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International Patterns of Union Membership

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Abstract

This paper examines changes in unionization that have occurred over the last decade or so using individual level micro data on many countries, with particular emphasis on the United Kingdom, the United States and Canada. I document an empirical regularity not hitherto identified, namely the probability of being unionized follows an inverted U-shaped pattern in age, maximizing in the mid- to late 40s in 34 of the 38 countries I study. I consider the question of why union membership seems to follow a similar inverted U-shape pattern in age across countries with such diverse industrial relations systems. I find evidence that this arises in part because of cohort effects, but even when cohort effects are removed a U-shape remains.

1. Introduction

This paper examines changes in unionization that have occurred over the last decade or so using individual level micro data on 27 of the 30 OECD countries, with particular emphasis on Canada, the United Kingdom and the United States. Micro data are also used to model union membership in a further 11 non-OECD countries.

The characteristics of union members show many similarities across countries. Density rates are generally higher for men than for women, and in the public sector than in the private sector. For the United Kingdom and the United States I find the probability of being a union member is higher for blacks than whites and higher for full-timers than part-timers. Most striking of all, the probability of being a union member follows an inverted U-shaped pattern in age, maximizing in Canada, the United States and the United Kingdom in the mid- to late 40s. This inverted U-shaped pattern is repeated in a further 31 countries, the unweighted average of the age maximum of all 34 countries being 48. The only countries where I did not find evidence that

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density had an inverted U-shape in age are the Philippines, Cyprus, Latvia and Brazil.

First, I examine changes in unionization across countries and document recent changes. Then I use rich micro data for the United Kingdom, Canada and the United States to estimate the probability of union membership. I examine these three countries first because the data sets are comparable, cover many years and are large. I then present similar analyses for many countries from the International Social Survey Programme (ISSP) and the European Social Survey (ESS) and the Eurobarometers of 1988–1994 and 2001 (EB). I find evidence of an inverted U-shape in age in 34 countries — Australia, Austria, Bangladesh, Belgium, Bulgaria, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Israel, Japan, Italy, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Russia, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, the United Kingdom and the United States. Finally, I consider the question of why the probability of union membership follows an inverted U-shape in age across so many countries with diverse industrial relations systems. However, the fact that the result is so widespread across such a diverse group of countries suggests that its explanation is unlikely to be driven by country-specific institutional features. There is evidence from the United States and the United Kingdom that there are strong cohort effects at work, but even when cohort effects are removed an inverted U-shape remains.

2. Characteristics of union members

Over the last three decades or so there have been a series of global changes that have weakened the power of unions (Pencavel 2005). Product markets have become more competitive and the composition of employment has also shifted from highly unionized to traditionally non-union sectors and workers. Younger workers have shown less interest in belonging to unions than their parents and their grandparents (Blanden and Machin 2003). Labour markets have also become increasingly internationalized, as trade has been liberalized, immigration increased, and capital markets taken on a more global structure. A major slowdown in world economic growth and productivity and increased inflation following the 1970s oil shocks created adverse labour market situations in most countries. Unemployment rates soared, particularly in Europe; unemployment consistent with given levels of vacancies rose; real wages fell for blue-collar workers, particularly in the United States, and unions in several countries took real wage cuts in the 1980s in order to stimulate employment. An important exception is the United Kingdom, where substantial real wage gains were experienced across the wage distribution through the 1980s and 1990s. Katz *et al*. (1995) provide a discussion.

Labour laws in many countries have also become much less union friendly than they were in the past. Blanchflower and Freeman (1994) provide a discussion of the impact of the Thatcher reforms on the British labour market, and for more recent evaluations, see the various chapters in Blundell *et al.* (2004). For instance, over the last two decades New Zealand has experienced economic liberalization, welfare cuts and the restructuring of the industrial relations system by eliminating national awards and removing compulsory unionism. Union density fell as a consequence. In other countries, such as the United States, there has been an increase in overt employer hostility towards unions as measured by increases in violations of labour laws (Kleiner 2002).

For all of these reasons one would expect to see unions in retreat across the globe (Blanchflower and Freeman 1992). Table 1 does show that unions have been in decline in most of the major OECD countries for the period 1970–2003. For example, using data from the final column of the table, Australia (–27), Austria (–27) and New Zealand (–33) all experienced declines of more than 20 percentage points, with percentage point declines from 1970 to 2003 in parentheses. However, there are several examples of countries over the same period that had *increases* in union density rates (e.g. Belgium (+13); Denmark (+10); Finland (+23) and Sweden (+10)). The story is different, however, if we confine ourselves to the last decade or so. If we examine columns 7 and 8 of Table 1 for the periods 1993–1998 and 1998–2003, it is apparent that, with the exception of Belgium, which had a very small increase, union density rates in the remaining 19 countries were lower in 2003 than

TABLE 1
Union Density Rate Changes, 1970–2003

	1970	*1990*	*1993*	*1998*	*2003*	*1970–2003*	*1993–1998*	*1998–2003*
						Percentage point changes		
Australia	50	41	38	28	23	–27.3	–9.5	–5.2
Austria	63	47	43	38	35*	–27.4	–4.8	–3.0
Belgium	42	54	55	55	55*	+13.3	+0.4	0.0
Canada	32	33	33	29	28	–3.2	–4.3	–0.1
Denmark	60	75	77	76	70	+10.1	–1.7	–5.2
Finland	51	73	81	78	74	+22.8	–2.7	–3.9
France	22	10	10	8	8	–13.4	–1.6	+0.3
Germany	32	31	32	26	23	–9.4	–5.9	–3.3
Ireland	53	51	48	42	35	–17.9	–6.2	–6.2
Italy	37	39	39	36	34	–3.3	–3.5	–2.0
Japan	35	25	24	23	20	–15.4	–1.8	–2.8
Korea	13	18	15	12	11	–1.4	–2.4	–0.9
The Netherlands	37	24	26	25	22	–14.2	–1.4	–2.2
New Zealand	55	51	35	22	22*	–33.1	–12.2	–0.2
Norway	57	59	58	56	53	–3.5	–2.5	–2.2
Spain		13	18	16	16	n/a	–2.6	–3.3
Switzerland	29	24	23	22	18**	–11.1	–1.2	–3.9
United Kingdom	45	39	36	30	29	–15.5	–6.0	–0.8
United States	24	16	15	13	12	–11.1	–1.7	–1.0

Source: Visser (2006).
* = 2002; ** = 2001.

they were in both 1993 and 1998. *Not a single OECD country experienced rising union density between 1998 and 2003*. In addition, three of the four countries that had big increases over the period 1970–2003 experienced *declines* in density in the two most recent periods (Denmark, Finland and Sweden). There is considerable evidence that unions over the last 10 years have been in retreat in most major countries. There is some evidence, then, that unionization rates across countries have started to converge.

Despite considerable differences in the time series paths of union density rates and in the level of density, there are many similarities in the characteristics of union members across countries in terms of the industry where they work, their race, gender and whether they are employed in the public or private sectors. As we will see in further detail below, what is particularly notable is that the probability of an individual being a union member follows an inverted U-shape maximizing around age 50 in all OECD countries.

We start with a comparison of Canada, the United States and the United Kingdom where the micro data available are particularly detailed. Table 2 provides details of the characteristics of union members in the three countries in 2004 (2005 for the United States). Despite considerable differences in the levels of union density in the three countries, there are many similarities in the characteristics of union members and in the sectors in which union workers are employed. Union density is currently 28.8 per cent in the United Kingdom compared with 12.8 per cent in the United States and 30.7 per cent in Canada. In all three countries the rates by gender are little different, while the membership of blacks is *higher* than that of whites in the United Kingdom and the United States. This is not true of other racial groups — in the United Kingdom Indians, Pakistanis and Bangladeshis ('Asians') have relatively low union density rates, as do Hispanics in the United States. The young are less likely to be members of unions in all three countries. Membership rates in manufacturing and construction are lower than average in the United Kingdom, but higher than average in the United States. Public-sector unionism is higher than in the private sector in all three countries although the difference is greater in the United Kingdom and Canada than it is in the United States.

