

Appendix

Data on earnings inequality are from three different sources:

1) The *Luxemburg Income Study* (LIS) reports individual information on earnings, employment status, gender, age, educational attainment, occupation and sector of employment (unfortunately not in a consistent way across countries or years). We have included 11 countries for overall 66 surveys covering the period 1967-2003.¹

2) The *International Social Survey Programme* (ISSP) contains information on earnings, employment status, gender, age, years of education, public or private sector, and individual union membership. In most waves earnings are collected in categories; we have recoded the data replacing with midpoint values, but this obviously reduces measured inequality. It can be noticed that ISSP data source constantly underestimate earnings inequality when compared to the LIS dataset, due to the original categorical nature of the data. We have included 24 countries for overall 282 surveys covering the period 1985-2004.²

3) The OECD database on earnings (updated July 2007 – see table H in OECD *Employment Outlook 2007*) includes earnings deciles by gender, though collected according to different definitions (gross/net, yearly/monthly/daily/hourly, types of workers included). This database covers 23 countries over the period 1960-2005, for overall 420 observations.³

While for earnings inequality we have to rely on scattered evidence from multiple sources, with respect to union presence we have made use of data from a consistent source for institutional measures:

4) the database on Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts (ICTWSS), covering 26 countries between 1960 and 2006, compiled by an author (Jelle Visser) in the framework of the NEWGOV project, financed under the EU FP7 research framework, on “Distributive Politics, Learning and Reform: National Social Pacts”. All countries correspond to the ISSP sample but Greece.

Among other institutional variables we have considered, we have included

5) the Kaitz index (namely the ratio of the minimum wage established by the law and the median wage) is available for a subset of 16 countries (Australia, Belgium, Canada, Czech Republic, France, Hungary, Ireland, Japan, Netherlands, New Zealand, Poland, Portugal, Slovakia, Spain, United Kingdom and United States) spanning the period 1960-2005. For the remaining countries the minimum wage has been set equal to zero.

In order to provide some descriptive evidence, we have computed the (unweighed) averages of some inequality measures in table A.1, including **standard deviation of (log) earnings, decile ratios** (9th to median and median to 1st decile). The same variables are plotted in figures A.1 and A.2 (which also report **the Gini concentration index** from LIS database).

¹ The countries are Australia (6), Austria (2), Canada (7), Germany (7), Italy (8), Netherlands (4), Norway (5), Spain (4), Sweden (7), United Kingdom (8) and United States (8).

² The countries are Australia (16), Austria (14), Canada (9), Czech Republic (11), Denmark (7), Finland (5), France (8), Germany (joining East and West Germany, which are separately sampled since 1990 -17), Hungary (18), Ireland (11), Italy (9), Japan (12), Netherlands (7), New Zealand (14), Norway (16), Poland (13), Portugal (7), Slovakia (6), Slovenia (14), Spain (10), Sweden (10), Switzerland (8), United Kingdom (20), United States (20). One tenth of the surveys (32 out of 282) overlap with LIS data.

³ The countries are Australia (30), Austria (1), Belgium (8), Canada (19), Czech Republic (6), Denmark (21), Finland (22), France (43), Germany (19), Hungary (10), Ireland (5), Italy (11), Japan (31), Netherlands (29), New Zealand (17), Norway (10), Poland (23), Portugal (5), Spain (3), Sweden (27), Switzerland (11), United Kingdom (36) and United States (33).

With respect to wage bargaining, we have considered three measures of union presence:

i) **union density**, the fraction of workers joining the unions, which reflects both the popularity of unions' arguments and the strength they possess when confronting their counterparts.⁴ The plots of alternative estimates of union density are in figure A.3.

ii) **union coverage**, that is employees covered by wage bargaining agreements as a proportion of all wage and salary earners in employment with the right to bargaining; it proxies the range of action allowed by the institutional features.⁵

iii) **coordination of wage bargaining**, which proxies the degree of similarity of wage policies followed by unions among different sectors.⁶

In some specifications we will estimate the effects of unions on wage inequality for three different bargaining regimes: *limited unionization and limited coverage* (bargaining coverage rates are below 50 percent: US, UK, Canada, New Zealand, Switzerland, Japan, the Czech Republic, Poland, Hungary and Slovakia); *limited unionization and extended coverage* (coverage rates are above 50 percent and at least double union density rates: Australia, Austria, Germany France, Netherlands, Portugal, Spain and Slovenia); *extended unionization and extended coverage* (coverage rates are above 50 percent but union density is also near or above 50 (Belgium, Denmark, Finland, Norway, Sweden, and – although a marginal case – Italy).⁷ In considering the union effect on earnings dispersion, we shall also take into account the differences in coordination across bargaining units and union centralization.

