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Wage and productivity relationships in Australia and the Netherlands

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1. Introduction

The Workplace Relations Act (WRA) introduced in Australia in 1996 was an emphatic expression of the trend initiated by the Hawke-Keating Accord process where the "centralisation of wage fixing through national wage cases in the Industrial Relations Commission, determined by principles based on cost of living and national productivity indicators, has been replaced by a new decentralised approach" (Mortimer, 2000: 175). The trend became apparent toward the end of the Hawke-Keating Government where microeconomic efficiency became the catch cry of those determined to deregulate the labour market.

The most recent *Earnings and Hours* data from the Australian Bureau of Statistics shows that at May 2000 the most common method of setting pay was unregistered individual agreements (38.2 per cent) (ABS, 6302.0). Thus legislative changes (the WRA) have installed the private commercial contract as the major instrument for determining wages and conditions. Given the history of specialised judicial processes for arbitration and conciliation in Australian labour relations, this is a major change and raises a range of questions both legal and economic (see Carlson, Mitchell and Watts, 2001, hereafter CMW).

With persistently high unemployment present, the move to decentralisation was motivated by the view (not shared by these authors) that increased employment growth required a reversal of the wage share gains made in the 1970s. The Accord successfully shifted national income back to profits by generally cutting real wages (CMW, 2001). Since then, wages policy has sought to match real wages growth and productivity at the plant level through decentralisation and deregulation. The direction of policy has reflected a faith in neoclassical employment theory, discredited in the 1930s, rather than any firm empirical evidence. Employment changes between 1983 and 2000 have not shown any close correlation with real wage movements. Further, persistently high unemployment remains and there is strong evidence linking demand fluctuations to employment and unemployment changes over this period (Mitchell and Muysken, 2001; Mitchell, 2001).

CMW (2001) examined the impact of the new forms of wage determination on wage outcomes in Australia and found that between 1995 and 2000, aggregate labour productivity growth (measured as output per person employed) exceeded the growth in real wages. The data suggests that productivity movements were only partially being passed on in the form of lower prices and/or higher nominal wage outcomes, so that businesses were using the productivity gains to expand their margins.

The policies of real wage restraint were not unique to Australia. In 1982, the Akkoord van Wassenaar was introduced in the Netherlands in the aftermath of the oil crises of the 1970s. It shared the same philosophy as the Australian Accord in that trade unions leaders agreed to wage moderation in return for a promise of employment growth. While Dutch employment growth achieved "miracle" proportions in the 1990s, the causal role of the Wassenaar Akkoord is unclear (Muysken, 2001). Given that the wage share has fallen consistently in the Netherlands, the moderation of real wages has allowed the businesses to use their productivity gains to expand their margins.

The major difference between Australia and the Netherlands in recent years is that in the latter wage determination through sectoral wage negotiations and binding collective extension of the results is still widely practiced and accepted. There has been no change equivalent to the WRA.

In this paper, we seek to assess the extent to which real hourly earnings in a specific industry are driven by movements in own-labour productivity (measured as gross value added per hour) and economy-wide productivity in Australia and the Netherlands. We also assess whether the introduction of the Workplace Relations Act (1996) has changed this relationship in Australia. Netherlands is used as a control, since it has not undergone any substantial changes to its wage determination system over the period examined.

We find in Australia, there is no systematic relationship between productivity and the real consumption wage by industry. Sectoral productivity is an important influence in some industries and economy wide productivity in others, but the rank correlation of real and nominal wages is relatively high over the period 1985-2000, although the standard deviation of sectoral productivity has exhibited a rising trend.

In the Netherlands, movements in industry hourly wage costs deflated by the CPI are in general more strongly influenced by sectoral productivity movements, rather than by economy-wide conditions over the period 1970-2000. Both wage costs and hourly productivity by industry exhibit a rising standard deviation. Yet after the Wassenaar Akkoord the rank correlation of nominal hourly wage costs has remained very high. This leads to our conclusion that businesses were able to use price changes to enhance margins and per unit profits.