Trends in union density have diverged between the public and private sectors in the United States, the United Kingdom, Canada and elsewhere. (See for the United Kingdom, 1948–1979, from Bain and Price 1983b, table 5 and Grainger and Holt 2005. For the United States the data are downloadable at http://www.unionstats.com. For Canada, see Lipset and Meltz 2004.) Workers in the public sector are members of unions while private-sector workers are less inclined to be so. In the United States, private density has fallen steadily in almost every year since 1960, while in Canada and the United Kingdom it has fallen since the early 1990s. The story in the public sector is very different. In the case of the United States, public-sector density reached its highest level of 40.2 per cent in 1976 and then has remained more or less steady in the 35 per cent range since then. In the United Kingdom, public-sector density has also fallen since the early 1990s (1993 = 64.4 per cent compared with 58.4 per cent in 2004), whereas public-sector density in

TABLE 2
Union Membership Rates by Characteristics, 2004/2005

	United Kingdom (2004)	*United States (2005)*	*Canada (2005)*
All	28.8	12.5	29.8
Males	28.5	13.8	29.8
Females	29.1	11.1	29.8
White	29.0	12.2	
Asian	23.5	11.4	
Black	32.5	15.1	
Hispanic		10.1	
Degree or equivalent	37.7	14.8	33.4
A-level or equivalent	26.4	14.3	26.7
No qualifications	21.1	7.7	28.1
Age 16–19	4.3	2.9	9.7
Age 20–24	13.1	5.4	14.6
Age 25–29	22.4	9.4	24.4
Age 30–34	27.1	11.7	28.8
Age 35–39	30.9	13.3	30.0
Age 40–44	34.5	14.1	33.5
Age 45–49	38.9	16.1	38.6
Age 50–54	39.7	18.2	42.2
Age 55–59	36.0	17.9	40.0
Age 60–64	27.8	15.1	32.7
Age 65–69	9.6	7.9	16.2
Age ≥70	5.9	6.9	12.1
Private	17.2	9.0	17.4
Public	58.8	37.2	71.4
Manufacturing	24.6	12.9	30.0
Construction	16.7	14.7	30.9
Managers	18.6	13.1	8.1
Professional occupations	48.6	18.2	14.6
Skilled trades	26.0	19.4	38.0

Sources: UK: Grainger and Holt (2005). USA: Union members in 2005, BLS, UDDL 06-99, http://www.bls.gov/news.release/pdf/union2. For Canada Labour Force Survey December 2005 and for the rates by age UK Labour Force Survey autumn 2004 and for the US MORG 2004 all weighted (own calculations).

Canada has actually *increased* (1990 = 64.6 per cent compared with 70.6 per cent in 2005). At the time of writing the United Kingdom and Canada had density rates in the private sector of around 17 per cent, more than double the US rate of 8 per cent. Public-sector density rates in the United Kingdom and Canada (58.8 per cent and 70.6 per cent) were also higher than the rate in the United States (36.5 per cent).

Visser (2003, table 11.8(A1)) reported union density estimates for a number of countries, which confirm that the much higher rate in the public sector is very general across OECD countries (below). His, somewhat older, estimates for the United Kingdom, the United States and Canada are very close to those reported in Table 2. The difference is especially stark in Switzerland, Poland and Canada.

	Private	*Public*
Australia (1998)	24	55
Austria (1998)	30	69
Canada (2000)	18	70
Denmark (1997)	65	86
Finland (1989)	65	86
France (1993)	4	25
Germany (1997)	22	56
Great Britain (1999)	19	60
Israel (1997)	25	50
Italy (1997)	36	43
Japan (1995)	22	68
Netherlands (1997)	19	45
Norway (1995)	44	79
Poland (1999)	10	80
Spain (1997)	15	32
Sweden (1997)	77	93
Switzerland (1988)	22	71
US (1999)	9	37

To determine whether a randomly selected individual is a member of a union or not, it is clearly crucial to know whether he or she works in the public sector. In addition, knowing their age is crucial.

Table 2 makes it clear that union density rates rise with age, with relatively low rates when members are young in all three countries with the highest rates around age 50. After age 50 union membership rates subsequently decline. Density rates are especially low for those under the age of 20 in all three countries. In the case of Canada, Morissette *et al.* (2005) show that unionization rates for the age group 55–64 became lower than workers aged 45–54 only from the end of the 1980s (sources: Labour Force Survey 1998, 2004; Labour Market Activity Survey 1986, 1989; Survey of Work History 1981.) The inverse U-shaped pattern appears to be a relatively new phenomenon in Canada, although the reasons for this are uncertain. Their reported union density rates are presented below.

Age	*1981*	*1986*	*1989*	*1998*	*2004*
17–24	26.4	17.1	18.4	11.9	13.6
25–34	39.8	36.4	34.7	25.0	26.1
35–44	42.0	43.3	42.9	35.8	32.8
45–54	41.7	43.4	44.6	42.8	41.2
55–64	41.9	43.8	41.6	38.4	38.2

It is apparent that there are other similarities between Canada, the United States and the United Kingdom in the characteristics of union members, who are disproportionately male, older and employed in the public sector. Union density is highest in all three countries among the most educated. There are a number of differences though; density is higher in construction than it is in the private sector and overall in the United States and Canada, but below it in the United Kingdom. Professional occupations have a considerably higher probability of being unionized in the United Kingdom than in the other two countries. Males have a higher probability of being unionized in the United States, but there is little difference by gender in the United Kingdom and Canada. We now turn to model econometrically micro data on union members in Canada, the United Kingdom, the United States and elsewhere to further explore such differences in the characteristics of union members.

3. Econometric analyses

What are the characteristics of individuals who belong to a trade union? The union membership decision has generally been modelled by economists under a demand and supply framework. The demand for unionization on the part of workers (Schnabel 2003), U^d, is written as follows

$$U^d = d(c, D, z, s, t) \tag{1}$$

where c is the cost of membership, D is the union wage gap, z are non-pecuniary benefits such as better working conditions, s is the cost of social welfare benefits and t is the individual's taste for unionism. The higher is the wage gap, non-pecuniary benefits and the greater the taste for unions and the lower are alternative benefits the greater the demand for unions. The supply of union U^s is written where

$$U^s = s(p, g) \tag{2}$$

and p is the cost of providing union services and g in the supply function stands for union goals, such as maximizing membership. Assuming market clearing the equilibrium level of unionism $U = U^d = U^s$. In reduced form then $U = f(t, D, z, s, t, p, g)$, which is what is generally estimated empirically. Since most of these factors cannot be measured they are often substituted by proxy variables such as personal characteristics, industry and location that are likely to impact unionism.

The starting point for the empirical analysis will be a comparison of the determinants of union membership in the United Kingdom, the United States and Canada using several large individual level micro data files with broadly similar sets of control variables. I then move on to examine data from the three cross-country data files that have the same information available in a further 35 countries. In each case I conduct country level analysis. Details of the data files used in this analysis are provided in the appendix.

United Kingdom

A number of papers have modelled the determinants of union membership in the United Kingdom using micro data at the level of the individual. Papers include Stewart (1987), Bain and Elias (1985), Booth (1986), Payne (1989), Green (1990, 1992), Cregan (1991), Elias (1996), Blanden and Machin (2003) and Machin (2004). There is evidence that the probability of membership is higher among men, is positively related to age or experience and in some cases is concave in age. There is also some evidence of positive non-white effects and negative education effects. For a discussion, see Riley (1997) and Schnabel (2003). Note that in the United Kingdom union membership is an individual decision; hence union members are employed at workplaces which are covered by collective agreements or which recognize unions for bargaining. However, in contrast to the United States, for example, union members are also employed at 'non-union' workplaces.

