THE DECLINE OF LABOUR SHARE IN NEW ZEALAND

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Abstract

The share of national income going to labour in New Zealand declined between the 1970s and the early 2000s. We argue that the majority of this decline can be attributed to institutional changes within the public market sector that began in the late 1980s. Corporatization (and in some cases privatization) re-orientated the enterprises away from a broad range of social and trading objectives towards generating profit for shareholders. The reforms thereby led to an increase in capital services and a corresponding decrease in the observed labour share in the public market sector. Using shift-share analysis we show that this decrease in the labour share of the public market sector accounts for the vast majority of the decline in economy-wide labour share. We also conjecture that a substantial proportion of the sharp increase in income inequality in New Zealand between the mid-1980s and the mid-1990s can be attributed to these institutional changes.

Keywords: Labour Share; Inequality; Economic Reform; State Owned Enterprises.
JEL Classification: D33, L3, N17, O15.

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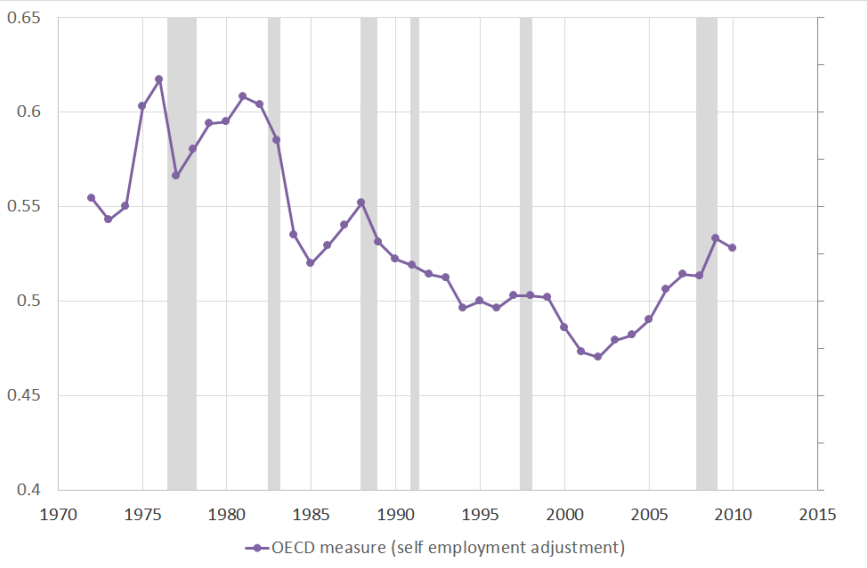


Figure 1: Labour Share of National Income in New Zealand (Source: OECD). Shaded regions indicate recessions.

1 Introduction

Across many developed economies the share of national income going to labour has been declining since the mid 1970s (Karabarbounis and Neiman, 2014). New Zealand is no exception. As illustrated in figure 1 below, the OECD measure of labour share (LS) averaged 0.58 between 1972 (when the data begin) and 1980. It reaches a nadir of about 0.47 in 2000, before recovering to 0.53 in 2009.

The global decline in LS has generated concern in both public policy and academic circles. LS has been an important part of the controversy surrounding the Piketty (2014) analysis of inequality. (See Jones (2015) for a recent treatment). The global decline in LS has been attributed to a variety of factors. Some have emphasized technological factors, such a reduction in the relative price of investment (Karabarbounis and Neiman, 2014) or the replacement of routine labor with equipment (Eden and Gaggl, 2014). Others have concentrated on policy changes, such as trade liberalization (Harrison, 2005) and the declining bargaining power of workers (Blanchard and Giavazzi, 2003).

In this paper we argue that the decline in LS in New Zealand was driven by institutional reforms in the public market sector (i.e., the enterprises owned and operated by the government that make sales to households and the private sector). Prior to the mid 1980s, New Zealand had a consistently large public market sector provisioning a wide array and goods and services to New Zealanders and export markets. The public market sector accounted for over 12% of national output prior to

the 1980s (Evans, Grimes and Wilkinson, 1996, p. 1873), and were concentrated within certain industries, such as communications, transport and electricity generation. The organizations were subject to opaque political influence and carried overlapping social and trading objectives (Evans, Grimes and Wilkinson, 1996, p. 1873). They were often run at a loss (Prebble, 1996). After winning the national election in July 1984, the fourth labour government embarked on reforming the public sector, transitioning government trading departments into State Owned Enterprises (SOEs). A primary objective of the SOEs was to return a profit to their shareholder - the government. By June 1995, 13 of the 16 SOEs were returning a profit, and the average return on the book value of assets across all SOEs was 8.4% (Evans, Grimes, and Wilkinson, 1996, p. 1874). Successive governments also sold off many of the SOEs to the private sector over the 1988 to 1994 period, achieving corporatization of the organizations by direct means.

Transforming the public trading entities into profitable businesses almost certainly contributed to the decrease in the labour share of national income. An increase in profitability would decrease the relative share of income going to labour even if the absolute level of labour compensation remained unchanged. However, corporatization was achieved in part through massive redundancies at many SOEs, so that profitability was achieved in no small part through a reduction in payroll costs. It is very likely that corporatization resulted in a direct transfer of income from labour to shareholders.

Because we have measures of labour share of income by sector of ownership (public-market, private market, and non-market), we can decompose the decline in overall labour share to each sector. The average proportion of national income going to labour declined by about 7.3 percentage points between 1972 (when the data begin) and 1986 (before the reforms) and 1995-2004 (after the reforms are complete). By using shift-share analysis, we estimate that the decline in public market labour share over this time period accounts for about 82% of this decline in overall labour share: Public market labour share fell from an average of 67% between 1972-1986 to an average of 35% between 1995-2004; meanwhile private market labour share fell from 43% between 1972-1986 to 39% between 1995-2004. The timing of the decline in public market labours share coincides with the corporatization reforms. Based on this timing we argue that the decline in LS in the public market sector can be attributed to the reforms. To bolster this argument we rely on difference-in-difference methodology, using the private market sector as the "control" for the public sector treatment.

We then demonstrate how we can account for the observed changes in sectoral labour compensation using a simple open economy model. The model features a monopoly government sector and a competitive market sector. The government uses two mechanisms to share monopoly profits

with its workers. As in Bridgman (2015), it uses restrictive work rules that require paid hours that are not used in production. It also uses the profit sharing wages mechanism from Ahsan and Mitra (2014) to increase wages. We examine the elimination of these mechanisms (corporatization) on labour share and inequality, showing that the policy change leads to a fall in aggregate wages, a reduction in employment, and an increase in firm profits. The model thereby incorporates the salient features of the public market sector. First, the government production sector is modelled as a monopoly because state trading enterprises dominated certain industries within the economy (such as transport, communications and electricity generation), affording the government significant market power in running the enterprises. Second, the work rules mechanism increases employment beyond the level that a profit-maximizing monopoly would select.

We conclude with a discussion on the link between labour share of income and inequality. Although that link is by no means strong when making cross country comparisons of inequality based on labour share (Bridgman, 2014), we argue that in the case of New Zealand the link is likely to be stronger due to the coincident timing of the reforms, the decline in labour share, and the increase in income inequality.

Our work is related to Azmat, Manning and van Reenen (2012), who find that privatization of the state sector leads to a reduced labour share in network industries (such as electricity and communications) in a sample of OECD countries (excluding New Zealand). Like our model, the SOE wishes to increase employment, but does not have our mechanisms (wasteful work rules and rent sharing wages) that allow the SOE to raise both wages and employment. We also link changes in labour share to inequality, which they do not examine.

