

Real Wages in New Zealand: 1840-1914

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Abstract

Using new data for the period 1840-1972, I construct a real wage index for unskilled labourers in New Zealand. Adding 32 years to the existing series, the new series allows a more complete understanding of the progress of New Zealand internally, and relative to the rest of the world. After growing at more than two percent per annum to 1882, the growth rate of real wages slowed to less than two thirds of a percent from 1883. In comparative terms, I trace the wage premium of New Zealand over Britain to the early 1850s. The premium peaks during the early 1880s, at approximately 50%, before declining to approximately 35% post 1910. Approximately 75% of Australian wages in the 1850s, New Zealand wages converge to the Australian level by no later than 1900, and the series do not diverge significantly thereafter.

1 INTRODUCTION

This paper details the construction of a nominal wage index, a consumer price index, and, derived from them, a real wage index for urban unskilled workers in New Zealand for the period 1840-1914. Real wages for skilled manual workers are estimated where possible. This index extends the existing Geasley and Oxley (2004) index by adding the period 1840-1872, and 1914.

While the standard of living during the Industrial Revolution has long been a subject of interest, the literature on factor price convergence during the late 19th and early 20th century has resulted in greater interest in estimates of real wages during this later period. The early convergence literature was based in part on Angus Maddison's estimates of real gross national product per capita (Baumol, 1986). The weakness of this literature is that it ignored the process by which factor prices were equalized, namely trade and migration. Following this, Williamson (1995) produced real wage series for a number of migrant sending and migrant receiving countries, and with Timothy Hatton, studied the causes and consequences of the mass migration from Europe (Hatton and Williamson 1998). New Zealand was excluded from their study, and so the first purpose of this paper is to allow the most complete inclusion of New Zealand in this literature that is possible.

The second, not unimportant reason, is to study directly the standard of living in New Zealand relative to the rest of the world. The non-wage data are suggestive of a high standard of living for the period ending 1914.

The paper is structured as follows. In section two I briefly discuss some weaknesses in the use of real wage indexes, as well as some non-wage evidence on the standard of living in New Zealand. In section three I describe the data sources, and the method by which price and wage series are estimated. The choice of consumption baskets is detailed in section four, and the final real wage series are presented in section five.

2 PRIOR EXPECTATIONS AND ALTERNATIVE MEASURES

Real wage indexes measure the private ability of employed workers to consume goods and services. The interpretation is typically as a measure of the

welfare for the wage earner, and their household. However, there are a ways in which what is measured by real wages may not coincide with the intended interpretation, and Feinstein (1998) discusses a number of them. The first is publicly provided goods. The public provision of medical and schooling facilities may add significantly to the welfare of an individual, without being captured a real wage index. The second problem is the standard problem of capturing changes in the range and quality of goods available. Finally, a real wage index cannot capture effects relating to the quality of life in a given location. While cities offered a greater range of services, this was accompanied by higher levels of pollution and crime. Overall, it is expected that the fact of living in a city is accompanied by some net disutility based on the location.

There are two further bases for criticism, that warrant some attention. The first of these is the way in which wages are estimated. In most instances annualized daily or weekly wage rates are used, with no allowance for loss of income from holidays, illness, or unemployment, or for labour income other than that supplied by the head of the household. Notable exceptions are Feinstein (1998) and Wood (1909) who estimate unemployment adjusted real wage indexes for Britain. While no comparable unemployment adjusted series is attempted here, both unemployment and secondary sources of income are discussed later as part of the discussion of the Department of Labour Household Survey of 1893.

A final criticism, related to the disamenities of cities, is home production. New Zealanders report very low expenditure on eggs as a percentage of household spending (described in detail below). The most likely reason for this is that many New Zealanders kept chickens. The introduction to the Labour Departments 1893 Household Survey makes a similar point with respect to fish and vegetables, the low spending is a result of home production rather than non-consumption. No attempt is made to quantify the magnitude of home production. It is simply noted that, given the availability of land and the general environment, it is likely that household consumption of food exceeded household expenditure on food.

These factors are of greatest importance in comparing incomes across countries, and within countries through time.

With these caveats in mind, it is worth reviewing a number of alternative sources of information on the standard of living in New Zealand during the period in question. The first is gross national product (GNP) per capita, and according to Angus Maddison's most recent estimates New Zealand had the highest GNP per capita in the world in the period immediately prior to the

outbreak of World War 1.¹ As a measure of welfare, GNP pre capita suffers from being insensitive to the distribution of income, aggregating factor payments without regard to the ratio of inputs, or the marginal rates of return to the factors. Williamson (1995) emphasizes the weakness of GNP as a measure for studies of factor price convergence in particular, and motivates his construction of cross-country real wage indexes on this basis. Despite the weakness of GNP per capita as a measure, it would be surprising if New Zealand had both a high output per capita, and low labour wage rates.

The second source of non-wage data on living standards comes from infant mortality. As a measure of welfare, infant mortality contains information on both consumption and the environment. There are two possible effects here. The first is the direct relationship between mean income and infant mortality, and more consumption is better. The second, claimed, relationship between income inequality and infant mortality. Deaton (2003, p. 139) reviews some findings finding on this second relationship and concludes that while (social) inequality may matter, the evidence on the importance of income inequality is weak.

In terms of the data, New Zealand is something of an outlier in the late 19th century, having infant mortality rates that were markedly lower than the rest of the world (Phelps 1908). This data are widely accepted as accurate; as Neal (1925, p. 345) describes it : "(T)here is abundant evidence that the statistics are very accurate, and that the low rate of infant mortality can in no way be attributed to a coexistence of complete birth-registrations in the face of defective death-registrations." Lessof (1949) provides a description of the institutional background for England and Wales and New Zealand, in particular over the legal requirements for the registering of births, as well as some relevant medical history. This discussion supports Neale's claim that the data are accurate. In addition, Lessof adds evidence that New Zealand's lower infant mortality persists, averaging slightly more than 50% of the British rate, for three measured periods between 1922 and 1938 (Lessof, 1949, p.89 Table 14).

The raw data on infant mortality points to a very high standard of living in New Zealand. The clear problem with this raw comparison is that it does not take account of the age of the mother at the time of childbirth, the average number of children per woman, or the physical environment. In terms of the physical environment, an obvious difference between New Zealand and England and Wales is the size of the major centres. If, as has been argued,

¹Maddison's estimates formed the basis of the early work on convergence (Baumol, 1986). While they may not be the best estimates for any individual country, they have the advantage of covering a large number of countries, and being prepared in a consistent manner. Baumol cites Maddison (1982), the most recent version of Maddison's estimates are available at <http://www.ggdc.net/maddison/>.

the higher wages associated with cities are partly (or more than) offset by greater levels of pollution and crime, then the size of Auckland relative to London needs to be taken into account. Within New Zealand, the fourteen major centres had a uniformly higher rate of infant mortality than the rest of the country over all measured periods between 1922 and 1938 (Lessof, 1949, p. 96, Table 21).

