend than the (unknown) average land values (new and old). Unfortunately, we have no hedonic measures of land quality, like distance from ports and rainfall, to make those adjustments. However, and as we also noted above, the vast majority of total reported acreage was being used by squatters that had rushed to the New South Wales interior after the Blue Mountains were breached in 1815. Since it was in the interests of the squatter to get to the best land before others, it seems likely that squatted land fell in quality over time, and since squatted land dominated total land, we think the land value estimates in Table 2 overstate the rise in land values v, and thus rents and incomes of the landed rich. In any case, we have no choice but to use the unadjusted Crown Land sales quotes in what follows.

2.2 Land Values, Land Rents and Relative Scarcities

 We begin this section by noting the immense volatility in the land prices per acre (in £) reported in Table 2, driven, as we shall see below, by the volatility in world wool prices, supply-side climate shocks, and the speculation they both provoked. To minimize the impact of this

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[7] Data on interest rates are reported in Figure 1.

[8] Taylor (1992) reports detailed evidence on land values per acre implied by Crown Land sales and those implied by local government tax assessments. The correlation between them is very poor. However, the tax assessment data for Victoria (starting 1865), New South Wales (starting 1883), Queensland (starting 1881) and South Australia (starting 1862) are all well beyond our half-century range. Since few local governments were given the authority to tax until beyond our period, we do not have that evidence to explore the quality of Crown Land sales data (for our purpose) during the dramatic pre-1870s growth decades.

volatility on trends, we take five-year averages at beginning and end. Between 1828-32 and 1856-60, land values per acre (v) rose at 2.2 percent per annum but land rents (r) *fell* by 0.3 percent per annum: this difference was driven by the fall in interest rates (as discussed in section 2.3). Furthermore, both rents *and* land values per acre fell across the 1860s. In contrast, annual earnings of unskilled labor (w) soared upward over the full half-century, pushing the wage-rental rate steeply upwards: between 1828 and 1860, w/v rose by 2.4 percent per annum and w/r by 2.5 percent per annum. Across the 1860s, the figures were even higher, 5.4 and 6.6 percent per annum, respectively.

[Table 2 about here]

2.3 What Drove Land Rents? Globalization and Financial Capital Market Integration

Land values per acre (v) are the capitalized value of land rents (r), or of land's marginal value product, where that marginal product is valued by prices of the commodity produced, here wool (Pw). Although the relation between rents and land values must have been influenced by expectations and speculation in the short run (N. Butlin and Barnard 1962: Table 1, p. 388), in the long run $v = r/i$, where i is the relevant bank interest rate facing sheep owners between shearing seasons.

Therefore, the behavior of the interest rate facing Australian pastoralists and farmers over time is informative of changes in land rents. If interest rates declined over the half-century before 1871, that must have put upward pressure on land values, such that any downward trend in rents would have been understated by trends in land values. This would also create a downward bias to any inferred distributional drift in incomes away from landowners and squatters and towards labor.

[Figure 1 about here]

Figure 1 reports a fall in the Australian bank lending rate (loans for three months or more) from a 10 percent average in 1820-24 to a 7 percent average in 1867-71. Furthermore, much of that 3 percentage point decline appears to have been driven by the integration of Australian with British capital markets, much like what was happening the world around over that half-century (Lindert and Williamson 2016: pp. 134-5; Obstfeld and Taylor 2003, 2004: Mauro *et al.* 2006). That is, the gap between the higher Australian bank rate and the lower British consol rate fell from 6.2 percent in 1820-24 to 3.9 percent in 1867-71, or by 2.3

percentage points (more than two-thirds of the fall in the Australian rate). After looking at the trends in the wedge between domestic and British interest rates, we also formally test for co-integration between the two series, using the Johansen co-integration test (Johansen 1995). The results support the existence of one co-integrating relation, that is of a long-run equilibrium between the two interest rates. [9] While not an impressive rate of convergence towards integrated world financial markets, this is consistent with a recent literature that points to the second half of the nineteenth century, not the first, as the source of fast financial capital market integration. [10]

To summarize, land values per acre fell at a slightly slower rate than land rents per acre between 1828-32 and 1867-71 (Table 2) simply because interest rates fell as Australian and British capital markets (only partially) integrated. Still, these global financial market integrating forces were much too modest to have had a significant impact on the behavior of Australian land values and thus wealth.

2.4 Wool Prices: Booms, Busts, and Global Commodity Market Volatility

As we have seen above, and consistent with similar trends in the ratio of land values per acre to GDP per worker (v/y: Panza and Williamson 2017: Table 8), the ratio of land rents per acre to average annual earnings per unskilled worker (*r/w*) and land values per acre to average annual earnings per unskilled worker (*v/w*) fell dramatically between the 1820s and the 1870s (Table 2). In this section we explore the role played by the price of wool in driving the relative value of land and rents per acre downwards. If wool prices rose, then the decline in land values and rents per acre would be all the more surprising.

The economic impact of global events on commodity prices during the half-century before the 1870s was carried by five global forces (Williamson 2011: Chp. 2): a world transport revolution lowering the cost of moving goods between home and foreign markets, thus raising commodity export prices and lowering manufactured import prices in peripheral locations like

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[9] We use one lag in the co-integration test, following Akaike's information criterion. When computing the parameters of the co-integrating equation using an error correction model, we find some weak evidence of price pass through.