The paper is organised as follows. In Section 2, we summarise the extant theoretical and empirical literature. A model of wage determination is specified in Section 3. In Section 4 we provide an overview of trends in wages and productivity by industry in Australia and the Netherlands, which we use to motivate the more formal analysis. In the following section econometric estimation is undertaken to test our model of wage setting at the industry level for the two countries. Concluding remarks follow.

2. Literature Review

Salter's (1960) seminal study of structural change in the UK found there were no systematic relationships between the growth of earnings per worker and productivity growth per worker by industry. He concluded that wage increases were determined by economy wide rather than industry specific factors.

In a cross-country study, Holmlund and Zetterberg (1991) found that the growth in industry wages in the USA were most sensitive to sectoral price and productivity changes, thereby confirming the importance of non-competitive forces. In contrast, industry wage setting in the Nordic countries (Sweden, Finland and Norway) was largely unaffected by sectoral conditions although wages drift remained a significant component of wage increases in both Sweden and Norway. The level of the expected average real consumption wage, a proxy for economy wide economic conditions, was strongly significant for all countries except the USA. The level of unemployment did not have a significant negative coefficient for all countries.

Bell and Freeman (1991) investigated the rising inter-industry wage dispersion in the USA between 1970 and 1987. They found that while 60 per cent of the increase arose from competitive market factors, a significant component of this trend was attributable to noncompetitive factors, resulting from the strong link between long term trends in industry wages and productivity growth. They found, however that the rank order correlation between the beginning and ending years was in excess of 0.9 for measures of

both weekly and hourly earnings, so that the increased dispersion was manifested in an orderly widening of the wage distribution (Bell and Freeman, 1991: 278).

Appelbaum and Schettkat (1995) found a weak correlation (0.33) between the growth rates of real consumption wages and productivity across 11 sectors in Australia over the period 1979-89. They concluded that the growth rates of nominal industry wages were not directly linked to their corresponding rates of productivity growth, but rather to economy wide developments.

Watts and Mitchell (1990) examined the impact of incomes policy in Australia on the adult male inter-industry wage structure. The rank correlation coefficients associated with weekly ordinary time earnings were relatively high between 1975 and 1981. Traditional relativities were restored during the Accord period following the 1981-82 wage breakouts. They did not analyse productivity growth across industries and the analysis of average weekly ordinary time earnings conflated movements in hours of work and hourly wages.

3. A model of wage determination

We can capture these empirical findings in a model relating wage formation to productivity and unemployment. We begin with a Phillips curve specification:

(1) $w - p = g - \beta u + c$

where w, p, g, u and c are the logarithms of aggregate wages, prices, productivity, unemployment and a constant, respectively. The real consumption wage in sector i follows the aggregate wage, but is also positively related to relative productivity:

(2) $w_i - p = (w - p) + \gamma_i (g_i - g)$

Equations (1) and (2) then yield:

(3) $w_i - p = (1 - \gamma_i) g + \gamma_i g_i - \beta u + c$

The model captures the competing hypotheses about the determination of sectoral wages, with both sectoral-specific productivity and economy-wide productivity, along with a further proxy for economic conditions, the unemployment rate also being included.

As noted, Holmund and Zetterberg (1991) found that γ_i was low while $\beta = 0$, particularly for Europe. Freeman and Bell (1991) also found a higher value of γ_i for the USA. In a decentralised system, γ_i should be higher unless offset by high labour mobility, whereas in a centralised system economy-wide factors would be expected to be influential.

The sectoral wage share can be defined as the log of real wages per hour minus the log of productivity per hour. Thus:

(4) $ws_i = w_i - p_i - g_i$

Baumol (1967) argues that relative sectoral price movements will reflect relative productivity. Hence:

(5) $p_i - p = -\delta_i (g_i - g)$

Solving equations (3) and (5) for the sectoral wage rate in terms of its own price yields:

(6) $w_i - p_i = (1 - \gamma_i - \delta_i) g + (\gamma_i + \delta_i) g_i$
        $- \beta u + c$

From (1) and (3), it can be shown that the sector i relative wage share depends on relative productivity. Appelbaum and Schettkat (1995: 615) found that for Australia, Denmark, Finland and Japan, the wage share has declined faster in industries with higher rates of productivity growth.