The infant mortality data suggests a very high standard of living, but part of this was attributable to the natural environment and the absence of large, densely populated centres. If the total standard of living of New Zealand relative England is the sum of the differences in private consumption and the natural environment, then we expect real wages that are higher in New Zealand if the implied premium from the infant mortality data is greater than can be explained by the natural environment.

Finally, as a proxy for information about living standards available to decision makers, real wages are more plausible than infant mortality rates. Any economic theory of migration requires that decision makers have information on the relative standard of living in the sending and receiving region. It is easier to imagine that real wages are a useful proxy for this information than infant mortality data.

As a total standard of living measure, some combination of the natural environment and real wages would appear to be the best measure, and as a single *ex post* proxy infant mortality may be the best measure of this. However, as a basis for decision making, and as an observable measure of standards of living real wages have much to recommend them.

3 METHOD AND DATA

What follows in this section is a brief description of the types of data sources used, and the extent of the data coverage. A list of all data sources is available on request.

The data can be divided into three rough periods, 1840-1852, 1853-1872, and 1873-1914. For the first period, there are ample data on wages, food, fuel, and building materials. The first part of this data are from local newspapers, the *New Zealand Gazette and Wellington Spectator* (1840-1844) followed by the *New Zealand Spectator and Cook's Strait Guardian* (1844-1850) for Wellington, and the *Nelson Examiner and New Zealand Chronicle* (1842-1848) for Nelson . In addition, the *Daily Southern Cross* and *Otago Witness*

provided more limited data on food, heating, and building supplies prices for Auckland and Dunedin respectively from the late 1840s. Official government data are taken from the *Statistics of New Zealand for the Crown Colony Period*, compiled under the supervision of Professor Simkin at the University of Auckland. This includes data from the official publications of the governments of New Munster and New Ulster, and the Colonial Blue Books, among others.

Data are relatively sparse for the period 1853-1872. Newspapers continued to publish regular series for a variety of consumption goods including food, building materials, and fuel for heating and lighting, but very seldom with wages and never with clothing. Most data are for Auckland and Otago, with the *Daily Southern Cross* and *Otago Witness* the main sources. These data are supplemented by the Auckland and Otago government gazettes, which also published wage data. From 1857 food prices are published in official statistics, and on a regional basis.

For the period 1873-1913 there are complete government statistics for all items in the food basket, and wages. Initially these are published in the Statistics of New Zealand, and later, for prices from 1891 onwards, in the New Zealand Official Yearbook. Coal, firewood and candles are included from 1885.

The somewhat problematic year is 1914, were the coverage of goods changes, and direct comparison with 1913 prices is not always possible. Greasley and Oxley omit 1914 from their index. I include it, although, it is a less certain estimate than the immediately preceding years.

In addition to the official statistics in the yearbook, Malcolm Fraser (1915), then Government Statistician, published a report on the cost of living for the period 1891-1914. His report includes prices for a wider range of goods than the official statistics, including house rents for the full period of the report. Thus, the official statistics include housing rents from 1909, Fraser's data are preferred for this item.

Clothing and rents (pre-1891) were gathered separately from the other data, as they were seldom included in either price reports in newspapers or in official statistics. Data for both were captured from newspapers. Clothing prices were from advertisements in newspapers. Where choice was offered, the cheapest item sized for an adult was captured. This was preferred to the median because of the enormous variety of quality in cloths, especially tweed, and the fact that even high-end retailers typically carried cheaper goods. Sufficient data were collected to generate price series for moleskin and tweed trousers, white and crimean shirts, blucher boots, and a combined series for blankets.

The rental prices are more tentative, as they are based on the asking rental for properties advertised in the classified section of, primarily, the *Daily Southern Cross* for Auckland and the *Evening Post* for Wellington. The obvious concern is that the asking rental may differ significantly from the eventual agreed rental.

In sum, the database contains 23,929 wage and price data points, which then reduces to 19,845 location/period mean points.

3.0.1 ESTIMATING THE PRICE AND WAGE SERIES

A Wellington-equivalent series is estimated for each good and wage. Although Wellington was smaller than Auckland, it has the longest published price and wage history, with relatively complete data at both ends of the index period. Prices were estimated from the following regression:

$$\ln(P_{it}) = \sum_i \beta_i (DLocation)_i + \sum_j \gamma_j (DType)_j + \sum_t \phi_t (DYear)_t + \epsilon_{ijt}$$

where P_{it} is the mean price for the good in location i at time t , $DLocation$, $DType$, and $DYear$ are dummy variables for location, type of good, and year respectively. The estimated price in any year is then estimated using the coefficient on the relevant indicators, $\hat{p}_{it} = e^{(\beta_{Wellington} + \gamma + \phi_t)}$. The type dummy was only used for a small number of goods. For example a single series for double blankets was derived from incomplete series for single, double, and queen-size blankets. In this case the price was $\hat{p}_{it} = e^{(\beta_{Wellington} + \gamma_{Double} + \phi_t)}$.

A similar procedure was followed for wages. A dummy for type of skill was used for the estimation of the skilled manual labourer series, with the coefficient on the carpenter dummy used to estimate the final series. The skilled manual labourer estimate is based on wages from carpeters, bricklayers, masons, smiths, plasterers, and a category "trades" listed in the *Statistics of the Crown Colony*.

In total two wage, sixteen food, two building materials, six clothing, and three heating and lighting series are estimated. The wage and food prices are for the full 1840-1914 period. All three components of the fuel series are available from 1844, and the six clothing series from 1859. Additional to this is the housing rental series.

The housing series is treated differently. Here I use Fraser's (1915) estimate for Wellington from 1891-1914, and the median of the advertised rental for an equivalent sized house for Wellington from 1878-1890. An equally weighted building material index is joined to this series to form the housing index.

4 BASKET CHOICES FOR THE CONSUMER PRICE INDEX

The basic elements of a consumption basket are food, fuel (heating and lighting), rent, and clothing. Two cost-of-living indexes are estimated, based on different consumption baskets.

The first is based on a limited basket comprising only food and rent. The weights are chosen to match those used in Williamson (1995, p. 185) as closely as possible. Williamson's weights are the average of the weights derived from household surveys for six European countries and the USA. The surveys were undertaken between 1905 and 1914. While there are obvious disadvantages to such a limited basket, it does have the benefit of generating a series that is directly comparable to the fifteen real wage series reported by Williamson.