[10] The rate of financial integration between Australia and Britain 1821-1871 may seem modest, but it is what the literature would have predicted. Obstfeld and Taylor (2003, 2004) and Mauro *et al.* (2006) argue that the biggest world financial market integration took place after 1870, although the United States, as a member of the leading North Atlantic "global" economy, was the first and earliest to so integrate with Europe (Sylla *et al.* 2006).

Australia;[11] a liberal trade policy move in Europe and its colonies (free trade in the British case), again serving to raise export prices in the exporter's markets; an acceleration in GDP and GDP per capita growth in Europe and North America, raising demand for all traded goods; an even greater acceleration in the demand for intermediates to fuel rapid manufacturing growth in foreign markets; and resource "discoveries" at the frontier. The first four of these worked to push upward the terms of trade in all resource abundant commodity exporting economies, raising their export prices and lowering the prices of their manufactured imports.

The impact was spectacular. The terms of trade in the periphery soared up to the late 1880s and early 1890s, paused at its peak, and then underwent the interwar collapse, which extended to the Korean War, an episode about which so much has been written (Prebisch 1950; Singer 1950; Lewis 1978, 1980). But between 1800 and 1870, the terms of trade in the commodity exporting periphery increased by almost two and a half times, or at an annual rate of 1.5 percent (Williamson 2011: Chp. 3).

What about the fifth dramatic global force, resource "discovery"? Here is where commodity exporters around the periphery differed: some claimed only a small share of world supply of their commodity export (e.g. Egyptian cotton, Ottoman raisins, Philippine tobacco) and some a very large share (e.g. Chilean copper, Brazilian coffee, Indian jute). Those with small shares took their export prices as exogenous. Those with large shares influenced world prices by their own supply. It did not take Australia long to become the world's dominant wool supplier after the penetration of the Blue Mountains in 1815 and the opening up of the vast pastoral interior, after which acreage grew at about 6.5 percent per annum up to 1839, a rate that doubled across the 1840s and 1850s, and rose even more thereafter (Table 1). By 1850, British imports of Australian wool exceeded that of all other suppliers combined (Barnard 1958: p. 20; Table VI, p. 218). Did world demand or Australian supply win the race? Table 3 supplies the answer. Relative to the GDP price deflator (Pw/Py), wool prices rose to a modest peak in the late 1840s and early 1850s, up by 36 percent between 1828-32 and 1845-52, a 2 percent per annum growth rate. But the boom did not last since Pw/Py then settled back to the 1828-32 levels in the following two decades. In short, there is no evidence of a secular wool price boom across the half-century before 1871, much unlike the experience of the typical commodity exporter at that

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[11] It must be said, however, that freight rates on shipping wool Melbourne or Sydney to London fell very little from 1845 to 1871 (Barnard 1958: Tables XXI and XXII, pp. 225-6).

time. Thus, the long run race between Australian wool supply and world demand was a tie, and the secular decline in *r/w*, or *v/w* cannot be explained by some secular wool price slump.

[Table 3 about here]

Volatility, however, is another matter entirely. Indeed, the volatility of both *Pw/Py* and *r/w* was immense, as illustrated in Figure 2. Here volatility is measured using the Hodrick-Prescott filter, which calculates how prices deviate from the trend. This volatility was something that all commodity exporters shared (Williamson 2008, 2012), even Australia from Federation to the present (Bhattacharyya and Williamson 2011, 2016). Nineteenth century wool prices were no exception (Weisser 1962). Australia's wool price volatility (on average equal to 11.5 during 1850-1870, and 12.6 during 1828-1871) was even more impressive when compared to other countries, both industrialized economies and commodity producers: it was 1.4 times bigger than that of the "poor periphery", the European periphery and the Middle East; 1.3 times bigger than Latin America; 1.5 times bigger than South and South East Asia and 3.9 times bigger than the European colonizing "core" during the first wave of globalization.[12] And commodity price volatility has always had its impact on income distribution, the income shares accruing to those owning and/or exploiting the resources, like Australia's squatters and landowners during our half-century, or mining interests over the next 150 years.

[Figure 2 about here]

2.5 Convict Coercion and Income Subsidies of Land and Capital[13]

Convicts and ex-convicts were about 88 (55) percent of Australia's male (female) labor force in 1830 (Butlin 1994, p. 40). Of course, the work of ex-convicts was indistinguishable from that of originally-free labor, so the convict worker shares were lower, but still very large: 55 percent of the total labor force in 1825, and 40 percent in 1840 (Meredith and Oxley 2015: p. 114). It is what was called "assigned" convict labor that concerns us here: in 1827, 72 percent were assigned to private sector employers (called "masters"), and in 1835 the figure was 66 percent (Coghlan 1918 vol. 1: pp. 180-181). The rest of the convicts were employed on public works or incarcerated. The assignment system was intended to reduce labor scarcity in the fast-growing private sector and to lower the financial burden on the colonial purse (Coghlan 1918.

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[12] See Williamson 2011, pp. 174-5 (Table 10.2) for a comparison with volatility in other economies.

[13] The opening paragraphs of this section draw heavily on Panza and Williamson (2017).

vol. 1: Pt. II, Ch. II; Butlin 1994: pp. 46-55; Meredith and Oxley 2015). [14] The system assigned convicts to work for private sector masters in all occupations, but farm and urban common labor dominated. The colonial government published requirements about "payments" under the system: such information allows us to assess the amount of the marginal product that convicts were able to retain for their own consumption and to compare their "earnings" with those of free labor (Panza and Williamson 2017). Estimating convicts' pay will also allow us to estimate the extent to which cheap labor subsidies inflated the rents received by landed interests, which employed them.[15] And it will also allow us to assess its contribution to what we think was an immense leveling of incomes as the convicts were "emancipated".