Table 3 reports the results of estimating dprobit models of union membership for the United Kingdom. Probit analysis is performed here using the dprobit command in the statistical program STATA 9.0 SE. Dprobit reports the marginal effect, that is, the change in the probability for an infinitesimal change in each independent, continuous variable and by default, reports the discrete change in the probability for dummy variables. The sample is restricted to workers only. The dependent variable is set to 1 if the individual is a union member, 0 otherwise. In all equations the following controls are included — age and its square, gender, race dummies, qualification dummies, industry dummies, region of residence dummies and a full-time dummy. A time trend (1993 = 0) is included in columns 1–3 rather than year dummies to determine the *ceteris paribus* annual rate of decline. Columns 2 and 5 restrict the samples to the private sector while columns 3 and 6 restrict it to the public sector. Column 3 adds five more dummies to distinguish the type of public-sector organization, with Central Government the excluded category: such data are not available in the General Household Survey (GHS). For brevity the coefficients and *t*-statistics on only higher degree and bachelor's degree are reported compared to the excluded category 'no qualifications', although a full set of education variables are included.

The main findings are as follows.

- Men are significantly *more* likely to be members than women. This contrasts with the results obtained in Machin (2004: 430), who finds 'by 2001 there is no gender gap in union membership' even though the male variable in his Table 2 has a (small) positive coefficient and a *t*-statistic of 1.75.[1] There are no gender effects in the public sector in either time period.[2]
- Blacks have a *higher* probability of being unionized than whites.
- Overall schooling and qualifications are related *positively* to membership in the public sector, but *negatively* in the private sector and the differences are large. Individuals with a first degree have a 3.4-percentage-point *lower* probability of being a union member than a worker without formal qualifications in the private sector, but a 16-percentage-point *higher* probability in the public sector. This was not apparent in 1983.
- The probability of being a union member rises with age and reaches a maximum in the late 40s (48 using the Labour Force Survey (LFS) and 46 from the GHS). When a set of 11 age dummies, each covering five years (e.g. 20–24) are included, the function maximizes a little higher in the age category 50–54. There was no evidence to suggest that higher order terms in age were significant.

TABLE 3
Dprobit Union Membership, United Kingdom: 1993–2004 and 1983

	LFS 1993–2004			*GHS 1983*		
	All	*Private*	*Public*	*All*	*Private*	*Public*
Time	–0.0047 (28.09)	–0.0030 (19.64)	–0.0056 (14.29)			
Private	–0.3941 (192.30)			–0.5101 (28.71)		
Nationalized industry			0.0556 (5.76)			
Local government			0.0954 (22.35)			
Universities			–0.0549 (8.15)			
National Health Service			0.0304 (5.18)			
Other government			–0.2617 (29.62)			
Age	0.022166 (75.47)	0.015543 (61.30)	0.03729 (48.75)	0.02765 (9.53)	0.02206 (7.39)	0.02573 (6.72)
Age^2	–0.000231 (65.75)	–0.000163 (53.67)	–0.000387 (42.73)	–0.00030 (8.61)	–0.00024 (6.58)	–0.00029 (6.31)
Male	0.0247 (18.29)	0.0343 (27.71)	0.0018 (0.60)	0.0310 (2.02)	0.0432 (2.61)	0.0001 (0.01)
Black	0.0326 (6.43)	0.0386 (7.46)	–0.0160 (1.64)	0.2658 (4.27)	0.2645 (3.27)	0.1472 (2.86)
Asian	–0.0326 (8.67)	–0.0171 (5.12)	–0.0839 (8.58)	0.0425 (0.82)	0.0384 (0.71)	0.0126 (0.17)
Chinese	–0.1134 (9.91)	–0.0776 (7.28)	–0.1641 (5.55)			
Other race	–0.0408 (7.10)	–0.0321 (5.89)	–0.0504 (3.95)	–0.0834 (1.13)	–0.1050 (1.35)	–0.0346 (0.37)
Full-time	0.1167 (83.25)	0.0500 (36.08)	0.2590 (83.71)	0.2663 (15.29)	0.2037 (10.76)	0.2416 (10.74)
Higher degree	0.0860 (25.67)	+0.0139 (4.01)	+0.1818 (31.52)	–0.0030 (0.11)	–0.1166 (1.47)	0.0495 (0.87)
First degree	0.0347 (14.03)	–0.0242 (11.09)	+0.1559 (30.07)	–0.1274 (4.73)	–0.1971 (6.63)	–0.0065 (0.23)
Industry dummies	61	61	61	9	9	9
Residence dummies	22	22	22	11	11	11
Education dummies	40	40	40	19	19	19
N	710,567	538,305	172,106	9,075	5,872	3,202
Pseudo R^2	0.2250	0.1304	0.1331	0.2600	0.1679	0.1652
Age maximum	48	48	48	46	46	44

Notes: Excluded categories are white, no qualifications and central government. *T*-statistics in parentheses.
Sources: Labour Force Surveys, 1993–2004 and 1983 General Household Survey.

- The maximum of the age function has moved up slightly over time from 46 in 1983 to 48 in 1993–2003.
- Union density has declined by nearly half a percentage point a year holding constant characteristics.
- There remains a large public-sector differential of more than 40 percentage points.
- Full-timers have higher density rates than part-timers.
- The broad patterns observed in the data using the LFS from 1993–2004 are similar to those observed using a much smaller data file from the GHS for 1983.

United States

I now turn to estimating dprobit models of union membership in the United States using data from the Current Population Survey (CPS) Merged Outgoing Rotation Group (MORG) Files of 1984–1991 and separately for 1992–2004 to determine the extent to which the unionized workforce in the two countries is comparable. I use data from the earlier period as background; union data first become available in the MORGs in 1984. Information is available on the union status of approximately 1.6 million workers in the first period and over two million in the later period. Even though data are available for 2003 and 2004, I report separate estimates for 1992–2002 and 2003–2004 because of changes in the industry code, which went from one based on the SIC to NAICS, which make comparisons difficult. The dependent variable is set to 1 if the individual is a union member, 0 otherwise. It is necessary to change the schooling measure in the later period because the Bureau of Labor Statistics (BLS) switched from a schooling measure to a more credential based indicator. In all equations age and its square, full-time status dummy, race dummies, a gender dummy plus controls to distinguish whether the individual worked in the public or private sector as well as state and industry are included. Controls are as similar as I can make them to the controls used in the UK analysis above. Examples of papers for the United States that model the probability of union membership using micro data include Antos *et al*. (1980) and Hirsch and Berger (1984).

Table 4 for the period 1984–1991 includes years of schooling as the education control. Table 5 for the subsequent period includes 15 highest qualification controls; the decision to split the data in two in 1992 arises because of changes in the education question in the CPS in that year. Separate results are presented for the periods 1992–2002 and then for 2003–2004 because of changes in the industry classification. In Table 3 the coefficients on the four highest education categories compared with workers with less than first-grade education are reported — once again the remaining dummies were included, but the results are not reported. Tables 4 and 5 for the United States suggest that the decline in union density has slowed (from 0.36 percentage points per annum in the first period to 0.18). It is also apparent that the broad patterns are similar — by race, gender, full-time/part-time and by education. The main

TABLE 4
Dprobit Union Membership in the United States, 1984–1991

	All	*Private*	*Public*
Time	–0.0036 (37.62)	–0.0040 (44.10)	–0.0000 (0.12)
Private	–0.1894 (155.61)		
State government			0.1188 (33.32)
Local government			0.2103 (64.57)
Age	0.0132594 (101.73)	0.009822 (83.73)	0.02883 (52.06)
Age^2	–0.000142 (90.56)	–0.000103 (72.66)	–0.000319 (49.47)
Male	0.0421 (74.47)	0.0435 (81.35)	0.0212 (10.17)
Years schooling	–0.0083 (79.10)	–0.0105 (105.34)	0.0061 (15.46)
Black	0.0729 (71.26)	0.0694 (68.10)	0.0920 (28.10)
Other race	–0.0166 (11.60)	–0.0004 (0.26)	–0.0832 (15.45)
Hispanic	0.0108 (8.92)	0.0020 (1.88)	0.0396 (7.56)
Full-time	0.0590 (82.39)	0.0237 (34.12)	0.2572 (96.10)
Industry dummies	45	45	45
State dummies	51	51	51
N	1,600,112	1,315,835	284,243
Pseudo R^2	0.2278	0.2136	0.2072
Age maximum	47	48	45

Source: MORG files of the CPS 1984–1991.
Note: T-statistics in parentheses.

difference between the two tables is that in the first period the trend in public-sector density is insignificant, but in the second period it turns down. The results reported here are broadly consistent with those of Bender (1997), who used individual-level data from the 1972 and 1987 May CPS files to estimate separate union membership equations for each of these years using a variety of estimation techniques. However, in contrast to the results reported here, his sample was restricted to manufacturing only. He found some decline in the gender and age/experience terms over time, but overall found relatively few significant differences between the estimated coefficients over time. The results were broadly similar whichever estimation method was used. Changing socio-demographic characteristics did not have a large effect on the decline in density, which is consistent with the results reported here. Bender's (1997) central finding is that gains in educational levels, changing occupations, and reductions in the economies of scale of union organizing activity appear to have played a much more important role. For brevity only a few selected qualifications and state dummies are reported.