The second consumer price index basket is based on weights derived from the Department of Labour's 1893 Household Survey (Household Survey, HS). For the survey, 800 questionnaires were sent out, and 146 were returned. Of the 146 returns, 106 are detailed in the report. I exclude the five households earning more than GBP200 per annum as the introduction to the survey describes this as the point beyond which a household may be described as having a high income. The Household Survey covers a wider range of goods than Williamson's basket, including not only fuel and clothing, but also savings, medical expenses, school materials, and books. Although they account for approximately 15% of household expenditure, these items are excluded from the consumer price index basket. The weights for this index are then based on the mean expenditure of all households. Where no expenditure was reported for non-rent items, a value of zero was used for that household for that item. The mean rental was based the mean of the rents reported; many of the households reported owning their own home, and so an omitted rental figure could not be treated as zero expenditure on the item.

In addition for providing weights for the consumer price index, the survey offers some insight into the bias in using only the full-time equivalent earnings of the head of the household to infer living standards. On average, the

head of the household earned 87.5% of his annualized weekly average wage rate. The time lost was for mainly for holidays and unemployment. This loss is in part offset by labour income from other members of the family. In total, of the mean reported household income of 510 pennies per week, 483 pennies were provided by the head of the household, and 42 pennies were provided by other family members. This final household income is 92.35% of the annualized wage rate of the head of the household. The real wages reported in this paper overstate the actual real wages earned by the household, at least for 1893, a depression year, but without reliable cross-country data on unemployment it is likely that annualized wage rates will remain the basis for international comparisons.

The weights for the baskets used, as well as some comparison baskets are shown in Table 1. Column one shows a basket based on the Household Survey, including the 15% of income spent on goods other and services other than those in the main four categories. Column two shows the Household Survey with "Other" set to zero, and the other items increased in proportion so that the sum of the weights is one. Williamson's basket is shown in column six. The consumer price indexes presented in this paper are based on the baskets shown in columns two and six.

The three other baskets are shown for comparison purposes. Column three shows the basket used by Greasley and Oxley (2004) for New Zealand. They also base their basket on the Household Survey, but with a different weighting scheme. Mclean's (1999) basket is for Australia, and is the most accurate nationwide basket for the period. McLean also shows baskets based on earlier regional studies. Allen's (1994) is for England and is based on earlier studies by Bowley and Shergold. Motivated by the different focus, Allen uses an English based basket for his study; the English worker was the most typical migrant to the English speaking colonies.

The broad division of spending is similar across countries. Housing by all estimates accounted for more than 15% and less than 20% of income. Food was more variable, with the detailed baskets (that is, other than Williamson) showing a low of 38.52% for Australia, and a high of 55% for England. The final New Zealand weight, column two, is close to the England figure. Clothing accounted for between 16% and 23% of income, with the estimate of 18.68% in column two closer to the England figure than either the Greasley and Oxley or McLean figures. The figure shown in parentheses is the weight (out of 100) on lighting only, derived from those households that them separately. The estimate in column two is the highest reported expenditure on heating and lighting. Finally, the most surprising figure is the reported expenditure on alcohol by Australians. The New Zealand figure may understate consumption, as the survey was based on consumption in the home, and did include drinking in bars.

Food baskets are shown in Table 2. Again, the full detail of the household Survey is shown in column one, with a reduced version based on goods for which prices are available in column two. The final series are based on the weights shown in columns two and five. For all series the main elements are meat, bread and flour, and butter and lard, or protein, carbohydrates, and fat respectively. With the exception of Williamson, these are the three are the largest parts of food expenditure, with meat the largest in New Zealand, bread and flour the largest in England, and butter and fat the smallest in both.

In constructing the indexes, I assign an equal weight to bread and flour, use rice only and potatoes only in their respective categories. Similarly, only salt was used for the category salt and spices. Where it is reported as a single figure, meat is divided equally between beef, mutton and pork. Despite adequate data for most periods, I was unable to produce a price series for bacon, and so the bacon weighting is added to pork. Butter is an equal weighting of salted and fresh butter.

The cost-of-living index is then computed as a geometric series of the prices and weights described above, so that $p_t = \Pi_i \left(\frac{p_{it}}{p_{i0}} \right)^{a_i}$, where p_t is the index value in year t , p_{it} is the price of good i in year t , p_{i0} is the price of good i in the base period, and a_i is the share of income spent on good i . The base period prices for all goods barring building materials is the mean of the 1890-1895 prices. Gaps in the wage and price series are estimated by linear interpolation, the base period is chosen because it contains no prices estimated by interpolation for any of the series.

4.1 Calibrating the Consumer Price Indexes

In order to compare the cost of living series to the comparable international series, I require some measure of purchasing power parity. The first difficulty frequently encountered in this area is entirely avoided because New Zealand used British pounds. The approach taken is then to compare prices in New Zealand relative to Britain in a single year, calculating the index value as described above, but with the British price as the base value. This gives a value of 100 for Britain, and the index value for New Zealand is then percentage premium (discount) of the cost of living in New Zealand relative to Britain.

In order to compare the index based on the Williamson basket to his series, I use the wages and prices that he uses for the same purpose (p. 184). These are shown in column three of Table 3. Williamson cites the

	New Zealand, 1893 Household Survey	New Zealand, 1893 Household Survey*	New Zealand, 1893 Greasley and Oxley (2004)	Australia, 1913 McLean (1999)	England Allen (1994)	World Aggregate Williamson (1995)
Housing	15.7	18.47	18	19.43	18	18
Food	45.3	53.26	50	38.52	55	82
Clothing	15.9	18.68	23	21.39	16	
Fuel and Light	7.3 (1.22)	8.59(1.41)	5		7	
Tobacco			2		2	
Alcohol	0.9	1.04	2	12.12	2	
Other Items	15.0			8.54		

Table 1: Basket Weight for Consumer Price Indexes

Item	Labour Dept.	Labour Dept.?	Greasley and Oxley	Allen 1994	Williamson
Bread/ flour	19.85	21.13 (11.26)	22.5	15	26.5
Oats/ rice	4.88	5.2 (2.77)	4	2	1.2
Vegetables (Potatoes)	4.57	4.87 (2.59)	4.5	4	0.05
Beans				2	
Meat	23.5	28.49 (15.17)	23.5		9.1
Beef				13	
Mutton				6	
Pork Leg				6	
Bacon	3.26		3	6	13.4
Fish	2.36		0.75		
Cheese	1.34	1.43 (0.76)	0.75	3	2.6
Butter	9.28	9.88 (5.26)	9.5	6	6.7
Lard				6	
Milk	7.65	8.15 (4.34)	8.5	5	13.9
Tea	7.65	8.14 (4.34)	8.5	5	
Coffee	1.52	1.62 (0.86)	0.75	2	9.1
Cocoa	0.97		0.5		
Sugar	8.13	9.05 (4.82)	8.5	5	6.4
Salt and Spices	1.93	2.06 (1.1)	2	1	
Pickles	0.52		0.5		
Jam	2.23		2		
Treacle	0.36		0.5		
Eggs				4	5.9
Raisins and Currants				4	
Jam				2	
Soap and Starch				1	
Vinegar				1	
Total	100	100 (53.27)	100	100	100