The masters were required to support their convict servants with food (rations), lodging, clothing and incidentals. In addition, the convict could earn additional income by hiring out for wages after assignment hours (3pm). These cash payments ranged from 10 to 15£ per annum (Coghlan, 1918 vol. 1: p. 60).

In order to estimate convict "earnings", we reconstructed their yearly consumption of food, clothing, and incidentals as reported in Coghlan (1918, vol. 1: p. 182-183). We then priced the convict's consumption basket and added extra income from overtime work. As explained in detail in Panza and Williamson (2017), convicts were paid only 59 percent of the earnings received by free labor for the same work.[16] This calculation refers to the 1830s, but we assume it remained much the same up to 1850.

Table 4 reports convict "exploitation" rate in the agricultural sector, namely the size of convicts' foregone earnings to subsidize their masters' income. This is calculated as the gap between free and convict wage rate, *wf-wc*, multiplied by convict labor force in agriculture, *Lca*, over total land rents, *rA*. Our estimates are certainly consistent with the claim that the assignment system greatly subsidized landowners, especially those operating large sheep walks, and especially the squatters who were the main source of the post-1815 pastoral boom: "One of the

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[14] 1821 marks the colonial government's determination to give priority to the private (over public) employment of convicts.

[15] The New South Wales assignment system officially ended in 1838-1839, but persisted much longer. In Tasmania, a similar system ended only in 1857 (Meredith and Oxley 2005).

[16] The figure was even lower for skilled work since the in-kind consumption remained the same, but the free laborer's earnings were much higher for skilled work in, say, the building trades or as a clerk. It was also much lower than 59 percent to the extent that after-3pm work was not available.

primary factors in explaining the vulnerability of the squatters … was the demise of the assignment system, and the consequent end of cheap labor ...” (Thomas 1991: p. 160). Indeed, Tables 4 and 5 estimate that in 1828-32 the convict cheap labor subsidy doubled the land rental share from 17.5 percent to 34.7 percent in New South Wales, a huge sum which had evaporated by 1851.[17] And that's not all. About half the convicts were assigned to farm work, and the other half to urban work, thus also raising the returns to capital in urban areas.

The system also implied an unequal earnings distribution in the early decades of our half-century and a big erosion of that earnings inequality by the later decades. In 1828-32, the bottom of the distribution – the cheap coerced convicts – held about 18 percent of total NSW income. By 1851, the “emancipated” convicts had moved up the earnings ranks, almost doubling their incomes if they remained unskilled, and moving up even higher if they could now exploit skills they could not exploit before, or could before only exploit at cheap unskilled labor rates.

[Table 4 about here]

3. The Evolution of the Functional Distribution of Income

3.1 Incomes at the Top: Did Land Rent Shares Boom?

Table 5 documents the share of land rental income in Gross Domestic Product, *rA/Y*. Not surprisingly, the share was very high in the early years of this frontier economy. Between 1828 and 1832, just fifteen years after the Blue Mountains were penetrated, the land rent share in New South Wales' GDP was 34.7 percent, implying a very unequal distribution of income. That income inequality was not necessarily translated into wealth inequality since so much of the pastoral land was squatted land, not owned land.[18] Twenty years later (1848-52), the NSW share had plunged to 7.7 percent, and it was lower still in 1860, after the 1850s gold rush. The rental income share for all Australia remained fairly stable across the 1860s and early 1870s, around 2 percent. A large part of the fall in the rental share was driven by rising labor scarcity (*r/w*: Table 2) and a good share of that rising labor scarcity was due to the disappearance of the huge subsidy

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[17] This is a lower bound. After all, free labor had to compete with cheap convict labor, thus lowering their wages as well.

[18] Of course, the squatters did own their sheep. We assume the land rents and prices reflected the value of sheep grazing on those acres.

offered by cheap coerced convict labor.[19] But the share also fell as non-farm sectors grew faster than the farm sector: the agricultural employment share fell from a peak in 1841-45, 49 percent, to 25.4 percent in 1860, a figure that was only a little lower cross the 1860s and early 1870s (Table 1).

It seems clear that income was redistributed from the top to the bottom of the distribution across this half-century, and the leveling was massive.[20]

[Table 5 about here]

3.2 Convict and Free Labor Wage Shares

Although it is not reported in Table 5, the unskilled wages share can be easily calculated as the sum of the annual earnings accruing to unskilled free labor, *wfLf/Y*, that is, the average unskilled annual earnings (*wf*) times the total free labor force (*Lf*) plus convict earnings (*wcLc/Y*).

We start with the convicts at the bottom of the income distribution, whose share (*wcLc/Y*) was a meager 18 percent in 1828-32.[21] Their share rose marginally with their numbers over the early years to a 19.9 percent peak in 1840-4, and then collapsed with gradual "emancipation" to zero in 1851. What happened to the incomes of these "emancipated" convicts? As they became free, they could (and did) move up the income ranks in three ways. First, they could join the free unskilled labor ranks as domestic servants, farm labor, or urban unskilled, jobs they had before but for which they only received 59 percent (or even less) of free labor in the same jobs. In this, the most common case, they moved into the free unskilled category with incomes on average 41 percent or more higher, an income gain much higher than the upward income jump received by emancipated black slaves in the US South (about 30 percent: Lindert and Williamson 2016: pp. 159-64). Second, if they had the skills they could move up the earnings ranks as artisans, mechanics and skilled in the building trades, with incomes 3 to 4 times higher than their convict wages. Third, some with literacy and numeracy skills could become clerks and other white-collar

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[19] The subsidy is understated to the extent that cheap convict labor also pushed down the wage of free labor.