- Men are more likely to be members than women in both the private and public sectors, by between three and four percentage points.
- Blacks have a higher probability of being unionized than whites.
- Overall schooling and qualifications are related *positively* to membership in the public sector, but *negatively* in the private sector.
- The probability of being a union member rises with age and reaches a maximum in the late 40s (47 for 1984–1991, 49 from 1992 to 2002 and 48 for 2003–2004). There was no evidence to suggest that higher order terms in age were significant. When a set of 11 age dummies, each covering five

TABLE 5
Dprobit Union Membership in the United States, 1992–2002 and 2003–2004

	All *1992–2002*	*Private* *1992–2002*	*Public* *1992–2002*	*All* *2003–2004*	*Private* *2003–2004*	*Public* *2003–2004*
Time/2004 dummy	–0.0018 (26.98)	–0.0018 (30.40)	–0.0007 (2.56)	–0.0016 (1.92)	–0.0012 (1.73)	–0.0041 (0.97)
Private	–0.1926 (183.27)			–0.1727 (78.55)		
State govt.			0.0960 (28.30)			0.1099 (12.52)
Local govt.			0.1759 (55.38)			0.1924 (22.89)
Age	0.010518 (96.97)	0.00697 (75.44)	0.0327 (61.98)	0.0084 (40.58)	0.00495 (29.43)	0.0330 (28.11)
Age^2	–0.000108 (84.45)	–0.000068 (62.15)	–0.00036 (58.90)	–0.000087 (36.25)	–0.00005 (24.62)	–0.00004 (27.2)
Male	0.0329 (69.73)	0.0318 (74.60)	0.0359 (17.81)	0.0250 (27.03)	0.0224 (27.58)	0.0446 (9.77)
Black	0.0508 (61.21)	0.0472 (60.12)	0.0613 (19.68)	0.0304 (18.64)	0.0278 (18.89)	0.0470 (6.36)
American Indian	–0.0347 (18.14)	–0.0007 (0.34)	–0.1616 (22.15)	–0.0228 (6.20)	0.0049 (1.19)	–0.1318 (7.89)
Asian	–0.0111 (9.39)	0.0012 (1.08)	–0.0721 (12.66)	–0.0064 (2.93)	0.0042 (2.15)	–0.0753 (6.18)
Hispanic	0.0137 (15.10)	0.0121 (15.50)	0.0252 (5.76)	0.0018 (1.11)	0.0017 (1.24)	0.0080 (0.83)
Full-time	0.0152 (29.81)	0.0023 (4.78)	0.0957 (44.38)	0.0380 (16.64)	0.0257 (12.02)	0.0890 (9.71)
First degree	0.0238 (3.75)	–0.0120 (2.77)	0.4284 (7.46)	0.0057 (0.53)	–0.0124 (1.73)	0.2970 (2.41)
Master's degree	0.0411 (8.16)	–0.0206 (5.12)	0.2197 (3.66)	0.0172 (1.48)	–0.0192 (2.98)	0.3455 (2.75)
Professional degree	–0.0272 (4.91)	–0.0251 (6.04)	0.2197 (3.66)	–0.0277 (2.98)	–0.0176 (2.52)	0.0908 (0.73)
Higher degree	–0.0411 (8.16)	–0.0352 (9.37)	0.2294 (3.82)	–0.0334 (3.84)	–0.0238 (3.70)	0.1305 (1.04)
Industry dummies	45	45	45	90	90	90
State dummies	50	50	50	50	50	50
Schooling dummies	15	15	15	15	15	15
N	1,811,934	1,501,651	310,269	343,504	284,398	58,469
Pseudo R^2	0.2373	0.1878	0.1938	0.2658	0.2052	0.1932
Age maximum	49	51	46	48	51	46

Source: ORG files of the CPS, 1992–2002.
Notes: Excluded category Federal Government, Maine, less than first-grade education and white. *T*-statistics in parentheses.

years (e.g. ages 20–24) are included, the function maximizes in the age category 50–54.

- As in the United Kingdom, the maximum of the age function has moved up slightly over time from 47 for the period 1979–1991, to 49 for the period 1992–2002 (48 for 2003–2004). The age maximum in the United States is higher in the private sector than in the public sector, whereas it is the same in the two sectors in the United Kingdom.
- Union density has declined by 0.4 of a percentage point a year holding constant characteristics.
- There remains a large public-sector differential of 20 percentage points.
- Full-timers have *higher* density rates than part-timers.
- The broad patterns observed in the data for 1984–1991 are similar to those observed for 1992–2004.

Canada

Table 6 presents the results of estimating a union membership dprobit for employees in Canada using data from the June 1997–December 2005

TABLE 6
Union Density Equations for Canada, 1997–2005

	All	*Private*	*Public*
Age 20–24	0.0520 (15.56)	0.0370 (14.54)	0.1606 (20.23)
Age 25–29	0.1508 (43.62)	0.0818 (30.11)	0.2670 (43.15)
Age 30–34	0.1933 (56.17)	0.1086 (39.49)	0.2935 (49.52)
Age 35–39	0.2179 (64.53)	0.1327 (48.57)	0.3092 (51.09)
Age 40–44	0.2394 (71.52)	0.1559 (56.60)	0.3234 (52.02)
Age 45–49	0.2615 (76.90)	0.1845 (63.90)	0.3274 (52.31)
Age 50–54	0.2693 (76.79)	0.1957 (64.03)	0.3182 (52.30)
Age 55–59	0.2472 (65.28)	0.1823 (54.69)	0.2798 (47.77)
Age 60–64	0.2079 (44.82)	0.1466 (35.93)	0.2527 (40.07)
Age 65–69	0.0123 (1.47)	0.0111 (1.56)	0.1650 (12.83)
Age ≥70	–0.0421 (3.21)	–0.0065 (0.58)	0.1026 (4.76)
Time	–0.00008 (0.38)	–0.0010 (5.98)	0.0028 (7.48)
Male	0.0577 (49.00)	0.0675 (66.94)	–0.0214 (10.12)
Some secondary	0.0281 (8.76)	0.0144 (5.97)	0.0855 (10.43)
Grades 11–13	0.0365 (11.81)	0.0195 (8.32)	0.1175 (15.49)
Some post-secondary	0.0044 (1.31)	0.0054 (2.08)	0.0739 (9.05)
Post-secondary	0.0322 (10.84)	0.0103 (4.58)	0.1456 (18.64)
Bachelor's degree	–0.0301 (9.42)	–0.0654 (27.48)	0.1146 (14.88)
Postgraduate degree	–0.0978 (29.26)	–0.0848 (28.47)	0.0224 (2.72)
December	0.0024 (2.29)	0.0023 (2.57)	–0.0022 (1.15)
Private	–0.04657 (223.92)		
Industry dummies	18	18	18
Province dummies	9	9	9
N	905,566	676,647	228,919
Pseudo R^2	0.2701	0.1373	0.0685

Source: Canadian Labour Force Surveys, June 1997–December 2005.
Note: *T*-statistics in parentheses.