Table 2: Basket Weights for Food

British Board of Trade's 1908 and 1913 reports on wages, rents, and retail prices as his sources for these prices. The figure that he uses that is difficult to reconcile with the 1908 report 23.25 *d.* for renting three rooms per week. The 1908 report gives 45 – 54*d.* per week as the predominant range for three room tenements, with more centres reporting prices above that range than below. Nevertheless, I retain his figures in full, simply noting that the rent figure likely understates the true figure.

For New Zealand the prices based on the estimated series described above are shown in the third column. As a check on the reasonableness of the estimated series, I repeat the calculation with prices from the official statistics published in the Handbook of New Zealand (column 4), as well as Fraser's prices (column 5) as quoted in his study of the cost of living. The rent figure is common to all three; the estimated series uses Fraser's figure, and the official statistics do not include rent until later. Williamson's rent is based on a three room tenement, and the figures in parentheses show the comparable result for using three room houses in Wellington. The main series is based on a four room house, as it is clear from the 1893 Household Survey that was the most common size house for New Zealand labourers.

The index values are shown in the bottom row of the table. Despite some differences in the details, the Fraser, Official Statistics, and estimated price series are remarkably consistent in their estimated cost of living premium for New Zealand over Britain, falling within three percentage points of each other. I use the estimated price series as my basis for comparing the relative costs of living, and so, for comparisons based on the Williamson basket, the cost of living is taken as 41% greater in New Zealand than Britain in 1905.

In order to compare the cost of living index based on the Household Survey basket to Britain, I use price and wage quotations from the Board of Trade's 1908 report where possible. The 1903 report of 1902 prices used for a small number of goods.² The prices used are shown in Table 4, with Williamson's (1995, p. 184) prices shown for comparison. Williamson's

²The alternative is to use Allen's (1994) basket and prices. Based on a basket that is similar in level of detail to the Household Survey, this yields a consumer price index that follows a similar pattern to that of the rest of the world, a decrease from 1880 to the mid 1890s, followed by an increase to approximately the 1880 level by 1913. While the consumer price index comparison is easily within the bounds of plausibility, for example in the the level relative to Sydney and Manchester, Allen's real wage series appears to be incorrect. Consequently, even when using the more complete basket for New Zealand I continue to compare the resulting real wage index to Williamson's for the international comparison. Notably, after calibrating their real wage to 1896 levels (as used by Alan), Greasley and Oxley (2004) then re-base their index to 1905, and compare their resultant series to Williamson's.

	Weight	Williamson	Wellington Estimated	Wellington Handbook	Wellington Fraser
Bread	15.3	1.25	1.66	1.625	1.50
Flour	4.9	1.29	1.17	1.35	1.38
Potatoes	4.7	0.43	1.88	1.61	1.18
Milk	7.6	3.50	3.30	3.50	3.33
Butter Salt	4.8	13.00	8.78	10.50	12.00*
Butter Fresh	4.8	13.00	10.09	13.00	12.00*
Cheese	2.1	7.00	6.99	8.25	8.00
Beef	11.4	8.00	4.61	4.50	4.00 (Stewing steak)
Mutton	4.3	8.25	4.72	4.25	5.00 (Leg)
Pork	9.5	8.00	6.13	5.50	6.50
Eggs	4.3	12.00	12.68	13.50	15.00
Sugar	3.6	2.00	2.70	2.75	2.60
Tea	2.2	18.00	20.90	22.00	20.00
Coffee	2.2	18.00	18.38	20.00	19.00
Rent	18	23.25	179.00 (131.00)	179.00* (131.00)	179.00 (131.00)
Index Value	100	100	141.07 (133.37)	143.07 (135.25)	140.40 (132.73)

Table 3: Table Caption

prices identical for most food items, with the important difference, as discussed above, being in the rent. The weights and prices are as shown in the Table 4, with the exception of the heating and light sub-basket, where the whole weight is put on coal. I use a four room house for Britain and New Zealand, with the comparable figures for three rooms shown in parentheses.

The relative cost of living is again computed for the Official Statistics, Fraser, and estimated prices for Wellington. They are again very similar in their estimate of the cost of living premium of New Zealand over Britain. The final figure used is for the estimated prices, and this yields a cost of living premium of 38.6% over Britain.

The resultant consumer price indexes are shown in Figure 1, with the comparable figure of 1 for Britain in 1905. Values are given in Appendix A, Table 6. The two series have a similar pattern, with the Household Survey suggesting a higher cost of living, and considerably higher before 1880. Williamson (1995) does not include his consumer price index, and so a direct international comparison is not possible. The pattern exhibited by both indexes between 1879 and 1913 is similar to the pattern found by Allen (1994, p. 112, Figure 6.1) for a variety of cities in the English speaking world; a decline in prices from 1879 to the mid 1890s, followed by increasing prices to 1913.

5 REAL WAGES

Real wages for unskilled labourers using both baskets are shown in Figure 2, and in Tables 7 and 8 in Appendix B. The series are based on the nominal wage series shown in Table 5 and the consumer price indexes in Table 6, both in Appendix A. They are scaled to be comparable to real wages in England using the wage rates for unskilled labour in Table 4, and setting England in 1905 to 100. Following from the differences in the underlying consumer price indexes, the series based on the Household Survey basket grows more slowly, and suggests a lower level of real wages than the index based on the Williamson basket.

The most notable feature of the series is the dramatic slowdown in the growth of real wages between the end of the 1870s and the early 1880s. Starting with the mean of the average of the real wage for 1880-1884, 1878-1882, and 1910-1914, and using the, middle year as the base, I calculate the geometric mean rate of growth of real wages between the three points.