[20] Concentration among those at the top is not the same as income shares accruing to all those at the top. Andrew Leigh notes that "In 1844, the top 0.1 per cent owned a whopping 17 per cent of the land and 11 per cent of the livestock" (Leigh 2013, p. 22), and earlier Mark Thomas (1991, pp. 157-165) documented the spectacular rise in land concentration between 1821 and 1838. But those facts do not necessarily speak to overall income inequality.

[21] *wcLc/Y* represents the share of convicts' wage *(wc)* times convicts' labor force *(Lc)* over GDP (*Y*).

employees, moving to the top of the earnings distribution. Not only did the convict share at the bottom of the income distribution disappear by 1851, but many of those "emancipated" convicts moved up the skill ladder thus promoting a pronounced leveling in the earnings distribution.

The free unskilled labor share (*wfLf/Y*) rose from 64.6 percent during the convict era we can document (1828-1849) to 70.2 percent during a convict-free era at the end of our half-century (1861-1871).

3.3 Skilled Labor's Share

Estimating skilled labor's income share ([*ws-wus*]*Lfs/Y*) presents two challenging problems, the solutions to which yield admittedly fragile estimates. Overall, we are more confident in estimated trends than levels. First, we need to measure the skill premium itself, and then we need to tally up those who were "skilled". While our solutions to these two problems can certainly be challenged, we apply them consistently across our half century.

First, we approximate the skilled labor premium by taking the gap between clerks' annual earnings and that of urban common labor, *ws-wus*, based on the Colonial Blue Books: as we noted above and in a previous paper (Panza and Williamson 2017), in NSW the ratio of the annual earnings of clerks to that of urban common labor *fell* from 5.86 in 1828 to 3.42 in 1871. A weighted average across a broader range of skills – including artisans at the bottom of the skilled earnings distribution, teachers in the middle, and doctors, judges, managers, government officials and others at the white collar top – would be very difficult with the data currently available. By focusing on the skilled wage premium received by clerks, we probably understate the average skill premium to the extent that the excluded skilled above outnumber the excluded skilled below. However, we doubt that a broader skilled labor calculation would produce very different long-run trends in the income share, although it might well raise levels.

Second, we measure the skilled labor employment share as the total labor force minus farm workers, miners, domestics, and urban common labor divided by the total labor force. Our measure of skilled occupations is an upper bound, including as it does carters, janitors, seamen and others, occupations which the 1828 census does not distinguish (although the 1871 census does). While our measure does document some economy-wide skilling across the half-century, it is surprising how modest it was. As defined, the share of the NSW labor force "skilled" rose

from 35.6 percent at the 1828 census to 37.1 percent at the 1871 census. This slow skilling rate is consistent with schooling evidence: from 1800 to 1870, Australian average educational attainment grew at a snail's pace (Madsen 2015: Figure 2.5, p. 45). Still, the slow growth in skill supply was enough to beat, apparently, an even slower growth in demand, since the skill premium fell over the half-century.

With these two problems solved, we can proceed with estimating the skilled income share as the share of the labor force skilled times the skill premium, or one minus the ratio of the annual wage earnings of clerks relative to that of urban common labor. The results are presented in Table 5. The skill premium was a very small share of GDP: 1.3 percent in 1828-32, it fell to less than 1 percent in 1856-60, and stayed almost the same in 1867-71. Clearly, the skill premium was not playing a significant role in explaining distributional changes across our half-century.

3.4 Imperial Subsidies: Transfers from Britain to New South Wales

At the start of our half-century, Britain was committed to significant financial transfers to New South Wales and Tasmania (labelled T/Y in Table 5). But what Noel Butlin called the "legal fisc" (Butlin 1994: Chp. 10) had completely changed by the end of our half-century, or even earlier: by the end of the period, the colony (and private British capital) had assumed almost total responsibility for revenue and expenditure on governmental operations and infrastructure development. That is, local land, labor and capital were receiving external subsidies (a negative entry in Table 5) from Britain. The transfer took the form of Commissariat expenses related to the penal system, the Colonial Fund for policing, defense, and infrastructure, and Crown Land sales. The latter was a source of special tension between Britain and the colonists, each claiming the land and its sales revenue as theirs, Britain giving up its claim by the 1850s. In any case, Table 5 enters these transfers as a (negative) share of GDP based on Butlin's estimates (Butlin 1994: Table 10.1, p. 86), and those shares are very big early in our half-century: they were -23.6 per cent for 1828-32 and -20.2 percent 1828-40. Britain's fiscal commitment fell over time to -1.3 percent in the 1850s, and to almost nothing thereafter.

3.5 Residual Claimants: Capitalists

The residual claimants share in Table 5 belongs to capitalists. Furthermore, most of the short run volatility of GDP ends up in the residual since we have no evidence to document short run unemployment or land rental income changes associated with that volatility. Still, here is what it implies for the long run. The residual share averaged about 20.9 percent in the early years 1828-40, swelled to 40.9 percent during the gold rush decade (1850-60), and dropped down to 27.2 percent in the 1860s (1861-71). Thus, the capitalist income share reveals only a modest upward trend over the half-century. However, we want to stress the great volatility in the share: for example, it was negative during three mid-convict years 1830-32, very low (4.8 percent) during 1843 and 1844 at the bottom of the 1840s depression and very high during the gold rush 1850s decade (40.9 percent). Although less dramatic, that volatility is shared by land rents, and the discussion of wool exports and prices predicted that volatility in both (a very common phenomenon for most commodity exporters). That volatility is also consistent with decadal booms and busts between 1800 and 1870 (Madsen 2015: Figure 2.1, p. 31).