Canadian Labour Force Survey (CLFS). We make use of data for each year from the June and December samples. Individuals rotate in and out of the Labour Force Survey — they are in for six months and then leave. New rotation groups enter in June and December each year. There is information in the CLFS on unions for all six rotation groups, however, once you have data for December and June each year, adding the other months adds very little, as essentially the identical information for the same people is repeated. It is not necessary to cluster the standard errors as there are no repeat observations on the same individuals. There are just over 900,000 observations. Controls are included for industry and province and for highest qualification as well as an annual time trend (1997 = 0) and a December dummy to identify the relevant rotation group. Results are reported overall and separately for the private and public sectors. Data on age are only available in bands so 11 dummy variables are included. It is apparent that there is no downward trend overall, although there is a negative trend in the private sector and a positive trend in the public. Males have a higher probability overall and in the private sector, but a *lower* probability in the public. Individuals with degrees have higher probabilities of membership in the public sector and a lower probability in the private compared to those with tenth-grade education or less.

It is appropriate to compare these results for Canada with those of Riddell and Riddell (2004), who examined the similarities and differences in coverage rather than union membership in the United States and Canada for 1984 and 1998 using micro data. This is especially useful given that I have no data on Canada prior to 1997 and the difference between coverage and membership in both countries is not large. In the case of Canada the data source was the Survey of Union Membership carried out in December 1984 ($n = 35{,}223$) and the December 1998 Labour Force Survey ($n = 47{,}904$) and for the United States it was the CPS, for December 1984 and December 1998 ($n = 13{,}275$ and $n = 12{,}852$, respectively). Controls were a series of age dummies, gender, schooling, industry, occupation and province/region dummies. In terms of the changes in Canada between 1984 and 1998 their main findings are that the public-sector coefficient increased (from 0.31 to 0.37); while the age minimum moved up from 25–34 in 1984 to 35–44 in 1998. The male coefficient in Canada was unchanged (0.026), but declined in the United States (0.069 and –0.043, respectively), which is broadly consistent with my findings in column 1 of Tables 4 and 5, where the male coefficient also declined from 0.042 to 0.032. Riddell and Riddell (2004) found that the age maximum in the United States also was 25–34 in the 1984 data and 35–44 in the 1984 data compared with my finding of 47 for 1984–1991 and 49 for 1992–2002 with much larger samples in Tables 4 and 5. The main differences in the controls used for the United States is that I included 50 state dummies while Riddell and Riddell (2004) included 11 occupation dummies and eight region dummies and fewer industry and education controls.

It is apparent that in all three countries using the most recent data available that, *ceteris paribus*,

1. Males have higher probabilities of being union members than females.
2. Private-sector workers have lower probabilities of being members than public-sector workers.
3. More educated workers have higher probabilities of being a union member in the public sector and lower probabilities in the private sector.
4. Full-timers have a higher probability than part-timers.
5. Middle-aged workers have the highest probability of joining a union. There is some evidence that this maximum has risen over time as unionization rates have declined.

Other Countries

Is the inverted U-shaped pattern in these data for the United Kingdom, Canada and the United States repeated in other countries? I explore this issue by using micro data at the level of the individual from three survey series. The data series are (1) ISSP for 2000–2002 ($n = 48{,}194$), (2) The ESSs of 2002 and 2004 (ESS) ($n = 33{,}116$), (3) EB surveys from 1988–1994 and 2001 ($n = 247{,}883$). Details of the surveys are provided in the appendix. Separate dprobit union membership equations for each country are estimated with other controls including gender and education and year dummies if appropriate as well as age and its square. Table 7 reports age maxima for each country in turn where the reported numbers are solved out from the positive age terms and the negative age squared terms if they are significant. Union density is an inverted U-shape in age at least once for 34 countries (including Canada, the United Kingdom and the United States) out of the 38 countries for which I have data. There was no evidence of an inverted U-shape for Latvia, the Philippines, Brazil or Cyprus using the ISSP data. The country with the lowest age maximum at 27 is Bangladesh and the one with the highest at 64 is Hungary. The unweighted average across these countries is 48, which is consistent with the evidence found for the United States and the United Kingdom obtained above where it was possible to also include the two age terms. Sample sizes are somewhat smaller in the ISSP and the ESS than in the EBs, where the most consistent evidence is found. In particular it appears that membership is related to age in an inverse U-shape maximizing in the late 40s, no matter what the level of union density prevailing in the country or whether it is corporatist or not.

I also explored the extent to which the other patterns identified above were replicated in other countries and the evidence was much more mixed than that for the U-shape in age, presumably in part driven by the relatively small sample sizes. For example, in the case of the equations used to estimate the age maxima in column 1 of Table 7 (results not reported), 12 out of 31 countries had significant and negative male coefficients (Austria, Bangladesh, Canada, Denmark, France, West Germany, Great Britain, Ireland, the Netherlands, Spain, Switzerland and the United States) while four had significant negative coefficients (Finland, Russia, Slovenia and Sweden) with the remainder insignificant. In the case of the ESS equations used in column 2 of Table 7

TABLE 7
Age Maximum in Union Density Equations by Country

	(1)	*(2)*	*(3)*	*Average*
All	47	49	47	48
Australia	43			43
Austria	44	*		44
Bangladesh	27			27
Belgium	37	37	38	38
Bulgaria	46			46
Canada	45			45
Chile	50			50
Czech Republic	53	50		52
Denmark	46	46	46	46
Estonia		45		45
Finland	45	45		45
France	65	*	53	59
Germany		48		48
Germany-East	41		44	43
Germany-West	43		43	43
Great Britain	44	53	47	48
Greece		54	46	50
Hungary	64			64
Ireland	44	47	44	45
Israel	51	60		56
Japan	36			36
Italy		*	51	51
Luxembourg		53	47	50
Mexico	51			51
The Netherlands	*	*	53	53
New Zealand	50			50
Norway	50	55	54	53
Poland	45	48		47
Portugal	59	56	50	55
Russia	55			55
Slovak Republic	57			57
Slovenia	44	50		47
Spain	45	*	45	45
Sweden	47	45		46
Switzerland	46	43		45
United States	44			44
Unweighted Average				48

Notes: Estimates obtained from the coefficients on age and age squared and solving for the maximum in a separate equation for each country.
Sources: Column 1 ISSP 2000–2002; column 2 European Social Survey 2002 and 2004. Column 3 EB Trend File, 1988–1994 and 2001 using the following surveys — 1988 (30); 1989 (31, 31a, 32a); 1990 (33, 34.0, 34.1); 1991 (35.0, 35.1, 36); 1992 (37.0, 37.1, 38.0); 1993 (39.0, 39.1, 40); 1994 (41.0, 41.1) and 2001 (56.1) with EB numbers in parentheses.
* = insignificantly different from zero ($t < 1.90$).

to estimate age maxima, 11 out of 22 countries had positive and significant male effects (Austria, Belgium, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain and Switzerland) while three had significant negative effects (Finland, Slovenia and Sweden) while the remaining eight had insignificant male coefficients. These three countries also had significant negative male coefficients in the ESS equations. Results were even weaker for private-sector and schooling variables in both data sets with more than half of coefficients on each of these variables being insignificantly different from 0. Interestingly, the ISSP equations confirmed the findings for the United Kingdom, the United States and Canada of an inverse U-shape in age, positive male effects and negative private-sector effects.

4. Discussion

The paper reports on the declining levels of union density in many countries both inside and outside the OECD that have occurred in most countries in recent years. It was noted that in many countries unions had been more successful in the public sector than in the private: public-sector densities in many countries were more than 20 percentage points higher. Evidence was also found that males had higher probabilities of being union members in the majority of countries examined, although there was some evidence that females had higher probabilities in the public sector. Similarly, some evidence was found suggesting that education had a positive impact in the public sector and a negative impact in the private.