The remainder of the paper is organized as follows. In the following section we provide a brief overview of the corporatization reforms, including the key pieces of legislation, a timeline, and a summary of the lay-offs that occurred after the policy. In section 3 we present our data and empirical methodology. We decompose aggregate LS into sectoral components, showing how the public market sector accounts for the vast majority of the observed decline in aggregate LS. In section four we present our model and how it captures the observed changes in sectoral LS we observe in the data. Section five provides a brief discussion of the potential relationship between the decline in LS and the rise of income inequality in New Zealand. Section six concludes.

2 The Public Market Sector

Prior to the reforms of the 1980s Government ownership of trading organizations had been a consistent and important characteristic of the New Zealand economy since European settlement (Duncan, 1996). The government directly ran organizations provisioning goods and services in many sectors of the economy, including banking, insurance, postal services, telecommunications, electricity, forestry and wood processing, freight and passenger transport (air, sea, road and rail), petrochemicals, steel manufacture, civil engineering, and agriculture (Duncan, 1996). The objectives of these organizations was unclear, and encompassed both social and trading objectives (Evans, Grimes and Wilkinson, 1996). It is however clear that generating profit from the government was not a priority given that the enterprises were often and continually run at a loss (Prebble, 1996).

The public market sector accounted for a significant proportion of the NZ economy, estimated to be account for over 12% of national output prior to reforms (Evans, Grimes and Wilkinson, 1996, p. 1873; also see figure 4 below.) Unfortunately we lack reliable employment data for the public market sector, so we cannot ascertain the proportion of the labour force employed by the public market sector. Estimates based on administrative data such as those provided by Duncan (1996) suggest that the sector likely accounted for a similar share of employment. For example, six SOEs (Telecom, Electrocorp, Forestry Corp, NZ Rail, NZ Post and Coal Corp) accounted for 66,000 jobs on the eve of the reforms (1987), which would correspond to about 4.1% of total employment (see Table 1 below). Based on our own collection of employment data, six additional SOEs (Air New Zealand, Bank of New Zealand, NZ Steel, Petrocorp, State Insurance and Rural bank) probably accounted for another 17,000 to 20,000 jobs (see Table 2 below).

2.1 Corporatization of the Public Market Sector

Corporatization and privatization of public enterprises was part of the broader economic reforms initiated by the fourth Labour government elected in 1984. The primary goal of the public enterprise reforms was to achieve allocative efficiency in the public market sector by emulating private sector enterprise (Duncan 1996, p 395). Initially this was to be achieved through corporatization, i.e.: mimicking the organizational, compensation and incentive structures commonly used in the private sector. Later this was achieved more directly though privatization.

The 1980s were a turbulent era in New Zealand history. On June 14 Prime Minister Muldoon called a snap election to be held on July 14. This put immediate pressure on the New Zealand dollar as it had been leaked that a Labour Government would allow the dollar to devalue. The

fourth Labour government swept into power after the election. Both the leader of the opposition David Lange and the Reserve Bank were in favour of a devaluation, but Muldoon initially defended the pegged currency. Muldoon finally relented and permitted the dollar to devalue on July 18. The fourth Labour Government took over on July 26. The incipient financial crisis gave the new government the political power to implement radical change.

Corporatization in the public sector was achieved through several key prices of legislation. The State-Owned Enterprises Act 1986 enabled the transition from trading departments and corporations into businesses run according to private sector principles. Section 4 of the act states that a principal objective of the reform was to have SOEs be "as profitable and efficient as comparable businesses that are not owned by the Crown" (Duncan and Bollard, 1992, p. 11). The State Sector Act 1988 replaced Governmental Departments with a corporate management structure, including a CEO. It also altered the role of role of the State Services Commission from employer and manager of the public service to the employer of Chief Executives (Duncan, 1996). One of the primary goals of corporatization involved using company boards to maximize shareholder wealth (Duncan, 1996). The Public Finance Act 1989 ensured government departments were funded according to their outputs. Previously departments were funded on an input cost basis. Prior to the reforms SOEs enjoyed specific advantages over private sector counterparts, including lower debt financing, favorable taxation and regulatory barriers (Duncan, 1996, p. 395). Although the Labour government was responsible for the majority of the reforms, the previous Muldoon Government was some responsible for corporatization of some key trading departments beginning in 1982, such as the railways department. Corporatization was largely successful in achieving profitability: By June 1995, 13 of the 16 SOEs were returning a profit, and the average return on the book value of assets across all SOEs was 8.4% (Evans, Grimes, and Wilkinson, 1996, p. 1874).

Privatization often followed Corporatization. Privatization began in 1988 with the sale of large SOEs such as New Zealand Steel and Petrocorp. Over the 1988 to 1994 period, thirty-one SOEs were sold to private sector investors.

2.1.1 Redundancies

The reductions in SOE employment were large during corporatization (Duncan, 1996), suggesting that the management achieved profitability in part though large reductions in staff numbers. Many SOEs shed between a half and three quarters of staff (see Table 1 below). Prior to the reforms, employment policy came under the auspices of the State Sector Conditions of Employment Act 1977. Policy was heavily influenced by the Treasury, the State Services Commission, and the

Public Service Association Union. After the reforms workforce management became more flexible as the act removed career security and abolished compulsory industrial arbitration in the public sector (Shaw, 2012).

While we lack precise estimates of employment levels in the state trading sector over the relevant time period, Duncan (1996) presents some basic estimates of the number of employees for some of the largest STEs and SOEs over the 1987 to 1994 period. This evidence - reproduced in Table 1 below - suggests that the size of these redundancies were significant. Between these six SOEs approximately 42,000 jobs were terminated between 1987 and 1994. Chapple et. al (1996) estimate the corporatization redundancies to be slightly higher, at 44,000.

Table 1: State Trading Enterprises Staff Numbers, 1987-94
As at end of March or June (Reproduced from Duncan, 1996)

	1987	1988	1989	1990	1991	1992	1993	1994	change: 1987 to 1994
CoalCorp	1,861	892	806	715	675	679	554	534	-1,237
Electricorp	5,739	4,154	3,876	3,690	3,730	3,096	2,861	2,835	-2,904
Forestrycorp	7,070	2,652	2,547	2,597	na	na	na	na	na
NZ Post	12,000	9,800	9,500	8,500	8,200	7,700	6,900	6,800	-5,200
Railways	14,900	12,500	9,900	8,400	5,900	5,400	5,200	4,600	-10,300
Telecom	24,500	23,931	19,151	17,131	15,066	13,600	12,300	9,500	-15,000
Total	66,070	53,929	45,780	41,033	33,571	30,475	27,815	24,269	-41,800

It is nonetheless difficult to precisely estimate the reduction in employment attributable to the policy. First, although it covers some of the largest employers, the list of SOEs in Table 1 is far from exhaustive. There could be substantial job losses in other SOEs that we are missing or the losses in Table 1 could be offset by increases in other SOEs. Thus, to get a better estimate of the change in total public trading sector employment over the period we supplement the employment data provided by Duncan (1996) with employment estimates for some of the other SOEs sourced primarily from Annual Reports (see the Appendix for details). These estimates are provided in Table 2. For the most part the evidence suggests that expanding the sample to include other SOEs would be immaterial. The additional job losses or gains are small in absolute terms, either because

there was little change in staffing numbers or because the SOE was so small to begin with that the job losses, while large in terms of a percentage of the firm-level workforce, are small in the greater context of total employment. If anything, we may wish to attribute about 5,000 additional job losses to corporatization in order to account for the fact that the railways were corporatized earlier (in 1982), and at this time it had about 20,000 employees.