4. The Big Picture: Two Australian Egalitarian Revolutions

It appears that Australia has had two episodes of egalitarian leveling, both about a half-century in length. The first one, discussed here, covered the half-century from the 1820s to the 1870s. The second one, which occurred between World War 1 and the 1970s (Leigh 2013; Atkinson and Leigh 2013), was witnessed by all OECD countries – since they shared the same exogenous political and global shocks (Lindert and Williamson 2016: Chp. 8). The one discussed here was certainly not shared with Western Europe, and especially not with the United States. We know now that the United States rode up a steep Kuznets Curve from an egalitarian British colony in 1774 to an unequal modern society in 1870 (in spite of slave emancipation), thus joining an unequal Western European club. And the United States income distribution is pretty much the same today. Australia's experience is exceptional since, while its GDP grew at a high rate, the gains from such growth did not accrue disproportionately to a small minority of land and capital owners at the top. Indeed, their share fell significantly. Thus, Australia's income distribution moved in a direction opposite to that of the United States. Part of this exceptionalism was driven by the emancipation of coerced convicts and part of it was driven by the absence of the kind of early industrialization that overtook the United States.

It must be said, however, that the work reported here speaks better to trends than to levels. When the dust settled in the 1870s, how much more egalitarian was Australia than the United States? And was that difference pretty much like it is today?[22]

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[22] We intend to answer the 1870s level question soon. The Colonial Blue Books, occupational censuses and other sources make it possible to construct the Australian earnings distribution for 1871, and perhaps even the income distribution.

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Table 1. Pastoral and Cultivated Acres, Total and Agricultural Labor Force (1,000), 1828-1871

Year	Total acres (A)	Labor Force (L)	Agricultural Labor Force (La)	Agricultural Labor Share (La/L)	A/L	A/La
New South Wales (including what would become Victoria and Queensland)						
1828	2,356	41.47	9.15	0.221	97.70	21.56
1829	3,056	46.36	10.44	0.225	141.68	31.91
1830	3,964	51.25	11.91	0.232	203.16	47.23
1831	4,041	56.15	13.59	0.242	226.90	54.94
1832	4,120	61.04	15.51	0.254	251.49	63.91
1833	4,200	65.94	17.70	0.268	276.95	74.34
1834	4,282	70.36	20.19	0.287	301.29	86.48
1835	4,366	74.78	23.04	0.308	326.48	100.60
1836	4,451	79.20	26.29	0.332	352.53	117.02
1837	4,538	84.05	30.00	0.357	381.43	136.13
1838	4,626	88.91	34.23	0.385	411.33	158.36
1839	4,717	93.76	39.06	0.417	442.24	184.21
1840	4,809	98.61	44.56	0.452	474.21	214.29
1841	4,903	103.47	50.85	0.491	507.25	249.28
1842	4,998	103.85	50.94	0.491	519.09	254.63
1843	5,096	104.24	51.04	0.490	531.18	260.11
1844	5,195	104.63	51.14	0.489	543.56	265.69
1845	5,297	105.01	51.24	0.488	556.21	271.40
1846	5,400	105.40	51.34	0.487	569.15	277.23
1847	5,505	105.79	51.44	0.486	582.38	283.19
1848	5,613	106.17	51.54	0.485	595.92	289.28
1849	5,722	106.56	51.64	0.485	609.76	295.49
1850	5,834	108.68	51.74	0.476	634.02	301.84
1851	5,948	152.47	51.84	0.340	906.85	308.33
1852	6,064	171.62	55.72	0.325	1040.68	337.89
1853	6,182	193.50	59.99	0.310	1196.24	370.89
1854	6,303	218.53	64.70	0.296	1377.31	407.79
1855	6,426	247.19	69.89	0.283	1588.39	449.10
1856	6,551	280.07	75.62	0.270	1834.80	495.40
1857	6,679	322.55	85.76	0.266	2154.29	572.77
1858	6,809	352.68	92.34	0.262	2401.51	628.75
1859	6,942	385.80	99.47	0.258	2678.30	690.51
1860	7,078	422.22	107.19	0.254	2988.31	758.67
All Australia (except Western Australia and Queensland)						
1861	15,156	547.80	128.73	0.24	8303	1951
1862	16,764	559.30	127.77	0.23	9376	2142
1863	18,220	571.05	126.81	0.22	10404	2310

1864	19,496	583.04	125.86	0.22	11367	2454
1865	20,452	595.29	124.92	0.21	12175	2555
1866	21,719	607.79	123.99	0.20	13201	2693
1867	22,823	620.55	123.06	0.20	14163	2809
1868	24,843	633.58	122.14	0.19	15740	3034
1869	25,673	646.89	121.22	0.19	16607	3112
1870	28,182	660.47	120.32	0.18	18614	3391
1871	30,143	674.40	119.37	0.18	20328	3598

Sources: Total Acres (*A*) from N. Butlin et al. (1986); S. Roberts (1969); and "Statistical Tables". We prefer these to Vamplew (1987). Total Labor Force (*L*) from colonial censuses, using geometric interpolation for missing years. Agricultural Labor Force (*La*) is derived from agricultural labor force shares in Table 4.