The most consistent and novel result in the paper is the finding that union membership follows an *inverted U-shape in age* across many countries with different density levels and trends and types of bargaining. We have micro data at the level of the individual on 27 out of the 30 members of the OECD and find an inverted U-shape in age in at least one of our data sets for *all* 27.[3] The only exceptions are Turkey, Korea and Iceland where I have no data. I also have the same inverse U-shaped result for Bangladesh, Chile, Bulgaria, Estonia, Israel, Norway and Russia. The only countries we do not find the result for are based on small samples from four poorer countries — Cyprus, Brazil, Latvia and the Philippines.

The obvious question to ask is why would union membership follow a path that maximizes at around age 50 for so many countries? Given the finding that the pattern operates widely it remains unlikely that the results are going to be driven by country specific factors. It is well known that unions compress differentials, which has the consequence that younger union workers are frequently paid below the values of their marginal value product (MVP) while older union workers are paid more than their MVP (Lazear 1979). This gives an incentive to employers to replace older (union) workers with younger (union) workers or non-union workers whose pay more likely approximates their MVP. The mechanisms by which this is achieved is likely to vary across countries, but with the same ultimate purpose. A number of possibilities present themselves.

1. One plausible answer would be that there are simply cohort effects at work here. Table 7 addresses that question for the United States for the period 1983–2002, the longest period available, and pooling together 20 MORG CPS files with just over 3.4 million data points. Due to the size of the data file we only include gender and private-sector dummies, while in columns 3 and 4 an

additional 50 state dummies are included. Eleven age dummies are included in the first column with a maximum probability at age group 55–59. There are no controls for time here. Adding cohort dummies for decade of birth suggests there are cohort effects — the probabilities of being a union member for the cohort born in the 1980s compared to someone born in the 1950s, is two percentage points lower. There is still evidence of an inverted U-shape with a maximum in the age group 35–39, but now the higher ages have significantly negative coefficients. Adding state dummies reduces slightly the size of the coefficients on the cohort dummies.

Table 8 presents the results of checking for cohort effects in a more detailed way for the United States for the period 1983–2002. Results are presented with and without birth cohort dummies without state dummies in the first two columns and with them in the final two. It is interesting to see the coefficients on the decade of birth becoming more negative with the younger cohorts. The results are stable to the inclusion of state dummies. Including these cohort effects reduces the size of the coefficients on the age dummies and reduces age when the highest probability occurs — in column 3 it goes from 55–59 to 35–39. Using the same CPS data for the United States I estimated a union dprobit that included controls for gender, three race

TABLE 8
Union Density Equations and Cohort Effects for the United States, 1983–2002

	(1)	*(2)*	*(3)*	*(4)*
Age 20–24	0.0845 (54.82)	0.0713 (45.31)	0.0841 (55.71)	0.0720 (46.73)
Age 25–29	0.1544 (97.40)	0.1182 (71.16)	0.1540 (98.49)	0.1193 (72.95)
Age 30–34	0.1920 (118.76)	0.1343 (77.36)	0.1912 (119.53)	0.1351 (78.97)
Age 35–39	0.2168 (131.47)	0.1362 (76.13)	0.2155 (131.92)	0.1367 (77.58)
Age 40–44	0.2384 (140.89)	0.1355 (73.01)	0.2365 (140.89)	0.1357 (74.26)
Age 45–49	0.2586 (147.41)	0.1346 (69.75)	0.2556 (146.63)	0.1341 (70.61)
Age 50–54	0.2684 (147.26)	0.1235 (61.32)	0.2656 (146.49)	0.1240 (62.53)
Age 55–59	0.2721 (142.34)	0.1050 (49.83)	0.2675 (140.75)	0.1054 (50.90)
Age 60–64	0.2358 (114.18)	0.0591 (26.79)	0.2287 (111.84)	0.0595 (27.63)
Age 65–69	0.1009 (39.54)	–0.0355 (15.24)	0.0940 (37.70)	–0.0326 (14.55)
Age ≥70	0.0274 (9.39)	–0.0761 (28.49)	0.0234 (8.29)	–0.0708 (27.69)
Male	0.0755 (199.40)	0.0745 (197.48)	0.0734 (201.59)	0.0725 (199.70)
Private sector	–0.2382 (429.53)	–0.2364 (427.47)	–0.2472 (441.99)	–0.2452 (439.88)
Born 1900–1909		–0.0368 (1.02)		–0.0315 (0.89)
Born 1910–1919		–0.0308 (0.85)		–0.0271 (0.77)
Born 1920–1929		–0.0230 (0.62)		–0.0215 (0.60)
Born 1930–1939		–0.0460 (1.30)		–0.0411 (1.20)
Born 1940–1949		–0.0643 (1.83)		–0.0578 (1.69)
Born 1950–1959		–0.0887 (2.53)		–0.0803 (2.35)
Born 1960–1969		–0.1136 (3.42)		–0.1045 (3.25)
Born 1970–1979		–0.1142 (4.05)		–0.1045 (3.83)
Born 1980–1989		–0.1097 (4.51)		–0.0998 (4.24)
State dummies (50)	No	No	Yes	Yes
N	3,429,407	3,429,407	3,429,407	3,429,407
Pseudo R^2	0.1011	0.1044	0.1449	0.1480

Source: MORG files of the CPS, 1983–2002.

dummies, a private-sector dummy along with a separate dummy for each year of age. The coefficients on these are plotted in Figure 1 as the higher line. The lower three lines report the results of adding a further 90 years of birth cohort dummies, overall and for men and women separately. There is still an inverted U-shape in age, which is lower and somewhat flatter than without the cohort effects. There is an obvious peak for men and then a decline after the mid-30s, whereas for women the function peaks at around 30 and remains more or less flat until age 60. Figure 2 plots the coefficients on the year of birth dummies for men and women combined only. It shows a steady decline in the probability of union membership for those born between 1930 and approximately 1965 and then a flat path after that.

There are cohort effects in union membership in the United States. Union membership in the United States increased from 1935–1950, was fairly flat from 1950–1975 and then declined steadily. One of the reasons that the flow has stabilized since the 1965 birth cohort, who were aged 25 in 1990, is that there are large outflows from union membership as the big cohorts retire. Further, birth cohort size was shrinking from 1960 as the baby boom was ending, so even a steady cohort effect means shrinking numbers. Removing the cohort effects, however, does not remove the inverted U-shape in age, although it does flatten it somewhat.

There are also cohort effects in union membership in the United Kingdom. A similar exercise was conducted for the United Kingdom using the LFS, but with a considerably shorter time run (1992–2004). The picture of the age

FIGURE 1
Variation of US Union Membership Probabilities by Age.