Table 2: Supplementary State Trading Enterprises Staff Numbers 1982-94

As at end of March or June

	1982	1983	1984	1985	1986	1987	1988	1989	1990	1992	1993	1994
Air NZ	8,172	6,980	6,864	7,020	7,484	7,668	-	8,621	-	7,498	7,206	7,404
Bank of NZ	-	-	6,364	-	7,687	-	9,522	-	-	-	-	-
NZ Steel	-	-	1,547	1,640	-	-	-	-	-	-	-	-
Petrocorp	-	-	-	-	-	760	-	-	-	-	-	-
Rural Bank	-	-	-	-	-	-	-	-	440	394	-	-
State Insurance	-	-	1,090	1,140	1,265	-	-	-	-	-	-	-
Railways	21,610	20,865	19,148	18,213	17,811	-	-	-	-	-	-	-

Second, these estimates of employment are based on administrative data. We cannot distinguish between full time and part time employees. It is possible that many employees were shifted from full time to part time work. This reduction in employed hours would not show up in the figures. Similarly, we cannot tell whether the laid-off workers were re-hired as contractors. In the case of SOEs with international operations we cannot tell whether the employees are located in New Zealand.

Third, we lack an observed counterfactual: changes in employment levels may have happened in the absence of the corporatization policy. However, the timing and severity of the job losses coinciding with the policy change are highly suggestive that the policy had a big impact.

Although we lack precision in the estimated corporatization redundancies, the burden of evidence suggests that corporatization resulted in a large reduction in employment in the public-market sector. To put the size of the reduction in perspective, suppose that corporatization directly reduced public market employment by between 40,000 to 50,000 persons. Total employment in 1987 was about 1.6 million (see Table 3 below), meaning that the job losses equated to between 2.5 to

3.1 percent of total employment. Unemployment in 1987 was about 75,000, so that corporatization job losses equate to between 53 to 67 percent of unemployed persons. Between 1987 and 1994, full time employment declined by 86,000 while part time employment increased by 56,000, for a decline in total employment of about 30,000. Unemployment rose from 75,000 in 1987 to about 170,000 in 1994 (see Table 3 below).

Table 3: New Zealand Labour Market Trends 1987-94
June Quarter, Thousands (Reproduced from Eaqub and Lattimore, 2011)

	1987	1988	1989	1990	1991	1992	1993	1994	change: '87 to '94
Full Time	1,338	1,293	1,236	1,227	1,196	1,196	1,212	1,252	-86
Part Time	269	288	290	283	318	319	323	325	56
Total Employment	1,607	1,581	1,526	1,510	1,514	1,515	1,535	1,577	-30
Unemployment	71	91	122	127	174	174	170	147	76
Working-Age Population	2,552	2,571	2,581	2,608	2,642	2,672	2,702	2,738	186
Unemployment Rate (%)	4.1	5.4	7.5	7.7	10.4	10.4	10.2	8.6	4.5
Participation Rate (%)	66.5	65.1	63.6	64.2	64.0	63.4	63.3	63.9	-2.6

There has been a permanent reduction in employment after the broader market liberalization reforms of the 1980s. Full time employment levels peaked in March 1986 at 1.359 million, before declining to a nadir of 1.177 million in March 1992 (see figure 10 in the appendix). Although the number of full time employed briefly exceeds the March 1986 level for one quarter in June 1996, it does not permanently exceed the March 1986 level until September 1999. In the meantime, the working age population of New Zealand increased by about 15.4% between March 1986 and September 1999 (Source: Authors' calculations based on Consolidated Working Age Population, Lattimore and Eaqub, 2011). Broader measures of employment that account for the underlying increase in potential workforce (the proportion of working age population in full time employment, and the proportion of working age population in full time equivalent employment) show that employment levels have never recovered to the levels before the reform period (see figure 11 in the appendix). For comparison, employment to working-age population ratios in the US trended upwards from the mid 1970s through to 2000 before declining. In addition, average real wage growth is the post

reform period has been stagnant (although it should be noted that these averages obscure a significant amount of heterogeneity in the distribution of individual level real wages). As shown in figure 9 in the Appendix, real wages fell between the mid 1980s through to the late 1990s, and have since recovered to levels last seen in the early 1980s.

It is possible that corporatization has contributed to these structural changes in the New Zealand labour market. While it is not the primary purpose the current paper, the model we present below to account for the reduction in labour share can also explain the permanent reduction in employment (as a proportion of potential workers) and the reduction in real wages observed after the reform period. This explanation for the reduction in employment differs somewhat from the early diagnosis of Chapple et al. (1996), who attribute the rise in unemployment after the reforms to broader cyclical factors rather than structural unemployment.

3 Data and Empirics

Our primary dataset consists of compensation of employees (COE) and value added (VA) by sector of ownership: private-market, public-market, and non-market. The non-market sector includes both public and private non-market sectors (the latter consisting of not-for-profits). The three sectors span the entire economy The data are annual and span the years ending March 1972 through to March 2012. The data were obtained from Statistics NZ National Accounts (Industry Benchmarks): Year ended March 2012.

Aggregating COE and VA across the three sectors yields total COE and GDP less indirect business taxes (IBT), respectively, for the whole economy. Our measure of LS will be aggregate COE divided by GDP less IBT, henceforth referred to as *net labour share*. It is important to note however that the private-market COE are not adjusted for self-employment, meaning that COE is likely understated for this sector. As shown in figure 2, the associated measure of labor share for the entire economy is lower than the OECD estimate, which makes a correction for self-employment. The discrepancy between the two labour shares is consistently between 0.05 and 0.04 for the entire period, suggesting that the contribution of the self-employed to total labour share has remained constant over the 40 years period.

Figure 3 exhibits net LS (COE divided by VA) for each of the three sectors. The public market sector experiences the steepest decline: It averages between 0.7 and 0.6 between 1972 and 1982; declines to about 0.55 between 1985 and 1989; and then falls to between 0.3 and 0.4 over 1994 to 2000. The private sector LS declines from an average of about 0.45 between 1972 and 1982 to about

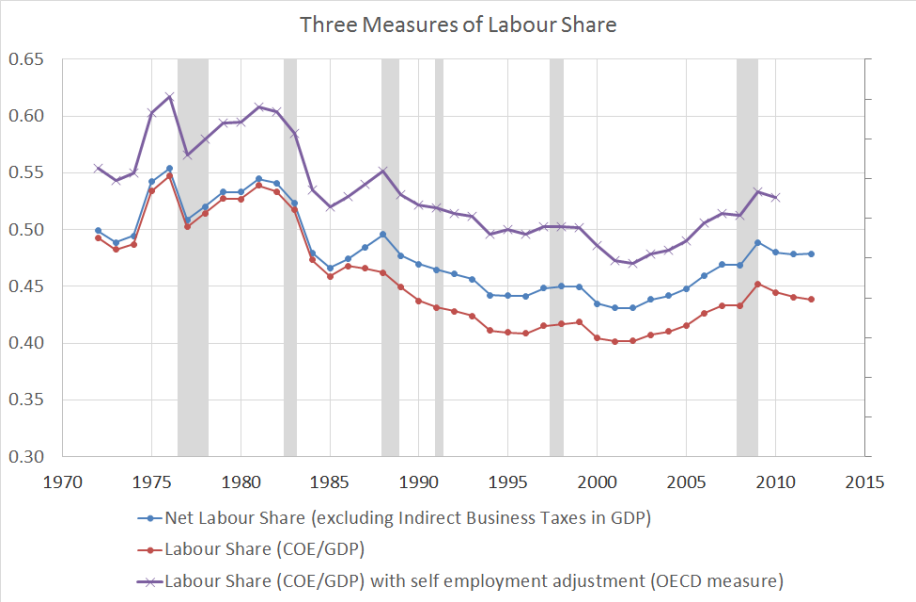


Figure 2: Various measures of the Labour Share of National Income

0.4 between 1985 to 2000. The first drop in both private and public market labour share has been attributed to the wage and price controls implemented over the 1982-1984 period (Conway, Meehan and Parham, 2015). It is possible that these controls were better imposed on wages compared to prices, given that firm owners have a strong incentive to keep wages fixed and a weak incentive to keep prices fixed.