Table 2: Land Values, Rents, and Relative Land-Labor Scarcity, 1828-1871

Year	Land Values per Acre £ (v)	Land Rents per Acre £ (r)	Unskilled Labor Average Annual Earnings £ (w)	w/v	w/r
New South Wales (including what would become Victoria and Queensland)					
1828	1.243	0.124	29.878	24.0	240.3
1829	1.490	0.149	29.961	20.1	201.1
1830	1.455	0.145	30.027	20.6	206.4
1831	1.416	0.142	30.082	21.2	212.4
1832	1.490	0.149	30.128	20.2	202.3
1833	1.205	0.120	30.166	25.0	250.4
1834	1.662	0.166	30.416	18.3	183.0
1835	2.120	0.212	30.633	14.5	144.5
1836	2.120	0.225	30.822	14.5	136.8
1837	2.081	0.235	31.603	15.2	134.5
1838	1.101	0.132	32.258	29.3	244.1
1839	1.342	0.134	32.814	24.4	244.4
1840	2.753	0.330	35.698	13.0	108.1
1841	1.164	0.128	38.835	33.3	303.2
1842	1.316	0.132	42.248	32.1	321.1
1843	1.288	0.112	45.961	35.7	412.1
1844	1.488	0.107	50.000	33.6	466.1
1845	1.345	0.081	52.421	39.0	649.7
1846	2.143	0.129	54.960	25.6	427.4
1847	1.970	0.118	57.621	29.2	487.5
1848	1.618	0.097	60.411	37.3	622.4
1849	1.819	0.109	63.336	34.8	580.3
1850	2.089	0.125	66.403	31.8	529.7
1851	1.919	0.115	69.619	36.3	604.6
1852	2.820	0.169	72.990	25.9	431.4
1853	4.309	0.259	76.524	17.8	296.0
1854	3.273	0.196	80.230	24.5	408.6
1855	1.903	0.114	80.587	42.3	370.8
1856	1.834	0.110	80.945	44.1	400.9
1857	2.337	0.140	81.305	34.8	248.0
1858	2.823	0.169	81.667	28.9	170.8
1859	1.845	0.104	82.030	44.5	425.6
1860	1.523	0.061	82.395	54.1	888.0
All Australia except Western Australia and Queensland					
1861	1.419	0.057	82.761	58.3	1027.9
1862	1.057	0.042	83.129	78.7	1860.9
1863	0.997	0.040	83.499	83.8	2100.9
1864	0.980	0.039	83.870	85.6	2182.2

1865	0.876	0.070	83.716	95.6	1364.9
1866	0.929	0.084	83.562	90.0	1067.0
1867	0.982	0.083	83.408	85.0	1018.1
1868	1.058	0.049	83.255	78.7	1597.5
1869	0.871	0.039	83.101	95.4	2433.5
1870	0.740	0.044	82.949	112.1	2523.0
1871	0.843	0.051	82.796	98.2	1941.5

Sources: Land values per Acre (*v*) are Crown land average sales prices from Taylor (1995) and Soos (2016); 1828-1837 uses the only available Tasmania series; 1837-1865 uses an acreage-weighted average of the only available Victoria and South Australia series; and 1865-1879 uses an acreage-weighted average of New South Wales, Victoria, and South Australia. Land Rents per Acre (*r*) = *v**i where the interest rate series (*i*) is bank lending rates in Figure 1. Unskilled Average Annual Earnings (*w*) are from Table 4.

Table 3: Wool Price Indices, Nominal and Relative 1828-1871 (1861=100)

Year	Nominal wool price index (*Pw*)	GDP deflator (*Py*)	Relative wool price index (*Pw/Py*)
1828	76.9	97.4	79.0
1829	71.2	96.1	74.0
1830	53.8	76.6	70.3
1831	78.8	74.0	106.5
1832	121.2	74.0	163.7
1833	75.0	81.8	91.7
1834	99.0	100.6	98.4
1835	107.7	100.6	107.0
1836	107.7	103.9	103.7
1837	128.8	101.3	127.2
1838	96.2	100.0	96.2
1839	98.1	125.3	78.3
1840	113.5	110.4	102.8
1841	119.2	100.6	118.5
1842	107.7	95.5	112.8
1843	84.6	74.0	114.3
1844	69.2	64.9	106.6
1845	90.4	70.8	127.7
1846	96.2	69.5	138.4
1847	86.5	61.0	141.8
1848	88.5	59.1	149.7
1849	71.2	55.8	127.4
1850	77.5	64.9	119.4
1851	87.6	59.7	146.7
1852	93.2	76.6	121.6
1853	112.2	104.5	107.3
1854	108.7	124.0	87.6
1855	78.8	131.2	60.1
1856	88.5	111.7	79.2
1857	92.3	101.9	90.5
1858	71.2	114.3	62.3
1859	94.2	109.7	85.9
1860	107.7	98.7	109.1
1861	100.0	100.0	100.0
1862	84.6	100.6	84.1
1863	88.5	98.7	89.6
1864	88.5	92.9	95.3
1865	80.8	89.6	90.1
1866	96.2	91.6	105.0
1867	100.0	87.7	114.1
1868	73.1	83.8	87.2
1869	65.4	83.8	78.1

| 1870 | 71.2 | 83.1 | 85.6 |
| 1871 | 57.7 | 83.1 | 69.4 |

Sources: Prices for greasy merino wool from Vamplew (1986, p. 116). The GDP deflator is from M. Butlin et al. (2015, Table A7).

Table 4: Average Annual Earnings of Convict (*wc*) and Free Labor (*wf*), in £, and the Implied Landlord Subsidy 1828-1850.