4. Stylised Facts

The data used are described in the Data Appendix. Table 1 compares sectoral employment, value-added, wage and productivity measures for Australia and the Netherlands in 2000. The sectoral composition of employment and value added is similar in the two countries. For both, relative wages are higher in manufacturing compared to services. The wage rate for non-commercial services (see data appendix) is relatively higher in Australia, probably reflecting the share of public sector employment. Productivity differentials are more dispersed than wage differentials. This is also reflected in the trends in productivity levels in manufacturing and services expressed relative to total productivity which are shown in Figure 1.

Table 1 Australia and the Netherlands, 2000

	Share in Total		Ratio to Total	
Netherlands	N	V	W	G
Manufacturing	0.17	0.20	1.16	1.63
Construction	0.08	0.07	0.97	0.55
Commercial services	0.54	0.49	0.97	0.82
Non-commercial services	0.15	0.11	0.88	0.44
Australia				
Manufacturing	0.15	0.14	1.08	1.04
Construction	0.09	0.06	1.03	0.79
Commercial services	0.49	0.48	0.92	0.98
Non-commercial services	0.26	0.23	1.11	0.87

Note: N is employment, V is value-added, W is the wage rate and G is labour productivity.

Table 2 (see page 8) show the annual average compound growth rates for various periods for employment, hourly wages and hourly productivity by sector for Australia and the Netherlands, respectively. We also include sectoral prices for the Netherlands. The differential between relative sectoral productivity in manufacturing and services in Australia is less clear than in the Netherlands, but relative manufacturing productivity does appear to exhibit a rising trend. Further analysis is required.

Sectoral prices are only available for the Netherlands and have moved inversely with relative productivity. This is consistent with equation (5).

Figure 1 Relative sectoral productivity, Australia and the Netherlands, various years
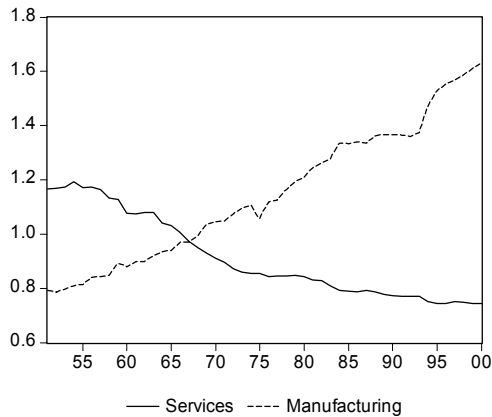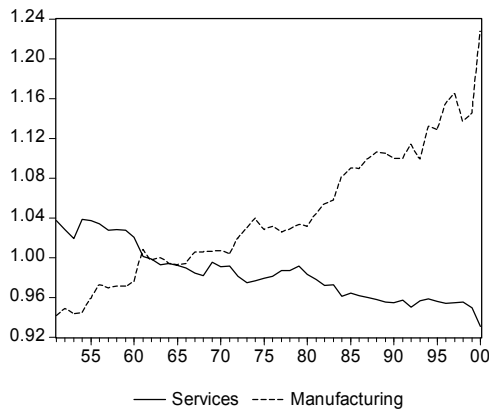

(a) The Netherlands, 1951-2000   (b) Australia, 1985-2001
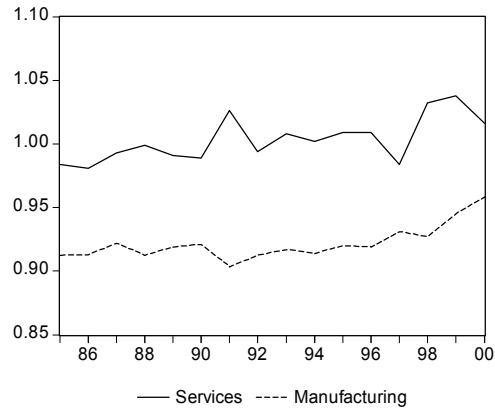
Source: see Data Appendix.

Figure 2 shows relative sectoral nominal hourly wages in both countries accord with our model. Manufacturing wages rise faster than aggregate wages, which is consistent with its higher rate of relative rate of productivity growth. The converse holds for services in the Netherlands, but relative wages in the services sector have increased in Australia.