In order to ascertain whether the decline in public market labour share is sufficient to account for the decline in aggregate labour share we require the share of output attributable to each of the three sectors. Figure 4 below exhibits the share of value added (specifically sector value added divided by GDP less IBT) attributable to the three sectors over the 1972 to 2012 period. Prior to the reforms the public market sector accounted for between 10 to 15% of GDP less IBT.

3.1 Sectoral Decomposition

Based on the sectoral labour and output shares (depicted in figures 4 and 3 above) we can attribute changes in total labour share (depicted in figure 2) to each sector. Let $COE_{i,t}$ denote compensation of employees (COE) in sector i at time t, and let $VA_{i,t}$ denote value added. Let COE_t denote aggregate COE, and let IBT_t denote indirect business taxes. Note that $GDP_t - IBT_t = \sum_{i=1}^{n} VA_{i,t}$. We can then decompose total labour share in the economy as follows.

$$\frac{COE_t}{GDP_t - IBT_t} = \frac{\sum_{i=1}^{n} COE_{i,t}}{\sum_{j=1}^{n} VA_{j,t}} = \sum_{i=1}^{n} \frac{COE_{i,t}}{VA_{i,t}} \cdot \frac{VA_{i,t}}{\sum_{j=1}^{n} VA_{j,t}} =: \sum_{i=1}^{n} LS_{i,t} \cdot OS_{i,t},$$

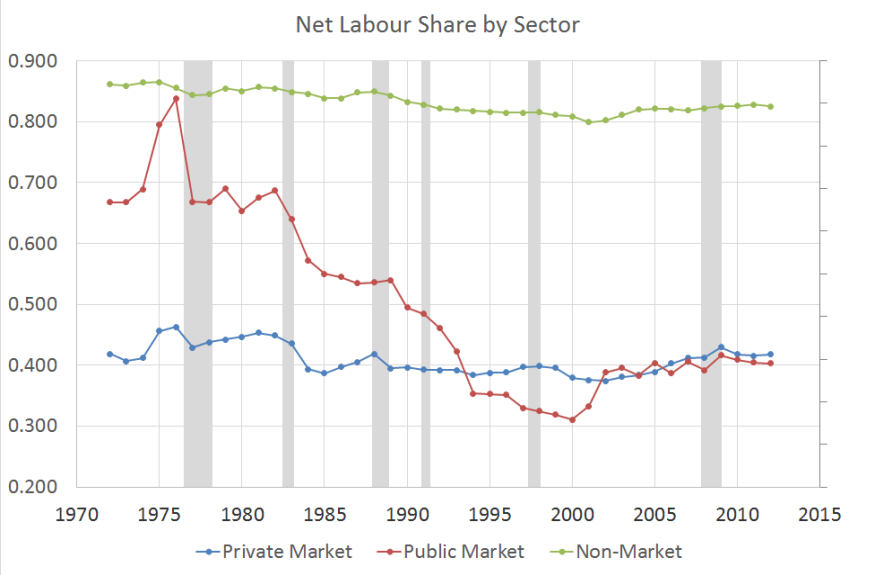


Figure 3: Labour Share by Sector of Ownership

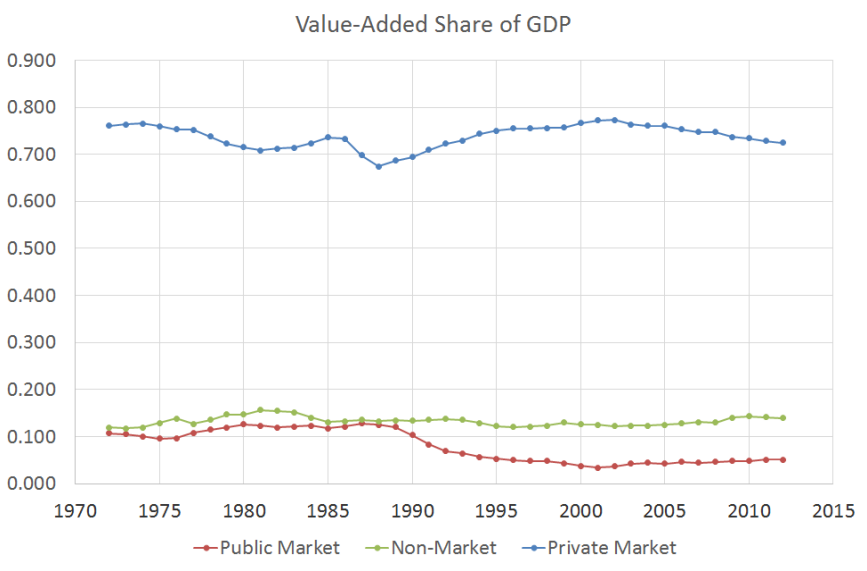


Figure 4: Sectoral Value Added as a proportion of Gross Domestic Product less Indirect Business Taxes.

so that total labour share can be expressed as a weighted average of sectoral labour shares ($LS_{i,t} := COE_{i,t}/VA_{i,t}$), where the weights are given by the output shares ($OS_{i,t} := VA_{i,t}/\sum_{j=1}^{n} VA_{j,t}$). Based on this decomposition we can then attribute the change in total LS between two time periods t and $t-h$ as follows:

$$LS_t - LS_{t-h} = \sum_{i=1}^{n} LS_{i,t} \cdot OS_{i,t} - \sum_{i=1}^{n} LS_{i,t-h} \cdot OS_{i,t-h}$$

Of course there is substantial variation in each measure of labour share, particularly in the early period of the sample. We therefore average out this variation by decomposing the change in average labour share between two time periods. That is

$$\frac{1}{T_4-T_3+1}\sum_{t=T_3}^{T_4} LS_t - \frac{1}{T_2-T_1+1}\sum_{t=T_1}^{T_2} LS_t = \sum_{i=1}^{n}\left(\frac{1}{T_4-T_3+1}\sum_{t=T_3}^{T_4} LS_{i,t}OS_{i,t} - \frac{1}{T_2-T_1+1}\sum_{t=T_1}^{T_2} LS_{i,t}OS_{i,t}\right)$$

for some $T \geq T_4 > T_3 > T_2 > T_1 \geq 1$. Here $t = T_3, \ldots, T_4$ is the "later" time period and $t = T_1, \ldots, T_2$ is the "earlier" time period. The percentage change in total labour share attributable to each sector i is given by

$$\frac{\frac{1}{T_4-T_3+1}\sum_{t=T_3}^{T_4} LS_{i,t}OS_{i,t} - \frac{1}{T_2-T_1+1}\sum_{t=T_1}^{T_2} LS_{i,t}OS_{i,t}}{\frac{1}{T_4-T_3+1}\sum_{t=T_3}^{T_4} LS_t - \frac{1}{T_2-T_1+1}\sum_{t=T_1}^{T_2} LS_t} \times 100\%$$

The table below exhibits the decomposition:

Table 4: Sectoral Contributions to National Labour Share

Compensation of Employees as a proportion of GDP less IBT

	All Sectors	of which: Public Market	Private Market	Non-market
1972-1986	0.524	0.076	0.320	0.118
1995-2004	0.441	0.016	0.316	0.108
Decline:	0.073	0.060	0.004	0.010
% decline in total LS	100%	81.9%	4.9%	13.2%

The large reduction in the contribution of the public market sector to total labour share (from 0.076 to 0.016) reflects both falling labour share within that sector as well as falling output share of the public market sector. The latter reflects privatization as enterprises move from the public to the private market sector. Note that the contribution of the private market to overall labour share remains rather constant in between the pre and post-reform periods, and that the labour share

within the private market sector is rather constant from 1984 through to the early 2000s (as shown in figure 3 above). This is consistent with the majority of SOEs being corporatized before being sold off to private investors (otherwise expect to see an increase in private sector labour share in the data during the reform period).