	Weight	Williamson	Board of Trade (1908)	Wellington Estimated	Wellington Handbook	Wellington Fraser
Wage, Urban unskilled		51.28	50.72*	92.6	90	
Rent (four rooms)	18.5	23.25	60 (49.5)	179 (131)	179 (131)*	179 (131)
Clothing	18.7	100	100	120	120	120
Candles, lb.	1.4			7.5	7.25	6.75
Firewood, 1/4 cord	3.6			82.68	87	132
Coal, 1/4 ton	3.6		53.75	124.18	121.5	117
Bread, lb.	5.6	1.25	1.25	1.66	1.625	1.50
Flour, lb.	5.6	1.29	1.29	1.17	1.35	1.38
Potatoes, lb.	2.6	0.43	0.43	1.88	1.61	1.18
Rice/ (Oats), lb.	2.8		1.53**	2.3	2.50	2.5
Milk, qt.	4.3	3.50	3.5	3.30	3.50	3.33
Butter, Salt, lb.	2.6	13.00	12	8.78	10.50	12.00*
Butter, Fresh, lb.	2.6	13.00	12	10.09	13.00	12.00*
Cheese, lb.	0.8	7.00	7	6.99	8.25	8.00
Beef, lb.	5.2	8.00	8	4.61	4.50	4.00 (Stewing steak)
Mutton, lb.	5.2	8.25	8.25	4.72	4.25	5.00 (Leg)
Pork, lb.	5.2	8.00	8	6.13	5.50	6.50
Sugar, lb.	4.8	2.00	2	2.70	2.75	2.60
Tea, lb.	4.3	18.00	18	20.90	22.00	20.00
Coffee, lb.	0.9	18.00	8.36**	18.38	20.00	19.00
Salt, lb.	1.1		0.20	0.90	1.00	1.00
Beer, hogshead	1.04		1224.18**	1051.1	900	
Index Value	100		100	138.577 (141.30)	140.110 (142.74)	138.465 (140.80)

* I use the average of the Mason's and Bricklayer's labourers rates (Board of Trade, 1908, p353)

**1902 price from the 1903 report.

Table 4: Table Caption

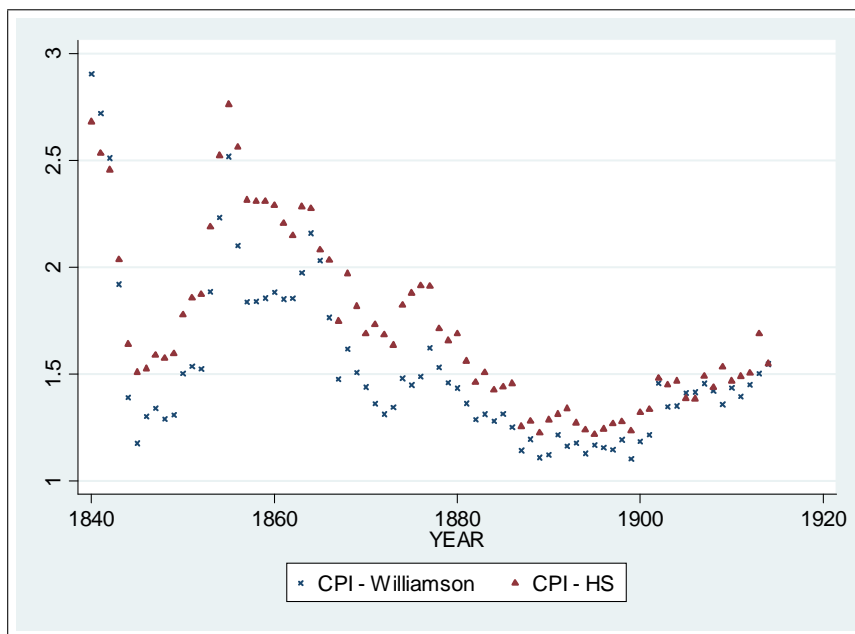


Figure 1: Consumer Price Index

Using the index based on the Household Survey basket, wages grow at an average rate of 2.12% per annum from 1842-1880, and then at 0.63% from 1882-1912. Using the Williamson basket is even more dramatic, with 2.44% and 0.36% as the growth rates for the successive periods.

While an investigation of the causes of the slowdown are beyond the scope of this paper, a possible explanation may lie in the influx of migrants in the early 1870s under the sponsorship of the Vogel government. This is only a tentative suggestion, and would need some explanation of why real wages remained constant, rather than falling. This in turn will likely require some analysis of unemployment, and the structure of typical labour contracts.

Figure 3 shows the real wage index based on the Household Survey basket relative to Britain and Australia. The Britain and Australia series are taken directly from Williamson (1995). After initially being lower, New Zealand wages reach the level of British wages in the 1850s, and grow more rapidly thereafter. The gap between British and new Zealand wages peaks in the early 1880s, following which the slowdown in the growth of New Zealand wages and continued growth of British wages reduces the gap. While Australian wages are at a higher level than New Zealand wages, approximately

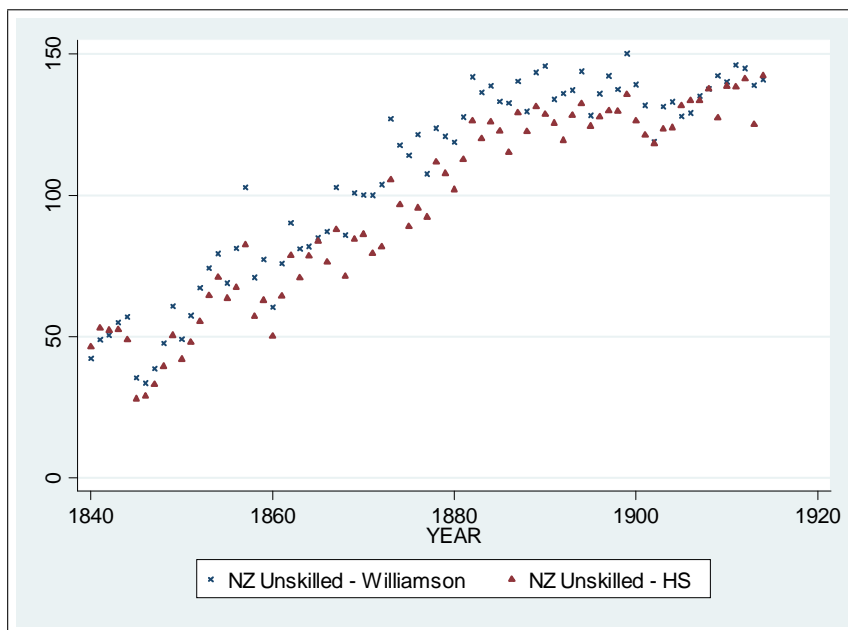


Figure 2: Real Wages for Unskilled Workers

70% higher in the late 1850s, the series converge in about 1900, and do not diverge thereafter.