Unconditional sample correlations between inequality measures and union presence are reported in table A.3. Full tables used to construct table 5 are reported in tables A.4-A.5-A.6. The dependent variable of this last table (the return to education estimated in ISSP data) is plotted in figure A.6, jointly with the return to age/experience. Also searching for the relative contribution of seniority in accounting for wage dynamics produced table A.7, which is commented in the main text.

Two alternative measures for the gender gap (gender differential – the percentage difference in median incomes; gender penalty, estimated from individual data) are plotted in figures A.4 and A.5. The latter is the dependent variable in the estimates of table A.8 which is commented in the main text. This dependent variable – the estimated gender differential - varies from -0.78 to 0.11. An alternative measure for female disadvantage is the median percent gender difference computed in the same dataset. The two measures are highly correlated ($r = -0.90$).

Finally, the wage gap between union and non-union members is estimated, results are reported in figure A.7 (and also used to depict figure 1 in the main text).

⁴ In the empirical analysis we consider two alternative measures of density, one obtained by aggregate data on membership and another obtained from individual responses in ISSP surveys. The two measures are strongly associated (correlation index is 0.91), and the results do not differ significantly when using either one or the other measure.

⁵ This measure is available at 5-year intervals, but has been interpolated in order not to lose observations.

⁶ It is based on a 5-point scale, ranging from “economy-wide bargaining, based on enforceable agreements between the central organisations of unions and employers affecting the entire economy or entire private sector, or by government imposition of a wage schedule, freeze, or ceiling.” to “fragmented bargaining, mostly at company level”.

⁷ In the most recent period (2000-2005) bargaining or union coverage averages 35.5 percent and union density 22.5 percent of employees in employment in the first group (*limited unionisation and coverage*). In the second group (*limited unionisation and extended coverage*) the averages are 22.2 for density and 83.8 for coverage; in the third group (*extended unionisation and coverage*) the figures are 61.1 and 85.1 percent (ICTWSS data, see infra; also Visser, 2006, for sources and methods of calculation; Ireland is excluded because coverage statistics are unavailable).

Table A.1 – Earnings inequality trends (unweighed averages by decades)

country	st.deviation log earnings ISSP			st.deviation log earnings LIS					p90p50 earnings OECD					p50p10 earnings OECD				
	1980	1990	2000	1960	1970	1980	1990	2000	1960	1970	1980	1990	2000	1960	1970	1980	1990	2000
Australia	0.736	0.662	0.724			1.03	0.789	0.842		1.65	1.7	1.75	1.86		1.59	1.68	1.64	1.66
Austria	0.546	0.518	0.573				0.869					1.77					1.57	
Belgium											1.68	1.58				1.45	1.44	
Canada		0.634	0.601			1.128	1.247	1.339	1.78	1.79	1.83	1.82	1.83	2.4	2.09	2.36	2.2	2
Czech Rep		0.436	0.435									1.71	1.75				1.65	1.68
Denmark		0.471	0.43									1.65	1.71			1.4	1.44	1.51
Finland			0.516							1.68	1.69	1.68	1.71		1.57	1.47	1.42	1.42
France		0.567	0.543						2.04	2	1.95	1.95	1.99	1.92	1.76	1.63	1.61	1.58
Germany	0.566	0.537	0.562		0.823	0.875	1.027				1.73	1.77	1.82			1.67	1.6	1.67
Hungary	0.496	0.487	0.446								1.64	2.09	2.29			1.59	1.87	2.15
Ireland	0.585	0.615	0.55									1.99	2.01				2.01	1.79
Italy	0.552	0.446				0.596	0.623	0.667				1.57	1.69			1.46	1.4	
Japan		0.807	0.812							1.76	1.81	1.85	1.83		1.7	1.72	1.64	1.63
Netherlands	0.497	0.437	0.658			0.677	1.199			1.62	1.62	1.69	1.76		1.59	1.55	1.6	1.65
New Zealand		0.63	0.681								1.45	1.56	1.75			1.49	1.56	1.56
Norway		0.491	0.463			1.364	1.467	1.333			1.48	1.45	1.45			1.41	1.36	1.42
Poland		0.494	0.521								1.65	1.89	2.08			1.6	1.71	1.94
Portugal		0.586	0.564								2.14	2.4				1.62	1.6	
Slovakia		0.419	0.444															
Slovenia		0.491	0.485															
Spain		0.518	0.567			0.642	0.923	0.972				2.1	2.14				2.01	1.65
Sweden		0.438	0.418	1.319	1.218	1.324	1.486	1.528		1.57	1.55	1.59	1.67		1.36	1.32	1.36	1.38
Switzerland	0.676	0.735	0.771									1.69	1.74				1.59	1.48
United Kingdom	0.68	0.707	0.723	0.791	0.851	0.799	0.994			1.7	1.78	1.88	1.95		1.88	1.78	1.82	1.8
United States	0.973	0.853	1	1.386	1.343	1.358	1.269	1.201		1.94	2.03	2.16	2.27		1.92	1.99	2.07	2.07