3.2 Difference-in-Differences Regressions

The decomposition given in Table 4 suggests that the reduction in aggregate labor share can be traced to shifts in labour share of the public market sector. To further buttress this argument we employ a difference-in-differences methodology to examine whether the reforms can account for the decline in public sector labour share. In our analysis the private market sector serves as the relevant control for the treated public market sector.

We lack a clean treatment that occurs in a given time period: The legislation that enabled corporatization occurred over several years (1986, 1988, 1989), while privatization occurred over a period of seven years (1988 to 1994). In our empirical specification we therefore allow for a transition to the treatment period. Our model is

$$\log\left(LS_{i,t}\right) = \alpha_i + \delta_t + \beta D_{i,t} + e_{i,t},$$

where $i \in \{public, private\}$, $t = 1972, \ldots, 2004$, and $D_{i,t}$ is a dummy for the pre-reform period:

$$D_{i,t} = \begin{cases} 1 & i = public,\ t \in \{1972, \ldots, 1986\} \\ 0 & otherwise \end{cases},$$

so that $-\beta$ captures the effect of corporatization on the (log) public market sector labour share. Prior to the treatment, the average log public-market labour share is given by $\alpha_{public} + \beta$; after the treatment it becomes α_{public}.

There are several weaknesses of our difference-in-differences methodology. First, the private market sector is an imperfect control for the public market sector. The public market sector was concentrated in many industries that have significant barriers to entry (see Tables 1 and 2), such as communications, transportation and energy production and distribution. Second, there are likely to be general equilibrium effects that difference-in-differences is ill-suited to deal with. The large amount of redundancies in the public market sector during the reform period could put downward pressure on wages, which may reduce labour share in all sectors of the economy via this intensive margin. This would lead difference-in-differences to understate the effect of corporatization on labour share.

We estimate the model by LS and use Newey-West heteroskedasticity and autocorrelation consistent estimates of the standard errors. Table 5 exhibits the results.

Table 5: Difference-in-Differences Estimates

$\hat{\beta}$	$\hat{\alpha}_{private}$	$\hat{\alpha}_{public}$
0.417**	-0.969**	-0.948**

The point estimate of β is positive and significant at the 1% level, indicating that the log LS of the public market sector is statistically greater than the log labour share from 1987 onwards. The point estimate of 0.417 indicates that the level of labour share over 1972 to 1986 was higher by a factor of 1.52 ($= e^{0.417}$). Between 1987 and 1995 the labour share in the public market sector was 0.387 ($= e^{-0.984}$) on average; while that of the private market was 0.379 ($= e^{-0.969}$) on average. This means that over the 1972 to 1986 period, the average labour share in the public market sector was 0.673 ($= e^{-0.984 \times 0.417}$).

4 Model

In this section we build a small open economy model that can explain the observed sectoral trends in labour share.

4.1 Environment

We study a static, small open economy. There are two types of labour, high and low skilled, given by N^H and N^L respectively. Each unit of low skilled labour provides one unit of labour services while high skilled labor provides $h > 1$ units.

There are two sectors that produce output: market and government. Both produce output using a Cobb-Douglas production function

$$Y_i = K_i^{\alpha} (\tilde{N}_i)^{1-\alpha} \tag{1}$$

where K_i and $\tilde{N}_i$ are capital and labour services for sectors $i \in \{M, G\}$. Both sectors rent capital are rental rate r.

Labour services in the market sector are given by $\tilde{N}_M = N_M^L + hN_M^H$. Labour services in the government sector are given by $\tilde{N}_G = N_G^L + hN_G^H - \kappa$, where $\kappa \geq 0$. The interpretation of κ is that it represents restrictive work rules which require paid time that is not used in production.

As shown in Bridgman (2015), work rules are a method of sharing monopoly rents with workers by increasing employment. The government sector also shares rents by paying fair (above market) wages that share a portion γ of profits:

$$w_G^j = w_M^j + \gamma \frac{\pi}{N_G^L} \tag{2}$$

where w_i^j is wage for sector $i \in \{M, G\}$ and labour type $j \in \{L, H\}$ and π is government profits. We assume that only low skilled workers get rent sharing wages. This assumption squares with the wage compression that government enterprises generally have.

Both sectors face demand $D_i = p_i^{-\rho}$, where p_i is the price of output for sector i and $\rho > 1$.

4.2 Equilibrium

Market firms take prices as given and solve

$$\max \left(P_M K_M^{\alpha} (N_M^L + h N_M^H)^{1-\alpha} - w_M^L N_M^L + w_M^H N_M^H - r K_M \right) \tag{3}$$

by choosing (skilled and unskilled) labour and capital. Kamal, Lovely and Mitra (2015) show that a profit maximizing government will maximize rents $R = \frac{\pi}{1+\gamma}$. Government firms choose output price and inputs to solve $\max P_M^{1-\rho} - w_M^L N_M^L + w_M^H N_M^H - r K_M$ subject to $p_G^{-\rho} = K_G^{\alpha} (N_G^L + h N_G^H - \kappa)^{1-\alpha}$.

4.3 Results

We examine the outcomes when the government firm uses rent sharing mechanisms ($\kappa, \gamma > 0$) and when they are removed ($\kappa, \gamma = 0$). We identify the rent sharing outcome with the pre-reform era and their removal with the corporatization reform.

We assume the pre-reform government firm only hires low skilled workers. This is mostly done for analytic convenience as both types of labor provide labor services at the same cost. (High skilled worker provide more services, but at a higher cost.) It also makes sense that a firm that is looking to maximize employment would hire workers who provide fewer units of labour services per hour. We will revisit this assumption when we discuss inequality below.

We also assume that the government sets κ so that profit is zero for the given γ. This assumption pins down this parameter and it fits the very low profit rates of pre-reform government firms.

The first item we examine is labour share. The pre-reform share is:

$$LS^{Pre} = (1 + \frac{\gamma}{1+\gamma} \frac{1}{(1-\alpha)(\rho-1)})[1 - \alpha + \frac{\alpha}{\rho}] \tag{4}$$

After the reform, it becomes:

$$LS^{Post} = \frac{(1-\alpha)(\rho-1)}{\rho} \tag{5}$$

The first thing to see is that LS falls with the reform. Inspection shows that $LS^{Pre} > 1-\alpha > LS^{Post}$. This change is due entirely to shifts in the sharing of rents. Labour gets all of the rents prior to the reform and none afterward.

The removal of each form of rent sharing contributes to this shift, but through different channels. The removal of work rules reduces labour share through through the quantity of employed labour. This is consistent with the permanent reduction in employment observed in the post reform period. The labour share without work rules is $(1+\frac{\gamma}{1+\gamma}\frac{1}{(1-\alpha)(\rho-1)})[\frac{(1-\alpha)(\rho-1)}{\rho}]$. On the other hand, the removal of the fair wage reduces labour share through the price of employed labour. This is consistent with the reduction in real wages observed after the reform period.

Each form of rent sharing accomplishes a different goal that a government may have. Work rules increases employment while fair wages increase wages of existing employees. They also have different impacts on productivity. Removing fair wages lowers labour share but does not increase labour productivity. Removing work rules does increase labour productivity since a portion of labour time is not used in production. The large increases in productivity and fall in headcount after the reform indicate that this mechanism may have been important.

In the model, firms rent capital and it is paid its full market return. There is some indication that NZ SOEs transferred part of this return to workers. Capital share was close to depreciation share: In 1987, central government's deprecation share was 16 percent while gross operating surplus's share (the share of income attributed to capital) was 29 percent. In contrast, the private sector's depreciation share was 15 percent while gross operating surplus's share was 49 percent. The modeling could be modified easily to account for this transfer by having the government firm own its capital and transferring the net return with the two rent sharing mechanisms.

We now turn to the impact of reform on inequality. The reform can increase inequality through two mechanisms.