Figure 2 Relative sectoral wages for Australia and the Netherlands, various years

(a) The Netherlands, 1951-2000   (b) Australia, 1985-2001
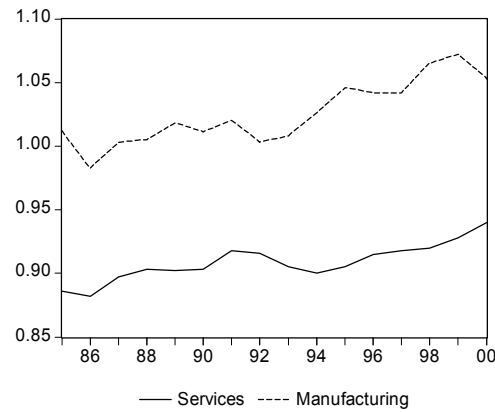
Source: see Data Appendix.

Wage Share

The model in Section 3 implies that the wage share in services will lie consistently above the aggregate wage share, whereas the manufacturing wage will lie consistently below. Figure 3 computes the sector wage shares expressed as ratios to the total wage share for the Netherlands. Apart from the turbulent period around the oil crises, the relative services wage share is generally greater than unity and the relative manufacturing share is generally below unity.

Data limitations prevent sectoral wage shares for Australia being computed. CMW (2001) examined trends in the Australian non-farm wage share since September 1959. While counter- cyclical patterns were evident over the entire period, there was a modest increasing trend up to the Accord (1983). Two notable rises occurred in the mid 1970s and in 1982/83. Over the Accord period, the wage share trended downward with some slowing of this movement due to the 1990s recession. The aggregate wage share is now stable around this lower level with no break attributable to the introduction of the WRA.

Figure 3 Relative sectoral wage share, the Netherlands, 1951-2000
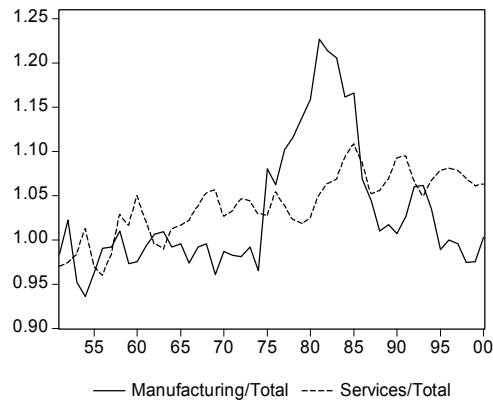
Source: see Data Appendix.

Industry Wage and Productivity Dispersion

Figure 4 shows the standard deviations of the log of real hourly wages (using the Implicit Price Deflator) and the log hourly productivity by industry for the Netherlands and Australia. The standard deviations of hourly consumption wages and productivity increase in a broadly similar manner, which would be expected. In Australia, there is also a systematic increase in sectoral productivity differences. Of note is that there has been no significant increase in the standard deviation of real wages since the mid-1990s, in spite of the introduction of the WRA which would be expected to increase wage differentials with wage movements more closely reflecting productivity movements.

Rank Correlation

We can gauge how disparate the industry wage outcomes are by computing rank correlations. High rank correlation would be consistent with industry wage outcomes following common patterns (or leadership).

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Figure 4 Standard deviations of hourly wages and productivity, Australia and the Netherlands

(a)
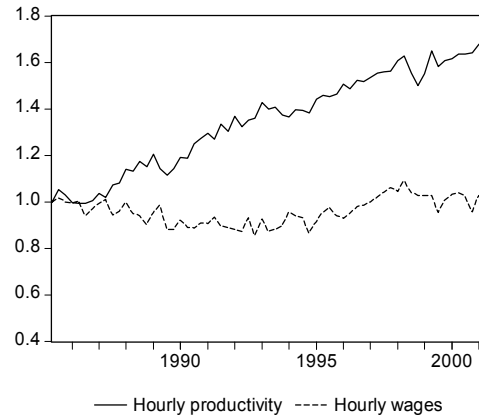The Netherlands 1985 to 2000

(b)
Australia 1985:2 to 2001:2

Source: see Data Appendix.