If Australia had a similar experience to New Zealand with regards the items omitted from the Williamson index, then the convergence date was in the early 1870s, and the initial premium is lower.

Perhaps the most noticeable feature is the slowdown in real wage growth in all three countries from approximately 1890.

The reported depressions in New Zealand and Australia from the 1890s do not show in declining real wages. A study of the structure of labour contracts, unemployment, and out migration may reveal the mechanism of the depression.

5.0.1 Wage to Income Ratio

I calculate the ratio of the real wage rate for urban unskilled labourers to Greasley and Oxley's (2000) preferred real output per capita series.³ The

³Repeating the exercise using Greasley and Oxley's nominal total GDP, Angus Maddison's population estimates, and the nominal wage series yields similar results.

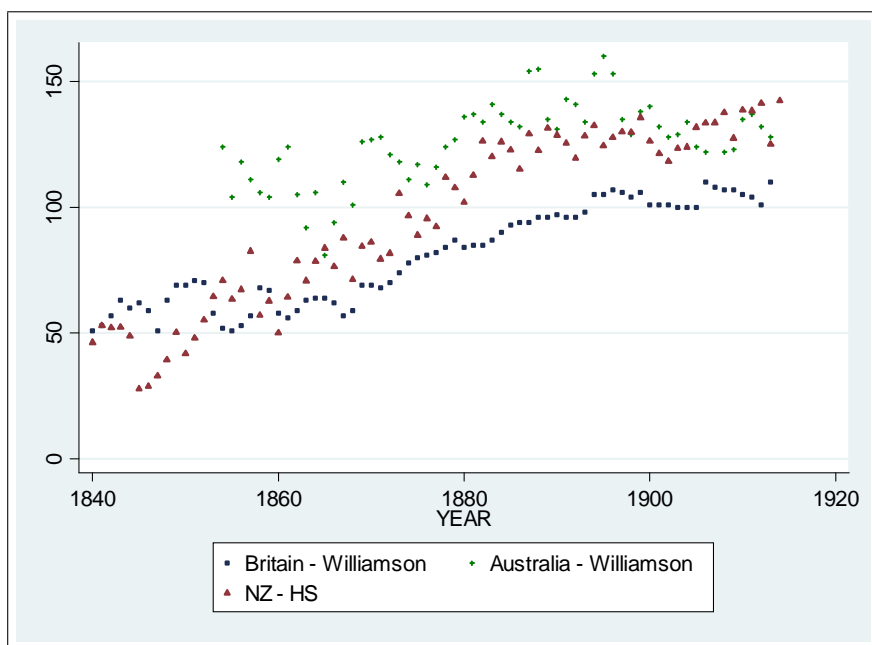


Figure 3: Real Unskilled Wages for New Zealand, Australia, and Britain

series cannot be interpreted as a labour share of income series, as it based on the whole population, and only considers the wages of the lowest paid workers. However, the series does show the rate of change of wages relative to the rate of change of per capita output. The resultant series is shown in Figure 4, and in Table 9 in Appendix C.

From 1865 to 1882 real wages rose faster than output per person. This trend halted in 1882, and declines rapidly from the mid 1890s. To use the breakpoints above, from 1865-1882 real GNP per capita fell 4%, while the real wage rose 67%. From 1883-1914, real GNP rose by 43%, while real wages rose only 3%.

Two events suggest themselves as candidates for the causes of the turning points. The 1880 break in trend coincides with the slowdown in the rate of growth of real wages. As noted above, the in migration in the early 1870s is a plausible candidate, and the effect of this migration on the rate of return on all factor prices would appear warranted. The increase in the rate of decline of the ratio coincides with the capital investment in freezing works and shipping facilities required for the exportation of meat and dairy to Europe. This investment almost certainly change the labour to capital ratio, and so the cause here may lie in the increase in capital per worker.

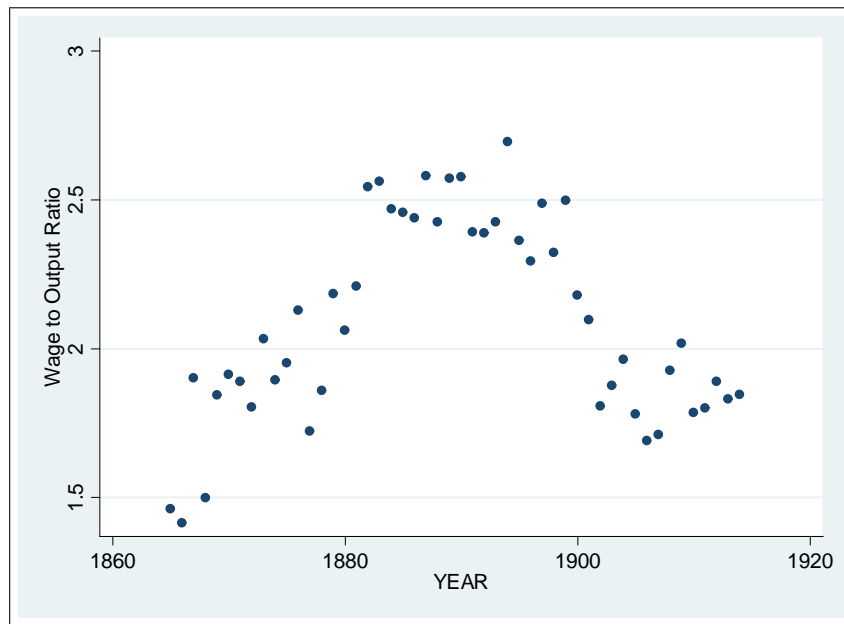


Figure 4: Ratio of Real, Unskilled Wage to Real GDP Per Capita

5.0.2 Skill Premium

The skill premium, the ratio of the skilled to the unskilled wage, is shown in Figure 5, and in Table 5 in Appendix A. From a median estimate of a fifty percent premium for the years around 1860, the premium declines to approximately forty percent post 1910. This decline, in timing and magnitude is similar to that found by Clark (2005) for England and Wales. Clark's decadal estimates are shown in the midpoint of the decade in Figure 5. This is again suggestive of some degree of integration in the global labour market.

6 CONCLUSIONS

The real wage series developed in the paper offers insight into the internal performance of the New Zealand economy from first formal colonization to the outbreak of the First World War, as well as some suggestion of the extent to which New Zealand was part of an integrated global economy during the period.