The fair wage mechanism will compress wages, so removing it will increase wage inequality. Wage inequality in the market sector is given by the difference in labour services provided $w_M^H = w_m^L h$. Fair wages in the government sector increase low skilled workers' wage above their market levels. The pre-reform government wage is

$$w_G^{L,Pre} = w_M^L(1+\frac{\gamma}{1+\gamma}\frac{1}{(1-\alpha)(\rho-1)}) \tag{6}$$

This mechanism pushes government low skilled wages up toward the skilled wage. Without the fair

wage mechanism ($\gamma = 0$), the government wages are market wages and wage inequality increases. This result depends on the fair wage being used to increase low skill wages. If high skill wages were subsidized, the opposite result would be obtained.

The reform also increases capital returns. If capital is held by a small group, the increase in profits will increase their incomes which would increase inequality.

5 The Decline in Labour Share and the Increase in Income Inequality

Income inequality has risen in developed countries over the past four decades, particularly amongst the English-speaking nations (Alvaredo et al, 2013). In this section we explore the extent to which corporatization and the corresponding decline in labour share can explain the rise in income inequality in New Zealand. Economists often focus on the labour share of national income within a broader context of income inequality. Labour Share is often taken as an indicator of inequality because capital ownership is thought to be concentrated (Jacobson & Occhino, 2012). Labour share is a central object in the controversy over the Piketty (2014) analysis of inequality (Krusell & Smith 2014, Rognlie 2014, Acemoglu & Robinson 2014, Jones 2014).

Two aspects of the rise in income inequality in New Zealand are unique. First, all of the increase in income inequality occurred over a relatively period of time: 1985 to 1995. The timing of this increase clearly implicates the broader market-based reforms of the 1980s. Second, when compared to other developed nations, increases in the share of national income going to the top end of the distribution has a smaller role to play in the overall increase in income inequality. Instead, the increase in income inequality is better characterized as a widening of the gulf between the middle class and those at the bottom end of the distribution. We argue that both aspects of the New Zealand experience are consistent with corporatization of the public-market sector. We also demonstrate a relatively strong correlation between labour share of national income and household income inequality (within, but not across, countries) to further buttress this argument.

5.1 Trends in Income Inequality in New Zealand

Almost all of the increase in income inequality in New Zealand occurred between 1985 and 1995: Over the 1995 to 2015 period almost all measures of income inequality have been flat, or in some cases declining. Figure 5 below exhibits the Gini coefficient on household income for New Zealand over the 1985 to 2011 period. Note that the increase in inequality is observed for income before

Figure 5: Source: OECD Statistics

and after taxes and transfers.

The Gini is of course a limited measure of income inequality, as are all measures that attempt to summarize a distribution with a single number. Nonetheless, other measures of income inequality (such as percentile and share ratios) exhibit the same salient features of the Gini over the time period: A steep rise in the measure of income inequality between 1985 and 1995 or 2000. Thereafter inequality remains flat, or in some cases, declines slightly. See Tables D.7A, D.8 and D.9 and figures D.11 and D.12 Ministry of Social Development (2015). The timing and lack of good alternatives clearly implicate the reform period.

It is worth noting that the trend in the Gini coefficient is different compared to other developed nations over the 1980 to 2015 time period (with the exception of perhaps Australia, for which we lack data prior to 1995). Income inequality - when measured by the Gini - has steadily increased in the US, Canada and the UK between the 1980s to present. Currently only Canada has a lower Gini coefficient than NZ.

The rise in household income inequality in New Zealand is probably driven more by a widening gulf between the middle class and those at the lower end of the income distribution. Particularly when compared to other countries, the top end is less important. Figure 7 illustrates the share of income going to the top 1% of adults across the five nations of interest. There is a jump in the share of income going to the top 1% after the reform period, from 6% to 9%. Thereafter there is volatility in the share, but there is no discernible trend. In contrast, the top 1% income share steadily increases from the 1980s onwards for the UK, USA, Australia and Canada. The current

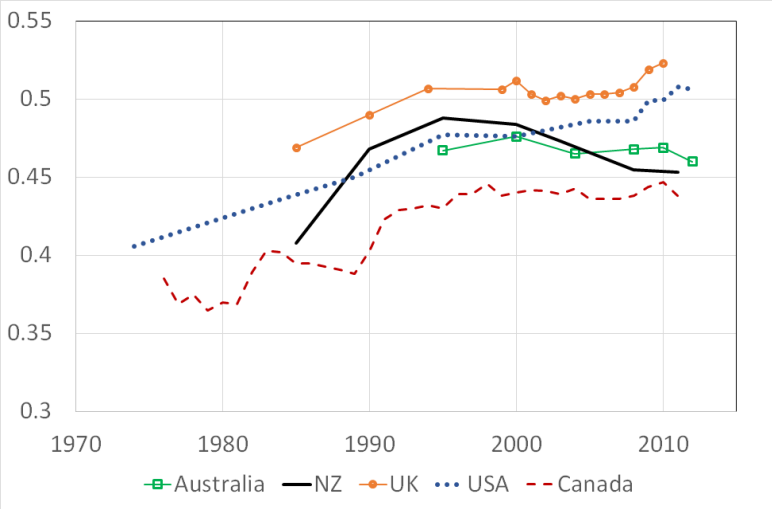


Figure 6: Gini Coefficient before taxes and transfers. Source: OECD Statistics.

share of income going to the top one percent in NZ is lower than in the four other nations as of 2012. Notably the top one percent income share is much higher for Canada than for NZ, despite the fact that the former has a smaller Gini coefficient. Figure 8 shows that the share of income going to households in the top 5 to 1% of households in NZ has remained flat over the same time period, whereas the corresponding shares for the UK and the USA clearly trend upwards.

5.2 The correlation between labour share and measures of income inequality

The international evidence suggests that the correlation between labour share and inequality across countries is rather weak (Bridgman, 2014). However, within many countries, the relationship between variation in measures of inequality and labour share are much stronger. For example, consider the following cointegrating regression

$$y_{i,t} = \alpha_i + \beta x_{i,t} + e_{i,t}, \quad \Delta e_{i,t} = \delta_0 e_{i,t-1} + \sum_{s=1}^{p} \delta_{s,i} \Delta e_{i,t-s} + u_{i,t}$$

where $x_{i,t}$ denotes a (log) measure of labour share of country i at time t, and $y_{i,t}$ denotes the (log) inverted Pareto-Lorenz (IPL) coefficient of country i at time t.[1] A key feature of the cointegrating equation are the fixed effects $\{\alpha_i\}_{i=1}^{n}$, which means the cointegrating relationship therefore captures

[1] Theoretically, the inverted Pareto-Lorenz coefficient and the Gini coefficient are closely related. The Pareto-Lorenz is the Gini coefficient for a Lorenz curve estimated using a Pareto distribution. Gini is a measure of the difference between a Lorenz curve and the 45 degree line (equality). The salient difference is that Gini estimates are based on the entire empirical distribution, whereas the inverted Pareto-Lorenz is based on only the top incomes, and assuming a Pareto distribution.

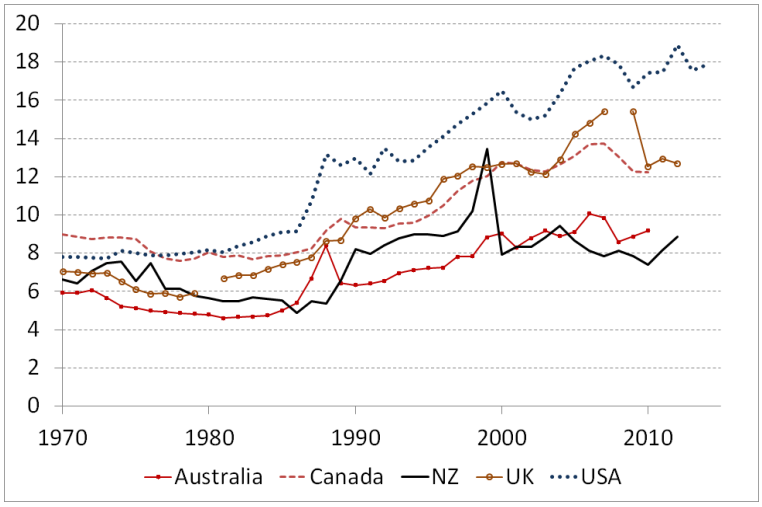


Figure 7: Share of household income going to the top 1% of income earners. Source: Global incomes database.