Figure 5 shows the rank correlations of hourly nominal wages for the two countries for 1986-2000, based on 1985. The Australian rank correlations are based on annual (four-quarter) average nominal wages whereas the Dutch calculations are based on annual nominal wage costs per hour. The correlations remain the same if real consumption wages are used. While the Australian figures lie below the Dutch, there are more Australian sectors. All the rank correlations are significant at the .01 level in a one tailed test.

Since 1985 the correlation between sectoral productivity *growth* and the *level* of sectoral wages in the Netherlands has been generally positive and quite high. This confirms the stability of the rank order of sectoral wages, despite greater influence of sectoral productivity. In contrast, sector wage setting in Australia is less sensitive to sector specific factors (see Section 5).

Figure 5 Rank Correlations for hourly wages, Australia and the Netherlands.
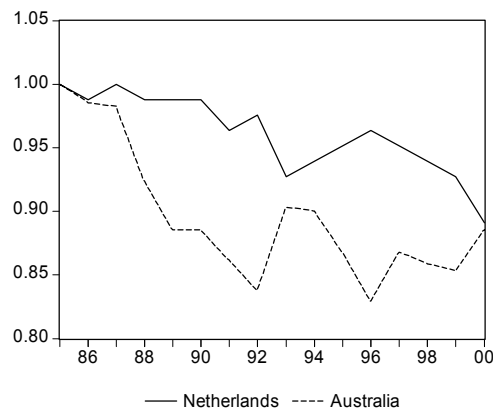
Sample: 1986-2000

Source: see Data Appendix.

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5. Regression analysis

To examine the model developed in Section 3, we estimated real hourly wages equations at the industry level for both countries. The regressions took the form (in logs):

$$(7) \qquad \left(w/p\right)_{it} = \alpha_0 + \alpha_1 \left(w/p\right)_{it-1} + \alpha_2 g_{it}$$
$$+ \alpha_3 g_{t-1} + \beta u_t + e_{it}$$

where w/p are hourly real wages in industry i, g_i is the corresponding output per hour worked in industry i, g is All-industry output per hour worked, and u is aggregate unemployment. This model allows us to discriminate between the influences of sectoral productivity on real hourly wages by industry relative to the impacts of industry-wide productivity movements.

The Australia models were supplemented with a range of dummy variables designed to test for the impact of the different Accord phases (full indexation, partial indexation, structural efficiency, and enterprise bargaining) and the introduction of the WRA (various thresholds were tested). For the Netherlands, we tested for structural breaks associated with the Wassenaar Akkoord. Maximum likelihood estimation corrected for first-order serial correlation was used and the equations were subjected to the usual diagnostic tests and were generally satisfactory.

For comparisons, the reported results are based on equation (3), with the real consumption wage as the dependent variable. We also ran regressions for the Netherlands using the real product wage (using the specific industry sectoral price deflators) and make references to those results later. The long-run own elasticities reported in Tables 3 and 4 are $\alpha_2/(1-\alpha_1) = \gamma_i$ and the total elasticities are $\alpha_3/(1-\alpha_1) = 1-\gamma_i$ for the two countries. The product wage equivalents for the Netherlands are $\alpha_2/(1-\alpha_1) = \gamma_i + \delta_i$ (own elasticities), and $\alpha_3/(1-\alpha_1) = (1-\gamma_i - \delta_i)$ (total elasticities). Full results are available from the authors.

For Australia, real hourly wages in some industries are driven by economy-wide productivity trends, while for others; it is predominantly own-industry productivity that matter. In only four service industries (Accommodation, Cafes and Restaurants; Finance and Insurance; Property and Business Services; and Cultural and Recreation Services), the restriction that the sum of these elasticities is unity is accepted. The model in Section 3 therefore serves as an approximation only. Thus workers in most industries do not fully share in labour productivity growth within the economy. Only workers in Cultural and Recreation Services gain full compensation for their industry-specific productivity increases.