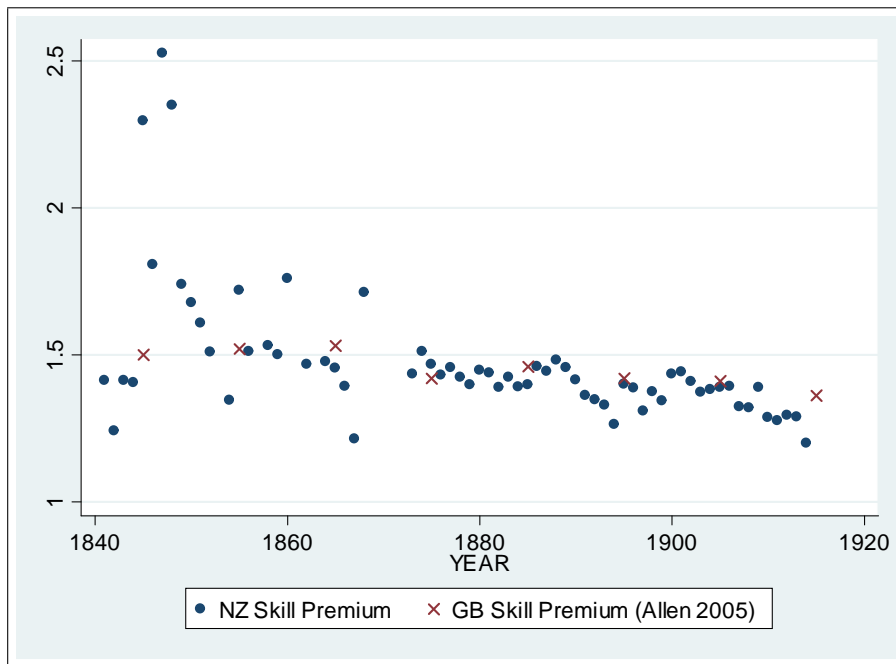


Figure 5: Skill Premium - Ratio of Trade wage to Unskilled wage

Globally, wages for unskilled New Zealanders were lower than for corresponding workers in Britain, Australia, and many other parts of the world prior to 1850. Following convergence with Britain in the 1850s, New Zealand wages grew more rapidly than British wages thereafter, and converged with Australian wages by not later than 1900. This placed New Zealand in a small group of high wage countries that included Canada and the USA in addition to Australia and Britain.

From the perspective of the internal economy, the obvious feature of the series presented is the slowdown in the growth of real wages between the end of the 1870s and the early 1880s. This in turn raises questions about the impact of in migration on the labour market.

The two pieces of evidence in favour of New Zealand being part of an integrated global economy come from the shape of the consumer price index for the period 1879-1913, and the decline in the skill premium. While these are not the direct evidence that real wage convergence would offer, the co-movement of these series is at least suggestive of market integration.

Overall, the non-wage suggestion of high wages is borne out by the wage data, and the wage series raises some interesting additional questions about the performance of the domestic economy.

**A NOMINAL WAGES AND THE CONSUMER
PRICE INDEX**

Year	Unskilled	Trades	Skill Premium	Year	Unskilled	Trades	Skill Premium	Year	Unskilled	Trades	Skill Premium
1840	62.9			1865	88.4	128.6	1.45	1890	83.8	118.5	1.41
1841	68.1	96.1	1.41	1866	78.8	109.7	1.39	1891	83.5	113.6	1.36
1842	65.0	80.6	1.24	1867	77.8	94.3	1.21	1892	81.0	109.2	1.35
1843	54.1	76.3	1.41	1868	71.2	121.9	1.71	1893	82.7	109.9	1.33
1844	40.6	57.0	1.41	1869	77.8			1894	83.2	105.0	1.26
1845	21.3	48.9	2.30	1870	73.8			1895	76.8	107.5	1.40
1846	22.3	40.3	1.81	1871	69.8			1896	80.5	111.5	1.39
1847	26.5	67.0	2.53	1872	69.8			1897	83.5	109.2	1.31
1848	31.5	73.9	2.35	1873	87.5	125.5	1.43	1898	84.0	115.5	1.37
1849	40.7	70.7	1.74	1874	89.3	135.0	1.51	1899	84.9	114.0	1.34
1850	37.8	63.4	1.68	1875	84.7	124.3	1.47	1900	84.5	121.1	1.43
1851	<i>45.1</i>	72.6	1.61	1876	92.7	132.6	1.43	1901	82.1	118.3	1.44
1852	52.5	79.2	1.51	1877	89.4	130.1	1.45	1902	88.8	125.1	1.41
1853	<i>71.6</i>			1878	97.1	138.2	1.42	1903	90.7	124.4	1.37
1854	90.8	122.0	1.34	1879	90.4	126.4	1.40	1904	92.2	127.3	1.38
1855	88.9	152.8	1.72	1880	87.3	126.3	1.45	1905	92.6	128.6	1.39
1856	87.5	132.1	1.51	1881	89.2	128.1	1.44	1906	93.6	130.3	1.39
1857	96.8			1882	93.6	129.9	1.39	1907	100.9	133.4	1.32
1858	66.9	102.3	1.53	1883	91.8	130.6	1.42	1908	100.3	132.2	1.32
1859	73.5	110.2	1.50	1884	91.0	126.5	1.39	1809	99.0	137.6	1.39
1860	58.2	102.3	1.76	1885	89.6	125.3	1.40	1910	103.0	132.5	1.28
1861	<i>72.0</i>			1886	85.0	124.1	1.46	1911	104.4	133.1	1.28
1862	85.8	125.7	1.47	1887	82.2	118.5	1.44	1912	107.8	139.5	1.29
1863	82.0			1888	79.4	117.7	1.48	1913	107.1	137.8	1.29
1864	90.6	133.8	1.48	1889	81.5	118.6	1.45	1914	111.8	134.0	1.20

Points estimated by interpolation are shown in italics.