Table A.2 –Trends in union presence

country	union density (ICTWSS)					adjusted coverage (ICTWSS)					wage coordination (ICTWSS)				
	1960	1970	1980	1990	2000	1960	1970	1980	1990	2000	1960	1970	1980	1990	2000
Australia	47.44	48	46.23	35	22.98	85	85	84.33	80	80	3	3	3.44	2.89	2
Austria	65.78	59.87	52.58	42.2	34.36	95	95	95.53	99	99	5	5	4.33	4	4
Belgium	40.53	49.21	52.27	54.37	51.91	81	89.27	96.33	96	96	4	3.89	4.56	4.56	4.25
Canada	28.21	33.23	34.68	34.13	30.03			37.13	36.78	36	1	2.33	1	1	1
Czech Rep				62.23	24.6				32.25	39.39				2	2
Denmark	58.13	67.24	78.12	76.35	73.54	67.7	69.6	72.67	70.47	80	5	5	3.89	3.22	3.13
Finland	38.03	62.11	69.55	78.41	73.67	95	95	95	94.72	90.36	4.2	4.11	3.67	3.67	3.88
France	19.89	21.59	14.8	9.14	8.3			74.13	79.56	82	2.2	2.33	2.33	2	2
Germany	33.13	33.69	34.44	30.35	22.78	79.6	78	75.6	68.67	63	4	4	4	4	4
Hungary				48.12	19.17				51	41.83				2	2
Ireland	53.73	60.91	60.56	52.91	38.97						1	3.33	2	4.56	5
Italy	26.78	45.19	44.21	37.96	34.18	89.9	86	84.73	82.28	82	2	2.89	2.67	3.56	4
Japan	34.59	33.95	29.25	24.33	20.03	31.4	31.2	26.27	22	21.5	5	5	5	3.89	3
Netherlands	38.25	36.52	29.34	24.72	22.43	81.17	76.67	79.6	85.11	84.71	4.2	4.11	4.33	4	4
New Zealand		58.68	60.1	32.84	22.8		70	68.8	45.83	30	3	3	3	1.22	1
Norway	58.93	54.13	57.46	57.23	54.58	65	65.67	70	71.67	72	4.8	4.89	4.33	4.67	4.5
Poland				28.53	13.8					41.5				2	2
Portugal		60.76	56.23	27.1	17.77			73.33	75			4	2.89	2.89	2.75
Slovakia				59.24	32.04				49.5	48.04				3	3
Slovenia				42.76	41.13				95	95				3.75	3.75
Spain		46.32	11	15.99	16.05			70.91	77.86	81.34		5	3.67	3	3.75
Sweden	68.64	72.95	81	84.43	77.53	70	70	72.43	89.19	91.84	5	5	4.11	3.44	3
Switzerland	33.99	30.7	28.29	22.99	20.41	60	61.33	67.73	49.94	48	4	4	4	4	4
United Kingdom	40.37	47.63	46.98	34.52	29.1	67.2	70.4	64.67	41.12	35.33	2.6	3.33	1	1	1
United States	28.59	24.36	19.25	15.19	12.82	32.2	33.2	21.73	16.54	14.17	1	1.89	1	1	1