This undermines the rationale of current policy, which is pushing for further wage setting decentralisation. Industry productivity growth is thus being used to expand profit margins. Accordingly, with unemployment still persistently high, it is not clear that the wage share declines stimulated by changing wage arrangements since the early 1980s have been beneficial to the bulk of Australians.

There is also clear evidence that the unemployment rate constrains hourly wages across industries in both services and goods producing sectors. There is no clear relationship between the effect of unemployment and the size of γ_i. This effect, where present, is of a higher magnitude than in the Netherlands.

Most of the significant (negative) break effects are associated with the final two Accord stages (DA3 and DA4) when the Government pursued decentralisation. The WRA does not exert a major additional effect in this sample. The results reflect the findings of CMW (2001) who argued that the key share changes occurred in the 1980s rather than in the 1990s.

The results for the Netherlands reveal that sector productivity effects are generally stronger than for Australia. In two industries, Construction' Education, Health and Community Services; and Wholesale and Retail, productivity increases at the industry level are fully passed on in higher real consumption wages.

The real product regressions for the Netherlands yielded larger own industry elasticities thereby revealing the significance of δ_i, which measures the impact of the relative levels of productivity on relative prices (equation 5). The sum $(\gamma_i + (1-\gamma_i))$ is more often accepted in these regressions thus provide stronger support for the model in Section 3. More research is indicated here.

6. Conclusion

We have shown that despite the trend towards decentralised wage setting in Austalia, wage earners are not being fully compensated for productivity increases and sectoral productivity, in particular is playing a minor role in wage outcomes. In constrast, despite its differential institutional wage setting arrangements, sectoral wage increases in the Netherlands are more closely linked to sectoral productivity changes, although in most industries too, industry productivity gains have been used to expand margins.

Table 2 Sectoral employment, wage and productivity growth rates, Netherlands and Australia

Industry	Measure	1971-1984	1985-1990	1990-1995	1995-2000	1985-2000
Netherlands						
Manufacturing	Employment	-3.49	1.05	-1.99	0.55	-0.14
	Hourly wage costs	3.42	1.94	0.86	2.65	1.82
	Sector price	3.82	3.03	0.26	2.25	1.84
	GVA per hour	5.82	2.04	3.55	2.19	2.59
Construction	Employment	-3.91	1.31	0.14	2.74	1.39
	Hourly wage costs	3.12	3.24	-0.98	-0.22	0.67
	Sector price	7.60	2.93	2.69	2.67	2.76
	GVA per hour	1.86	3.00	-1.44	0.17	0.56
Commercial Services	Employment	-0.48	2.47	2.31	4.38	3.05
	Hourly wage costs	2.68	1.55	0.15	0.72	0.80
	Sector price	6.01	1.32	2.79	1.84	1.98
	GVA per hour	3.48	1.10	0.46	1.14	0.90
Non-Commercial Services	Employment	2.06	1.12	1.55	3.46	2.03
	Hourly wage costs	2.27	1.52	1.12	-0.82	0.60
	Sector price	7.77	1.79	2.75	3.31	2.62
	GVA per hour	0.90	0.56	0.26	-1.65	-0.28
Total Economy	Employment	-1.45	1.58	0.93	3.09	1.86
	Hourly wage costs	2.83	1.77	0.35	0.94	1.02
	Sector price	6.25	0.86	1.62	2.16	1.55
	GVA per hour	3.88	1.51	1.28	0.85	1.22
Australia						
Manufacturing	Employment	n.a.	0.91	-1.11	0.46	0.09
	Hourly wage	n.a.	-0.47	1.11	1.37	0.67
	GVA per hour	n.a.	0.86	1.70	2.75	1.77
Construction	Employment	n.a.	4.36	0.29	3.12	2.58
	Hourly wage	n.a.	1.19	0.19	-0.20	0.39
	GVA per hour	n.a.	-1.64	0.55	-0.07	-0.39
Commercial Services	Employment	n.a.	4.39	1.65	2.39	2.80
	Hourly wage	n.a.	-0.07	0.48	1.99	0.79
	GVA per hour	n.a.	0.96	1.29	3.43	1.89
Non-Commercial Services	Employment	n.a.	3.64	2.47	2.19	2.76
	Hourly wage	n.a.	-0.81	-0.19	1.39	0.12
	GVA per hour	n.a.	0.22	0.27	1.01	0.50
Total Economy	Employment	n.a.	3.30	1.09	1.87	2.08
	Hourly wage	n.a.	-0.44	0.42	1.22	0.40
	GVA per hour	n.a.	0.76	1.31	2.60	1.55

Source: see Data Appendix.