Table 5: Nominal Wages and Skill Premium

Year	Williamson Basket	HS Basket	Year	Williamson Basket	HS Basket	Year	Williamson Basket	HS Basket
1840	2.91	2.68	1865	2.03	2.08	1890	1.12	1.29
1841	2.72	2.53	1866	1.76	2.03	1891	1.22	1.31
1842	2.51	2.46	1867	1.48	1.75	1892	1.16	1.34
1843	1.92	2.04	1868	1.62	1.97	1893	1.18	1.27
1844	1.39	1.64	1869	1.51	1.81	1894	1.13	1.24
1845	1.18	1.51	1870	1.44	1.69	1895	1.17	1.22
1846	1.30	1.52	1871	1.36	1.73	1896	1.15	1.24
1847	1.34	1.59	1872	1.31	1.68	1897	1.14	1.27
1848	1.29	1.57	1873	1.34	1.63	1898	1.19	1.28
1849	1.31	1.59	1874	1.48	1.82	1899	1.10	1.23
1850	1.50	1.78	1875	1.45	1.88	1900	1.18	1.32
1851	1.53	1.86	1876	1.49	1.91	1901	1.21	1.33
1852	1.52	1.87	1877	1.62	1.91	1902	1.46	1.48
1853	1.88	2.19	1878	1.53	1.71	1903	1.35	1.45
1854	2.32	2.52	1879	1.46	1.66	1904	1.35	1.47
1855	2.52	2.76	1880	1.43	1.69	1905	1.41	1.39
1856	2.10	2.56	1881	1.36	1.56	1906	1.41	1.38
1857	1.84	2.31	1882	1.29	1.46	1907	1.46	1.49
1858	1.84	2.31	1883	1.31	1.51	1908	1.42	1.44
1859	1.85	2.31	1884	1.28	1.42	1809	1.36	1.53
1860	1.88	2.90	1885	1.31	1.44	1910	1.44	1.47
1861	1.85	2.21	1886	1.25	1.46	1911	1.39	1.49
1862	1.84	2.15	1887	1.14	1.25	1912	1.45	1.50
1863	1.97	2.28	1888	1.19	1.28	1913	1.50	1.69
1864	2.16	2.28	1889	1.11	1.22	1914	1.55	1.55

Table 6: Consumer Price Index, Great Britain 1905=1

B REAL WAGES

Year	Unskilled	Trades	Year	Unskilled	Trades	Year	Unskilled	Trades
1840	42.22		1865	84.91	123.48	1890	145.78	205.99
1841	48.83	68.93	1866	87.08	121.24	1891	133.97	182.35
1842	50.45	62.58	1867	102.79	124.58	1892	136.01	183.24
1843	54.98	77.56	1868	85.90	147.00	1893	137.23	182.28
1844	56.97	80.04	1869	100.75		1894	143.86	181.74
1845	35.35	81.16	1870	100.05		1895	128.25	179.58
1846	33.46	60.41	1871	99.98		1896	135.98	188.43
1847	38.64	97.59	1872	103.77		1897	142.25	186.11
1848	47.61	111.82	1873	127.04	182.21	1898	137.51	188.95
1849	60.67	105.45	1874	117.77	177.94	1899	150.20	201.77
1850	49.08	82.33	1875	114.06	167.38	1900	139.18	199.44
1851	57.37	92.23	1876	121.46	173.86	1901	131.84	189.95
1852	67.19	101.35	1877	107.57	156.51	1902	118.90	167.43
1853	74.14		1878	123.74	176.08	1903	131.44	180.33
1854	79.31	106.61	1879	120.88	168.96	1904	133.11	183.84
1855	68.88	118.32	1880	118.77	171.76	1905	127.99	177.74
1856	81.18	122.60	1881	127.70	183.47	1906	129.12	179.69
1857	102.76		1882	141.93	196.96	1907	135.19	178.74
1858	70.87	108.46	1883	136.48	194.20	1908	137.67	181.49
1859	77.24	115.87	1884	138.79	192.86	1809	142.33	197.75
1860	60.30	106.02	1885	133.22	186.26	1910	140.15	180.05
1861	75.85		1886	132.62	193.49	1911	146.08	186.25
1862	90.19	132.21	1887	140.35	202.42	1912	144.98	187.61
1863	80.99		1888	129.67	192.22	1913	138.98	178.83
1864	81.85	120.84	1889	143.52	208.80	1914	140.98	169.03

Table 7: Real Wages in Wellington, Williamson basket, 1840-1914

Year	Unskilled	Trades	Year	Unskilled	Trades	Year	Unskilled	Trades
1840	46.26		1865	83.70	121.79	1890	128.63	181.75
1841	52.99	74.80	1866	76.40	106.38	1891	125.52	170.86
1842	52.14	64.69	1867	87.80	106.41	1892	119.42	160.90
1843	52.42	73.94	1868	71.31	122.02	1893	128.37	170.50
1844	48.85	68.63	1869	84.44		1894	132.49	167.38
1845	27.87	63.97	1870	86.17		1895	124.43	174.22
1846	28.56	52.11	1871	79.44		1896	127.77	177.06
1847	32.94	83.20	1872	81.69		1897	129.97	170.04
1848	39.40	92.55	1873	105.51	151.34	1898	129.77	178.31
1849	50.34	87.49	1874	96.63	146.01	1899	135.67	182.25
1850	41.91	70.31	1875	88.90	130.46	1900	126.29	180.96
1851	47.99	77.14	1876	95.51	136.72	1901	121.31	174.77
1852	55.29	83.40	1877	92.26	134.24	1902	118.32	166.61
1853	64.52		1878	111.81	159.10	1903	123.44	169.34
1854	70.94	95.36	1879	107.70	150.54	1904	123.91	171.13
1855	63.48	109.06	1880	101.97	147.45	1905	131.75	182.96
1856	67.31	101.64	1881	112.68	161.89	1906	133.50	185.78
1857	82.49		1882	126.33	175.31	1907	133.57	176.60
1858	57.09	87.37	1883	120.09	170.88	1908	137.62	181.42
1859	62.75	94.13	1884	125.98	175.06	1809	127.43	177.05
1860	50.10	88.10	1885	122.73	171.60	1910	138.68	178.16
1861	64.33		1886	115.23	168.12	1911	138.34	176.39
1862	78.71	115.39	1887	129.22	186.37	1912	141.31	182.86
1863	70.79		1888	122.52	181.61	1913	125.07	160.94
1864	78.50	115.90	1889	131.40	191.16	1914	142.33	170.65

Table 8: Real Wages in Wellington, Household Survey basket, 1840-1914

C WAGE TO OUTPUT RATIO

Year	R.W./ Real GNP PC	Year	R.W./ Real GNP PC	Year	R.W./ Real GNP PC
1865	1.46	1882	2.54	1899	2.50
1866	1.41	1883	2.56	1900	2.18
1867	1.90	1884	2.47	1901	2.10
1868	1.50	1885	2.46	1902	1.80
1869	1.84	1886	2.44	1903	1.87
1870	1.91	1887	2.58	1904	1.96
1871	1.89	1888	2.42	1905	1.78
1872	1.80	1889	2.57	1906	1.69
1873	2.03	1890	2.58	1907	1.71
1874	1.89	1891	2.39	1908	1.93
1875	1.95	1892	2.39	1809	2.02
1876	2.13	1893	2.42	1910	1.78
1877	1.72	1894	2.69	1911	1.80
1878	1.86	1895	2.36	1912	1.89
1879	2.18	1896	2.29	1913	1.83
1880	2.06	1897	2.49	1914	1.84
1881	2.21	1898	2.32		

Table 9: Ratio of real wages to Real GDP per capita

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