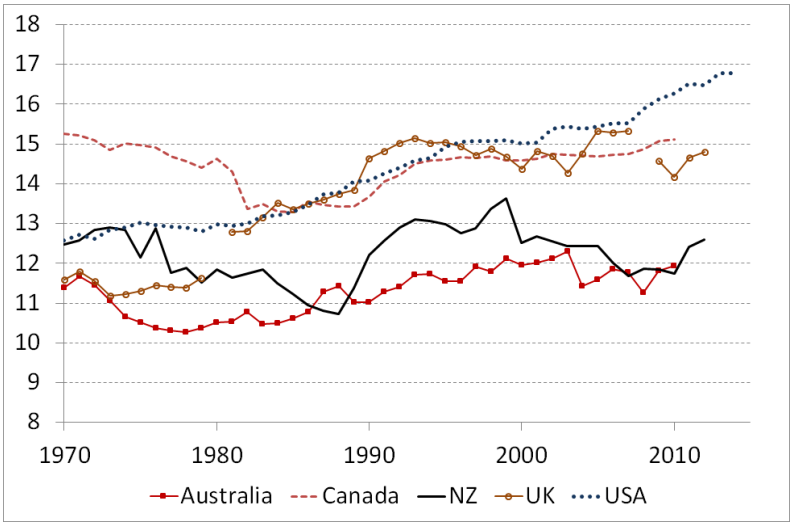


Figure 8: Share of total household income going to top 5-1% of income earners. Source: Global incomes database.

a long-run relationship within each time series of the panel (i.e., we account for the fact that the correlation between LS and the IPL coefficient across countries is weak).

We test the null hypothesis of no cointegration ($\delta_0 = 0$) against the alternative $\delta_0 < 0$. We consider both gross labour share (COE/GDP) and net labour share (COE divided by GDP less IBT) as measures of national labour share. We have an unbalanced panel of annual data for ten countries (Canada, France, Ireland, Italy, Japan, the Netherlands, New Zealand, Sweden, the UK, and the US), spanning 1946-2012 in total. (Note that the time span for each country varies.) The data are obtained from the World Top Incomes database (http://topincomes.parisschoolofeconomics.eu/). For additional details on the dataset, see Bridgman (2014). The Kao (1999) adjusted ADF statistic is 3.63 (statistically significant at the 1% level under an asymptotically Normal distribution) when gross labor share is the cointegrating variable, while the adjusted ADF is 3.00 (statistically significant at the 1% level) when net labour share is used as the cointegrating variable.

The table below exhibits panel dynamic OLS estimates of β. The optimal leads and lags are selected by the Schwarz information criterion.

Table 6: Panel Cointegration Regressions

Dependent Variable: Log-differenced Inverted Pareto-Lorenz Coefficient	
Cointegrating variable	Cointegrating Coefficient
Log Gross Labour Share	-0.87***
Log Net Labour Share	-0.64***

White time period and cross section heteroskedasticty robust standard errors. ** (*) indicates significance at the 5% (10%) level.

We also run a regression of the IPL on LS in terms of annual growth rates (specifically, log-differences). The relationship continues to hold, although it is mitigated when period fixed effects are included. This probably reflects the fact that the increase in the IPL coefficient and the fall in labour share are a common trend observed in all nations in the dataset, and thus the period fixed effects are removing the variation attributable to the relationship of interest, rather than confounding common variables.

Table 7: Panel Growth Regressions

Dependent Variable: Log-differenced Inverted Pareto-Lorenz (IPL) Coefficient						
Regressors:						
Log-differenced Gross Labour Share	-0.35**		-0.35**		-0.29	
Log-differenced Net Labour Share		-0.37**		-0.39**		-0.35*
Cross Section Fixed Effects	No	No	Yes	Yes	Yes	Yes
Time Period Fixed Effects	No	No	No	No	Yes	Yes

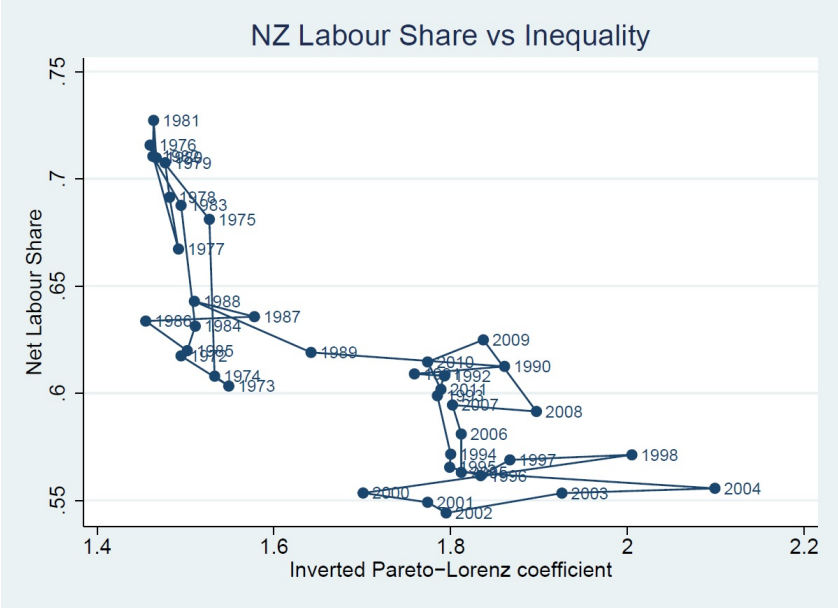
White time period and cross section heteroskedasticty robust standard errors. ** (*) indicates significance at the 5% (10%) level assuming a Normal limiting distribution.

Although there may be a statistically significant long run relationship between the inverted Pareto-Lorenz coefficient and labour share on average across the sample of ten countries considered, this does not necessarily mean there is a relationship within any specific country.[2] Figure 5.2 depicts a scatterplot of net labour share against the IPL for NZ. We observe a rather strong negative relationship between LS and the inverted Pareto-Lorenz coefficient. A dynamic OLS regression of the log IPL coefficient on the log net labour share yields a point estimate of -1.07, which is statistically significant at the 1% level (using a Newey West estimator of the long run variance of the regression error). This indicates near unitary elasticity of the IPL and net labour share of national income. The evidence for cointegration within this time series is less clear however. The Phillips-Oularis t-statistic is -3.17, which is significant at the 10% level. We should however expect a lack of power under the alternative hypothesis given the limited time span of the dataset.

6 Conclusion

Like many developed countries around the world, the labour share of national income in New Zealand has declined since the 1970s. In this paper we present evidence suggesting that institutional reforms in the government sector are behind this trend. Specifically, the corporatization policies of the late 1980s turned the public market sector into profit maximizing businesses. This change entailed a significant loss of staff from the affected entities, and a marked reduction in the proportion of value added used to compensate employees. We show that the vast majority of the decrease in aggregate labour share can be attributed to changes in the public market sector. The labour share of income in this sector decreases markedly after the reforms, while the proportion of value added

[2] For example, the relationship appears weak for the US and Sweden.



compensating employees in the private market sector does not decrease by nearly as much after the reforms are enacted.