Year	Free unskilled average annual earnings	Convict average annual earnings	Convict labor force (000)	Convict farm labor share (%)	Landowner Subsidy (£)
	(*wf*)	(*wc*)	(*Lc*)	(*Lca/Lc*)	(*wf-wc*) *Lca/rA*
1828	29.88	17.63	10.88	0.48	21.83
1829	29.96	17.68	12.48	0.47	15.93
1830	30.03	17.72	14.35	0.47	14.27
1831	30.08	17.75	16.52	0.46	16.34
1832	30.13	17.78	19.04	0.45	17.32
1833	30.17	17.80	21.96	0.45	23.90
1834	30.42	17.95	24.71	0.44	18.99
1835	30.63	18.07	27.90	0.43	16.36
1836	30.82	18.18	31.58	0.43	16.95
1837	31.60	18.65	33.09	0.42	16.86
1838	32.26	19.03	34.93	0.41	31.23
1839	32.81	19.36	37.12	0.41	32.10
1840	35.70	21.06	39.67	0.40	14.65
1841	38.84	22.91	42.59	0.39	42.66
1842	42.25	24.93	36.57	0.39	37.47
1843	45.96	27.12	30.88	0.38	39.25
1844	50.00	29.50	25.49	0.38	35.40
1845	52.42	30.93	20.36	0.37	38.08
1846	54.96	32.43	15.45	0.37	18.38
1847	57.62	34.00	10.75	0.36	14.09
1848	60.41	35.64	6.22	0.36	10.06
1849	63.34	37.37	1.85	0.35	2.69
1850	66.40	39.18	0.55	0.35	0.71

Sources: A (acres, 000) are taken from Table 1, and rents per acre (*r*) are taken from Table 2. Free unskilled labor average annual earnings (*wf*) are from Coughlan (1918), vol. 1 for the 1820s, 1830s, and 1840s, and from "Statistical tables" for the 1850s, augmented by Coughlan (1918, vol. 2) for urban common labor where necessary. Convict unskilled labor average annual earnings (*wc*) = 59% of that of free labor, a figure estimated in Panza and Williamson (2017). Agricultural convict labor share (*Lca/Lc*) is assumed to be the same as for the total labor force, taken from Table 1.

Table 5: Australian Functional Shares (%) 1828-1879

Year	Land Rent	Annual Earnings			British Imperial Transfer	Residual Claimants: Capitalists
		Convict Unskilled	Free Unskilled	Free Skilled		
	(rA/Y)	$(wcLc/Y)$	$(wfLf/Y)$	$([ws\text{-}wus]\ Lfs/Y)$	(T/Y)	
New South Wales (including what would become Victoria and Queensland)						
1828	25.07	16.4	70.39	1.35	-29.57	16.35
1829	34.02	16.5	68.27	1.29	-25.52	5.45
1830	38.45	17.0	66.49	1.24	-19.99	-3.15
1831	36.78	18.8	68.94	1.27	-21.78	-4.05
1832	39.02	21.5	72.42	1.31	-21.00	-13.28
1833	26.26	20.3	61.97	1.10	-16.72	7.11
1834	25.25	15.7	44.33	0.78	-16.01	29.93
1835	24.43	13.3	34.12	0.59	-17.22	44.76
1836	24.82	14.2	32.69	0.56	-24.64	52.36
1837	26.98	15.6	36.68	0.61	-22.03	42.14
1838	15.24	16.6	39.08	0.65	-36.68	65.13
1839	14.36	16.3	37.93	0.62	-26.92	57.73
1840	32.91	17.3	39.24	0.63	-25.21	35.12
1841	14.79	23.0	50.11	0.79	-24.55	35.86
1842	16.18	22.4	62.96	0.98	-19.12	16.57
1843	13.55	20.0	72.33	1.11	-13.90	6.96
1844	12.32	16.6	78.69	1.19	-11.54	2.73
1845	8.26	12.2	77.15	1.14	-13.29	14.58
1846	13.03	9.4	83.49	1.22	-17.22	10.08
1847	11.54	6.5	87.43	1.26	-15.57	8.85
1848	8.31	3.4	82.94	1.18	-12.33	16.51
1849	9.28	1.0	88.68	1.24	-13.46	13.24
1850	9.48	0.3	83.79	1.15	-13.89	19.19
1851	7.44		103.78	1.40		-12.62
1852	4.01		44.04	0.59		51.37
1853	4.25		35.47	0.47		59.81
1854	2.92		37.17	0.48		59.43
1855	1.82		44.41	0.57		53.20
1856	1.71		48.36	0.61		49.33
1857	2.04		51.41	0.63		45.91
1858	2.44		54.84	0.67		42.05
1859	1.43		56.02	0.67		41.88
1860	0.80		58.45	0.69		40.06
All Australia (except Western Australia and Queensland)						
1861	1.35		64.13	0.75		33.77
1862	1.16		68.32	0.78		29.74
1863	1.23		72.49	0.82		25.47

|				
1864	1.26	72.53	0.80	25.41
1865	2.35	73.62	0.80	23.22
1866	2.81	70.15	0.76	26.29
1867	2.94	72.01	0.76	24.29
1868	1.80	69.89	0.73	27.57
1869	1.42	68.36	0.70	29.51
1870	1.72	67.78	0.69	29.82
1871	2.21	72.80	0.73	24.27

Sources: Land rents, see Tables 1 and 2; Annual earnings, see Table 4; imperial transfers: Butlin (1994).