Table 3 Wage-productivity regressions, Australia, 1984 to 2001

Industry	Own Elasticity	Industry Elasticity	UR	Break	Effect	Unity Test	R^2
Mining		0.35		A3, A4	-		0.76
Manufacturing		0.52	-0.07	A3	-		0.92
EGW		0.67		A3, A4	-		0.88
Construction	0.54		-0.04	GST	+		0.63
Wholesale Trade	0.25		-0.06	A4, WRA	-		0.79
Retail Trade		0.40	-0.02				0.85
Accom, Cafes, Restaurants		0.72				*	0.82
Transport	0.16			A3	-		0.83
Communications		0.47		1994 on	+		0.87
Finance		1.04				*	0.92
Property and Business	0.27	0.54		GST	+	*	0.86
Government		0.48	-0.09	A3, A4	-		0.93
Education	0.20	0.22	-0.03	A1, A2	-		0.72
Health and Community		0.54					0.78
Cultural and Recreation	0.79		-0.07			*	0.53
Personal and Other	0.31			A3	-		0.64

Note: Own elasticity relates to sectoral productivity and the industry elasticity refers to the All industry effect. The Unity Test refers to a Wald test on the restriction that the productivity elasticity in total (own and industry equals unity. The * indicates acceptance of the null.

Table 4 Wage-productivity regressions, The Netherlands, 1970 to 2001

Industry	Own Elasticity	Industry Elasticity	UR	Break	Unity Test	R^2
Accommodation, Cultural and Personal	1.66	-0.10		1988 -		0.99
Chemical, Rubber and Other		0.75	-0.03	1995 -		0.99
Construction	0.71	0.05		1980 (a) +	*	0.99
Education, Health and Community	1.01	0.29		1981 -	*	0.98
Finance and Insurance		0.36		84, 94 (a) -		0.99
Manufacturing (Main)		1.22		1985 -		0.99
Manufacturing (Other)		0.56		1981 -		0.99
Manufacturing (Metals)	0.52		-0.02	1974 (a) +		0.99
Transport and Communications	0.67			1981 -		0.99
Wholesale and Retail Trade	0.85		-0.02	1980 -	*	0.99

Notes: see Table 4. (a) denotes a single year impact whereas the other breaks are step-dummies. The sign next to the break year signifies the direction of the impact (- for negative, + for positive).

Data Appendix

Australia

Employment and Total Hours Worked by industry came from the ABS, *The Labour Force, Australia*, Cat. No.6203.0.

Gross value added data for 16 non-farm ANZSIC industries came from the ABS, *National Accounts*, Cat. No.5204.0. The value added series are chain indexes. Sectoral price indices were not available so wages were deflated by the non-farm implicit price deflator.

Average hourly wages by industry were computed from the ABS, *Average Weekly Earnings*, 6302.0.

Manufacturing and *construction* are equivalent to the ANZSIC industries. *Commercial-services*: Wholesale; Retail; Accommodation, cafes, restaurants; Transport; Communications; Finance and Insurance, Property and Business; Cultural and Recreation and Personal and Other. *Non-commercial services*: Education and Health and Community.

Netherlands

Annual data (1951-2000) came from the Centraal Planbureau (CPB). Hourly wages in the Netherlands were deflated with industry deflators.

M*anufacturing*: Metaal; Overige; Voedings en genotmiddelen Chemische, rubber and kunststof. *Construction*: Bouwnijverheid en installatiebedrijven. *Commercial services*: Transport en opslag; Handel en reparatiebedrijven; Verhuur van en handel in onroerend goed; Uitzendbureaus and Tertiair Overige; Post en telecommunicatie; and Bank en verzekeringswezen. *Non-commerical services*: Zorg.

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