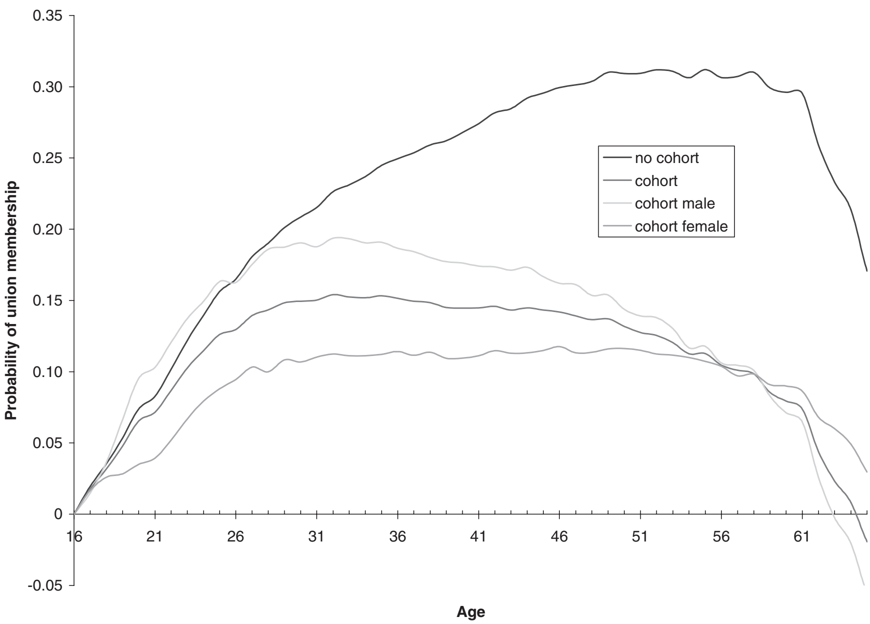
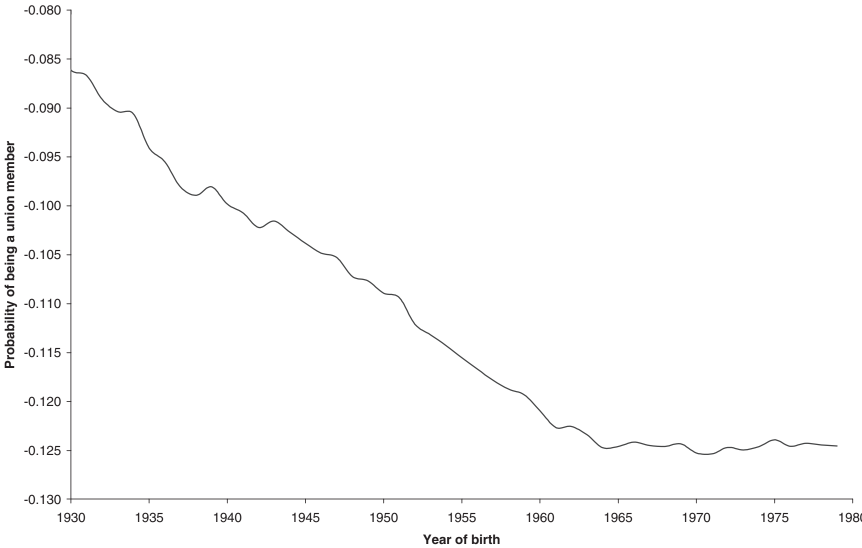


FIGURE 2
Cohort Effects on Union Density, United States.



dummies, with and without cohort dummies, was similar to that reported here for the United States, but the birth dummies showed a steady downward path. Results are reported in Figures 3 and 4. Once the cohort dummies are included the age paths are much flatter than without them and flatter than seen in Figure 1 for the United States, although flatter in the 40s, but there is a clear turn down after approximately age 50. Lack of suitable data prevents us from doing a similar exercise in other countries. Younger cohorts are clearly less willing to join unions than older cohorts were. These findings contrast with those of Disney *et al*. (1998) who examined retrospective data from the mid-1970s using the Family and Working Lives Survey of 1994–1995. They found 'there is no evidence in the data of an age effect on union membership in any systematic manner across all cohorts' (p. 1).

2. The inverted U-shape pattern in union membership reflects a broader life-cycle pattern.[4] The benefits of being a union member are generally greater for younger workers than older workers. For example, the union wage differential is usually higher for younger workers than for older workers (Blanchflower and Bryson 2003, 2004). The age/earnings profile rises at first and then flattens off as individuals age, especially for blue-collar workers. In part this arises because of reduced hours, especially overtime and may be related to declining health.

Interestingly, there is also a growing literature suggesting that there is a U-shape in age for a number of other variables. In cross sections, even after correcting for potentially confounding influences, there is now known to be a well-determined convex link between reported well-being and age. Blanchflower and Oswald (2006a), for example, found for the United States and for

FIGURE 3
Variation of UK Union Membership Probabilities by Age.

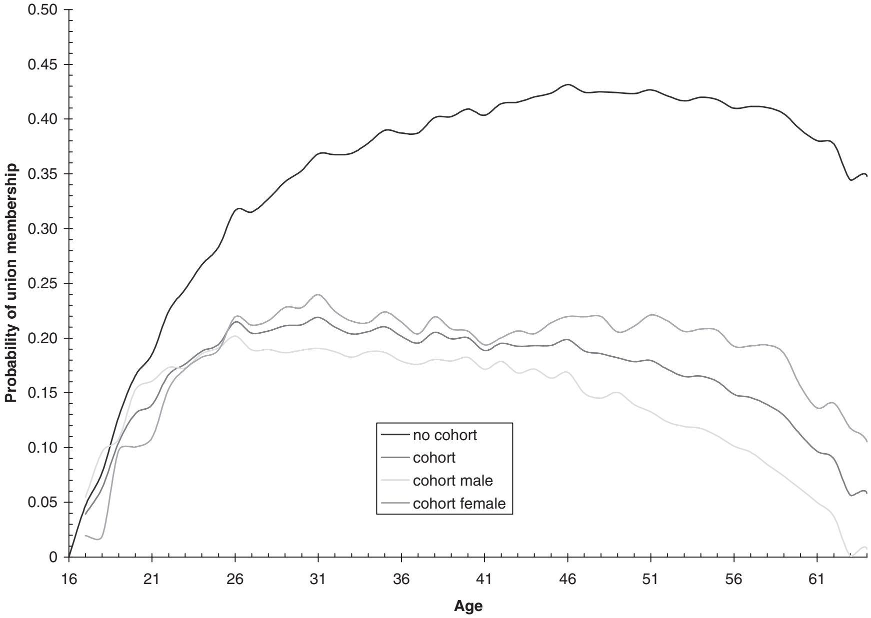
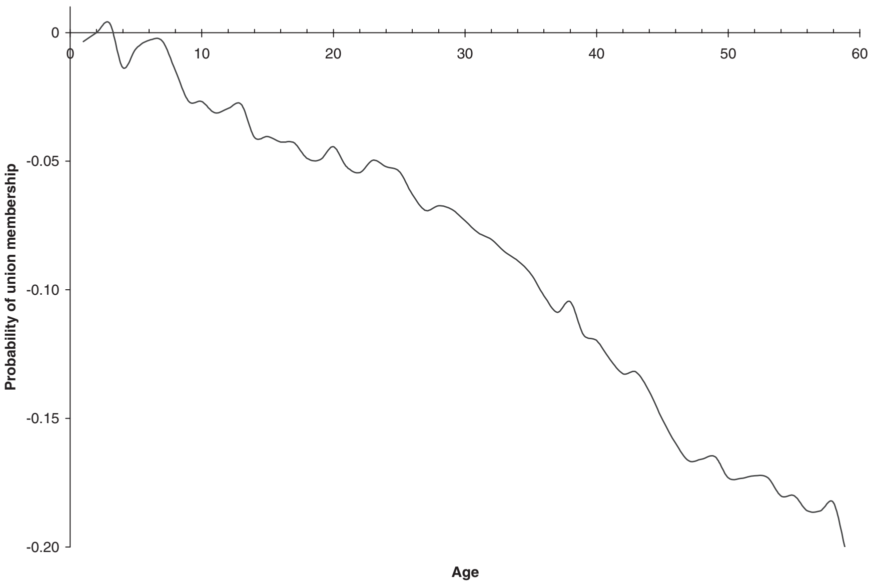


FIGURE 4
Cohort Effects on Union Density, United Kingdom.



France, Belgium, the Netherlands, West Germany, Italy, Luxembourg, Ireland, Great Britain, Greece, Spain and Portugal, that happiness is U-shaped in age, *minimizing* in the mid- to late 40s and not explained by cohort effects. Conversely, mental health, stress, unhappiness and depression seems to follow an inverted U-shape which also *maximizes* in the late 40s (Blanchflower and Oswald, 2006b). What causes the U-shaped curve in human well-being, and the regularity of its mathematical shape in different parts of the industrialized world, is not currently well understood. Blanchflower and Oswald (2006b) argue that one possible explanation is that individuals learn in mid-life to adapt psychologically to their own strengths and weaknesses, and thus are able to quell infeasible aspirations. Another is that cheerful people live systematically longer than the miserable, in ways and for reasons not currently appreciated, and that the well-being U-shape in age traces out in part a selection effect. A third is that some sort of comparison process is at work: people have seen school-friends die and come eventually to value their blessings during the remaining years of life.