Figure 1: Australian and British Interest Rates, 1820-1871
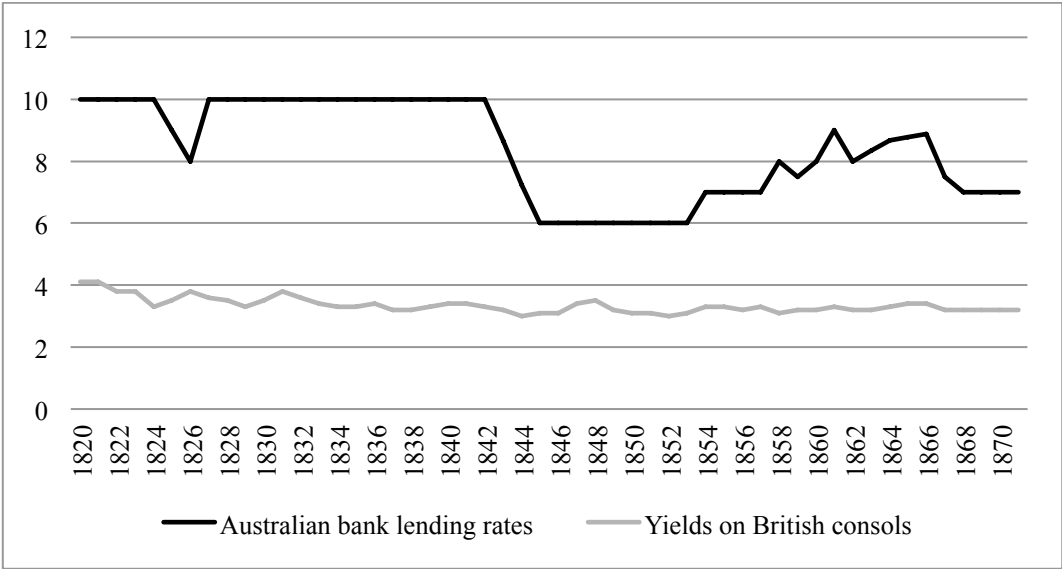
Sources: Australian Bank Lending Rates in %, three months or more, are from N. Butlin et al. (1971) with geometric interpolation. Yields on British Consols in % are from N. Butlin et al. (1971).

Figure 2: Volatility in the Rental/Wage Ratio (*r/w*) and in Wool Prices Relative to the GDP Deflator (*Pw/Py*).
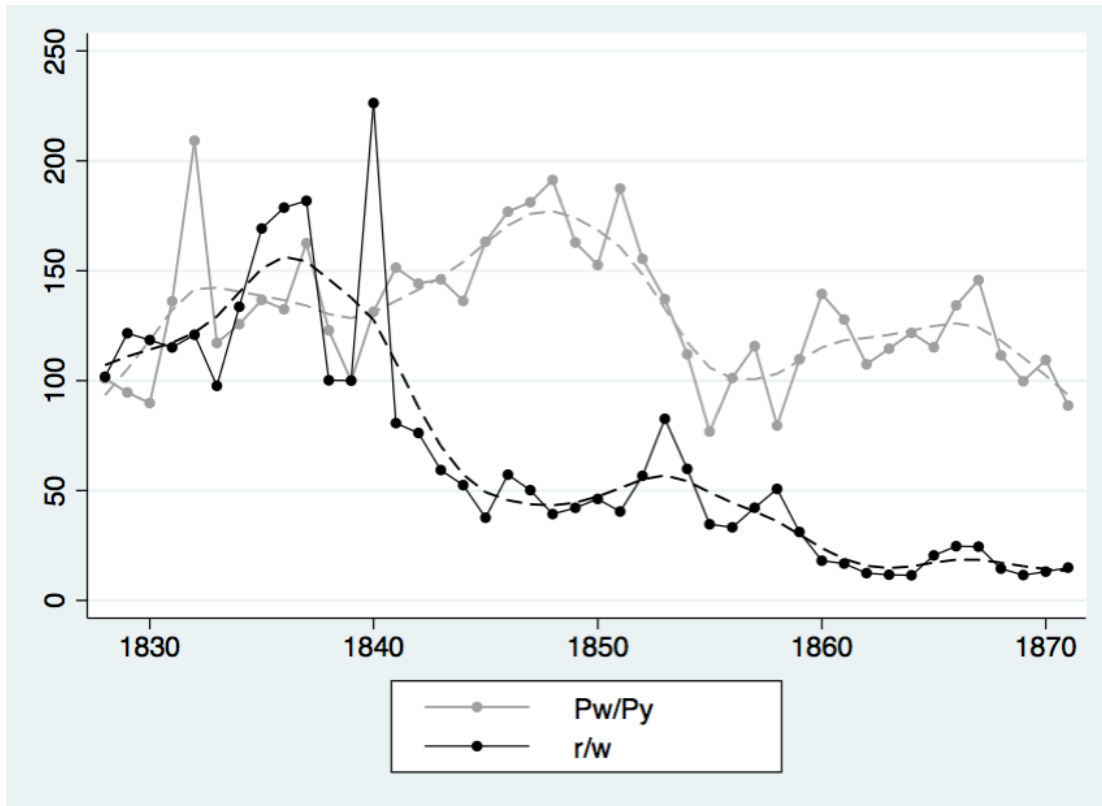
Sources: Rental/wage ratio: see Table 2. Relative wool prices: see Table 3.

Notes: The dashed lines represent the trend component of each series, calculated using the Hodrick-Prescott filter.