We also argue that these institutional changes can help us to better understand the role that the institutional reforms have played in increasing inequality in New Zealand between 1985 and the late 1990s. We present evidence to show that a broad measure of income inequality (the Pareto-Lorenz coefficient) and labour share a strong statistical relationship within a cross section of ten countries in the post war period, and within New Zealand itself. Thus, if we believe that there is a relationship between labor share of income and inequality within New Zealand, our results suggest that the changing role of the state from an employer to profit maximizer has played a significant role in exacerbating inequality within New Zealand.

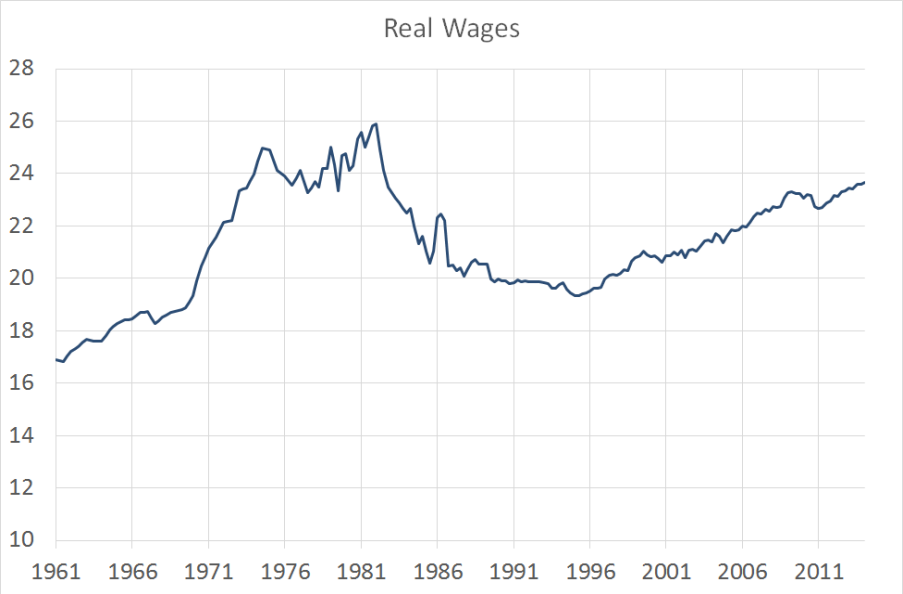


Figure 9: Average Real Wages: 2006 dollars per hour (Source: Lattimore and Eaqub, 2011)

7 Appendix

7.1 Supplementary Figures

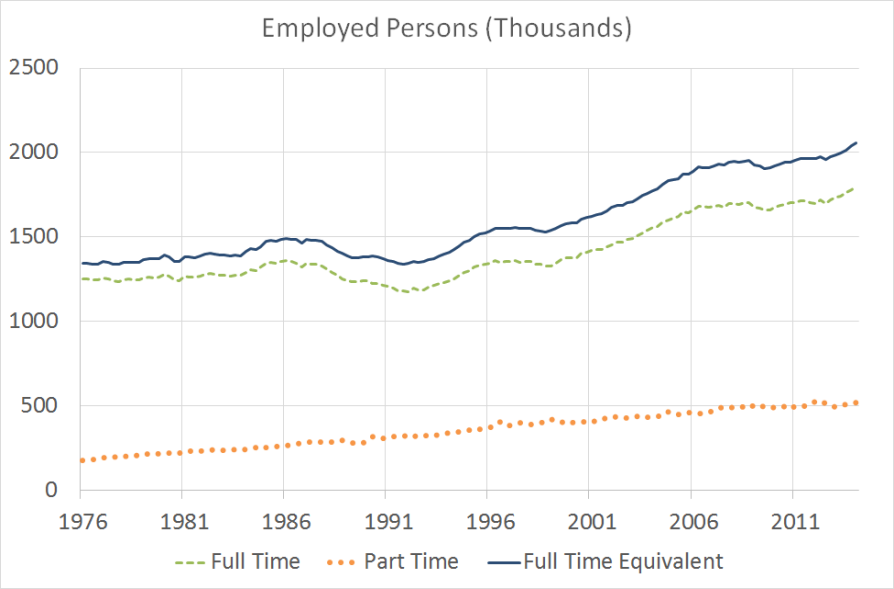


Figure 10: (Source: Lattimore and Eaqub, 2011)

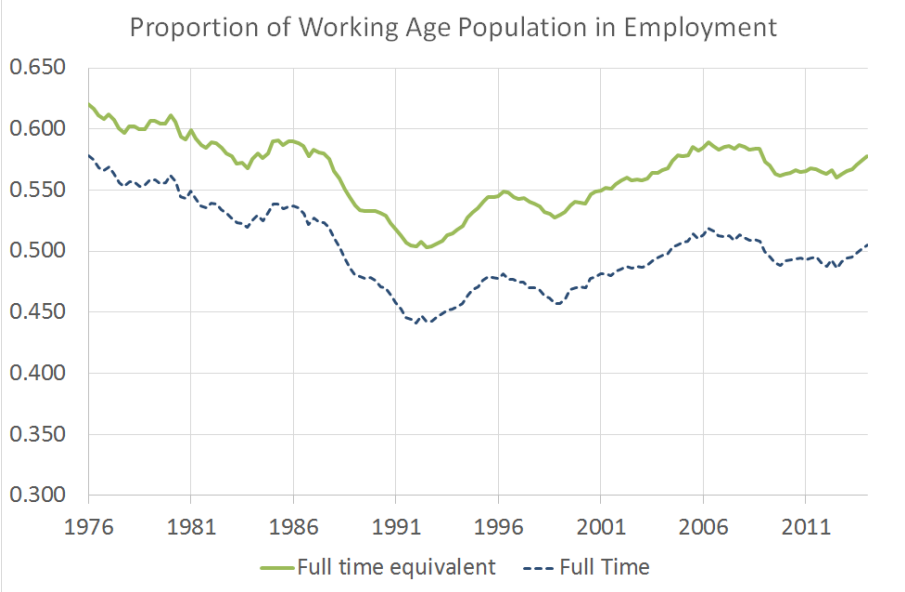


Figure 11: (Source: Lattimore and Eaqub, 2011)

7.2 Supplementary State Trading Sector Staff Numbers

Air New Zealand. Page 23 of the 1986 Annual Report gives employment numbers over the 1977 to 1986 period. In 1977 Air NZ had 8,344 employees; by 1986 this had declined in 7,668. The 1994 Annual Report lists 7,404 "core group" employees and 9,039 employees in total. See Air New Zealand (1986, 1994).

Bank of New Zealand. Page 22 of the 1986 AR lists 7,687 employees located in New Zealand and 8,771 employees total. Page 6 of the 1988 AR lists 9,522 employees world wide. See Bank of New Zealand (1986, 1988).

New Zealand Rail. The 1984 Official Yearbook (OYB) of New Zealand lists 21,610 NZ Rail employees for the financial year ending 1982 and 20,865 for 1983. The 1985 OYB lists 17,800 employees in 1984, while the 1987-88 OYB lists 17,811 employees for the 1986 financial year. Given that Corporatization of NZ Rail began in 1982, these numbers would suggest an additional 5,000 job losses attributable to Corporatization. See Department of Statistics (1985, 1986, 1989).

New Zealand Steel. Page 6 of the 1985 annual report lists 1640 employees. Page 28 of the 1987 annual report states that there was a reduction of 400 employees beginning in August 1986. See New Zealand Steel (1985, 1987)

Petrocorp. Page 11 of the 1987 "Corporate Profile" Document lists 760 employees. No other estimate could be obtained from company reports and alike. See Petrocorp (1987).

Rural Bank. Page 13 of the 1992 Annual Report lists 440 employees in FY 1990 and 394 employees in FY 1992. See Rural Bank (1992).

State Insurance. Page 161 of the 1986 Annual Report lists 1,265 employees. We could not find subsequent mention of the number of employees but p. 189 of the 1997 Annual Report discusses "large redundancies". See State Insurance (1986, 1997).

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