3. Union members quit their jobs from their late 40s and move to non-union jobs in other organizations. This appears to be a possibility especially for workers in the US public sector who are covered by defined benefit pension plans. Members of the NYPD and other unionized police departments around the country are able to retire after 20 years of service with generous retirement packages, which include retiree health care benefits. In the case of the NYPD, for example, the pension multiple is derived based on the *single* highest year of earnings *including overtime*. As overtime is often determined by seniority, the last year of service usually carries with it a lot of overtime, which then raises dramatically the amount of the pension. The individual rules of the pension plans determine when this pension can be drawn without penalty. As an extreme example, most police departments do not pay social security for their members — although most sheriffs departments and corrections departments do — and hence there is an incentive for retiring union members to move to jobs that do pay social security, some of which will be non-union.

It may well be attractive to retire from General Motors in Michigan at age 50 on a sizable pension and then even move, say, to the Right-To-Work states of Nevada, Arizona or Florida, which have seen large net in-migration in recent decades, and work in a non-union job at lower pay. Working at a golf course in the winter sun is attractive to some, including the author, when the temperature hits –15°F in the frigid North-East!

Unions sometimes are prepared to acquiesce with reductions in employment where older workers get laid off first and get retirement benefits or extended unemployment or disability benefits. While a disproportionate share of workers who are laid off do not get other jobs, the ones who do may not be able to obtain union jobs. Consistent with this, Bertola *et al*. (2002), in a study of 17 OECD countries, find that greater unionization lowers the relative employment of older workers. As a referee has noted, however, this may be a relevant explanation for Anglo-Saxon countries with their clear distinctions between union and non-union jobs, but is unlikely to be a convincing explanation for Central European or Nordic countries.

4. Union members lose their jobs and become unemployed. Carruth and Disney (1988) charted the dramatic drop in employment and the rise in unemployment in the United Kingdom between 1979 and 1982 and the interesting coincidence of a decline in union membership of two million over the same time period. There is reason to believe that many of the union workers who became unemployed in the early 1980s became long-term unemployed. In the United States the existence of temporary lay-offs in the union sector helps explain the absence of union members from the employee count, but this does not help us across countries as this phenomenon does not generally exist outside the United States.

5. Union members quit their jobs and are promoted to managerial jobs in their own organization, or elsewhere, which are non-union. In both the private and the public sector this phenomenon can operate; for example in most police forces in the United States promotion to the levels of sergeant and lieutenant do not usually involve a change in union status, but more likely to a different union. Promotion to captain, commander and beyond involves a move from one side of the bargaining table to the other. Chiefs of police and plant managers, at least in the United States, are generally not union members.

6. Union workers are disproportionately employed in older workplaces, many of which are in traditional industries that have been subject to increased competition. When downsizing or plant closures occur, union members lose their jobs and are unable to replace them with comparable union jobs. Manufacturing employment has declined in most OECD countries. In the United States between 1973 and 2004, manufacturing employment fell from 20.1 million to 15.8 million; union density declined from 38.9 per cent to 12.9 per cent. The number of union members actually fell by 5.8 million — more than the total decline in manufacturing employment over that period; from 7.8 million members in 1973 to 2 million in 2004 (source: http://www.unionstats.com). In the US General Social Survey both union and non-union workers were asked 'how easy would it be for you to find a job with another employer with approximately the same income and fringe benefits you now have?' Three options were given — very easy, somewhat easy and not easy at all. Pooling the data for the years 1977–2004 to ensure a reasonable sample size, the percentage saying 'not easy at all' was 37.4 per cent in the non-union sector and 56.3 per cent in the union sector ($n = 8{,}666$).

7. Older union workers increasingly free-ride as they age. They enjoy union benefits, but stop paying their union dues. This is likely to be of particular importance in France where density rates are in single digits, but coverage close to complete. Evidence in Bryson (2006) suggests that this is unlikely to be important in both Britain and New Zealand as free-riding in unionized workplaces appears to be higher among the young and lowest among the longest tenured. However, it is higher among managers in both countries than non-managers. It is less of an issue in the United States where unionization

occurs at the level of the workplace and coverage is little higher than membership.

8. Older and younger workers have less 'need' for unions than prime-age workers. There is some evidence that the support for unions among union members declines with age for European countries, such as in Bryson and Freeman (2006) for the United Kingdom and the United States and, in Lipset and Meltz (2004), for the United States and Canada. As noted above, this may likely arise because of the smaller union wage gaps available for older workers. Less 'need' for unions could also be because of higher employment protection for older workers provided by law or labour courts.

9. The most productive union members quit because the seniority/wage compression rule reduces their potential earnings. Rising wage inequality implies that the most productive union members are the ones that have the most to gain from quitting their union jobs and moving to non-union jobs in the right-hand tail of the wage distribution. Another possibility is that such able union workers set up in business themselves. Self-employment rates are well known across countries to be higher among older workers (Blanchflower 2000, 2004).

10. More highly unionized industries may have a higher proportion of older workers because the benefits brought by unions reduce turnover. Moreover, many of the more highly unionized industries are old and declining and have relatively few entrants. Hence the direction of causation may run from unionization to age rather than from age to unionization (Bain and Price, 1983a: 22–23) and, as Richardson and Catlin (1979: 378–379) point out, 'may show more about the kind of industry that employs older workers than about the propensity of old workers to join unions'.

It is unclear what the relative weights of each of these factors across countries are as there has been little prior work on these issues. The probability of union membership follows an inverse U-shape in age, with broadly similar maxima, across this diverse group of countries: Australia, Austria, Bangladesh, Belgium, Bulgaria, Canada, Chile, the Czech Republic, Denmark, Germany, Estonia, Finland, France, Greece, Hungary, Ireland, Israel, Italy, Japan, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Russia, the Slovak Republic, Slovenia, Spain, Sweden, Switzerland, the United Kingdom and the United States. The likely reason for it arises because older union workers are paid above the values of their marginal products; employers thus have incentives to replace them. The mechanisms by which this is done will likely vary across countries.

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Notes

1. I understand from private communication with Steve Machin that the lack of a gender differential in his paper arises because, for comparison purposes, that in Machin (2004) he excluded a public-sector dummy because it is unavailable in the NTS. That appears to account for the difference between our two papers; in the LFS in any year, adding a public-sector dummy, or detailed industry controls, produces a significant and positive male differential.
2. Note that in 2004, 65 per cent of all workers in the public sector were female compared with 41 per cent in the private sector (Heap, 2005). Total employment in 2005 in the United Kingdom was 28,713,000, made up of 22,867 in private employment and 5,846, or 20.4 per cent, in public-sector employment, down from 23.1 per cent in 1992 (Hicks, 2005, table 1).
3. The 30 members of the OECD are Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States.
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Appendix

1) UK

a) General Household Survey (GHS) — with equivalent data on individuals available for the single year of 1983. Although the GHS is a time series of cross-sections, 1983 is the earliest year when union status is reported. Sample size for the 1983 GHS is just over 9,000 employees.

b) Labor Force Survey every year since 1993. Union data are only reported in one of the four quarterly sweeps of the survey — in the Autumn (September, October and November), of each year. Here data from the 1993–2004 surveys are pooled, generating a sample size of just under 711,000 employees.

2) United States

Merged Outgoing Rotation Group files of the Current Population Survey, 1984–2002
For details see http://www.nber.org/data/cps_index.html

3) Canada

Labour Force Surveys, June 1997–December 2005

4) International Social Surveys, 2000–2002

For details see http://www.issp.org/homepage.htm

*5) The European Social Surveys of 2002 and 2004 (ESS) (*n = *33,116)*

For details see http://www.europeansocialsurvey.org

*6) Eurobarometer surveys from 1988–1994 and 2001 (*n = *247,883)*

For details see http://www.gesis.org/en/dtat_service/eurobarometer/index.htm.