Table A.3 – Pair-wise correlations between inequality and union presence

	union density ICTWSS	adjusted coverage ICTWSS	wage coordination ICTWSS	kaitz index (minimum/median)
st.dev.log wage ISSP	-0.5005*	-0.6268*	-0.3923*	-0.1248
st.dev.log wage LIS	0.3318*	-0.3845*	-0.0475	-0.4622*
p90p50 OECD	-0.6710*	-0.4983*	-0.4907*	-0.2940*
p50p10 OECD	-0.5758*	-0.6512*	-0.5529*	-0.4420*
Gini on wages LIS	-0.0699	-0.6842*	-0.3686*	-0.6383*

* significant at 5%

Table A.4 – Correlations with p90/p50 decile ratio – OECD

	1	2	3	4	5	6	7	8	9
union density ICTWSS x group1	-0.0024 [1.66]*			-0.0029 [2.03]**			-0.0028 [1.93]*		0.0052 [2.78]***
union density ICTWSS x group2	0.0032 [2.18]**			0.0019 [1.29]			0.0025 [1.68]*		-0.0006 [0.39]
union density ICTWSS	-0.0038 [3.20]***			-0.0038 [3.17]***			-0.0037 [3.14]***		-0.0039 [3.49]***
bargaining (or union) coverage, adjusted x group1		-0.0047 [4.88]***			-0.0046 [4.63]***			-0.0054 [5.03]***	-0.0087 [5.86]***
bargaining (or union) coverage, adjusted x group2		-0.0041 [3.28]***			-0.0054 [4.18]***			-0.0057 [4.07]***	-0.006 [4.49]***
bargaining (or union) coverage, adjusted		0.0002 [0.32]			0 [0.02]			0.0006 [0.65]	0.0021 [2.37]**
coordination of wage bargaining x group1			-0.0315 [3.98]***			-0.0321 [4.05]***	-0.0014 [0.15]	-0.0034 [0.39]	-0.0051 [0.59]
coordination of wage bargaining x group2			-0.0152 [1.99]**			-0.0154 [2.04]**	-0.0136 [1.65]	-0.0246 [2.63]***	-0.0118 [1.40]
coordination of wage bargaining			0.0054 [0.91]			0.0059 [0.97]	0.0014 [0.23]	0.0075 [1.08]	0.007 [1.01]
minimum wage to the median OECD				-0.0906 [3.95]***	-0.0783 [3.31]***	-0.0377 [1.30]	-0.0819 [3.61]***	-0.0759 [3.22]***	-0.1156 [5.12]***
Observations	377	365	405	377	365	405	377	365	353
R ²	0.93	0.95	0.92	0.94	0.95	0.92	0.94	0.95	0.96
Log likelihood	632.7	644.32	603.61	638.66	649.73	604.52	640.46	654.52	671.76

Robust t statistics in brackets - * significant at 10%; ** significant at 5%; *** significant at 1% - country and year controls included – minimum wage = 0 when absent

Group 1 includes countries with coverage below 50% (United States, Japan, Canada, Czech Republic, Poland, Hungary, Slovakia, New Zealand, United Kingdom, Switzerland).

Group 2 includes countries with coverage above 50% and excess coverage (=coverage-density) above 50% (Slovenia, Australia, Netherlands, Austria, Spain, France, Germany and Portugal).

The residual group is composed by Belgium, Denmark, Sweden, Finland, Norway and Italy.

Table A.5 – Correlations with p50/p10 decile ratio – OECD

	1	2	3	4	5	6	7	8	9
union density ICTWSS x group1	0.0034 [1.74]*			0.0024 [1.24]			0.002 [1.02]		0.0062 [2.14]**
union density ICTWSS x group2	0.0081 [3.77]***			0.006 [2.78]***			0.0069 [3.15]***		0.0037 [2.03]**
union density ICTWSS	-0.0058 [3.25]***			-0.0057 [3.19]***			-0.0064 [3.75]***		-0.0079 [5.39]***
bargaining (or union) coverage, adjusted x group1		-0.0064 [5.36]***			-0.0062 [5.23]***			-0.0068 [5.07]***	-0.0081 [3.76]***
bargaining (or union) coverage, adjusted x group2		-0.0046 [2.48]**			-0.0056 [3.02]***			-0.0055 [2.88]***	-0.0062 [3.11]***
bargaining (or union) coverage, adjusted		0.0048 [5.67]***			0.0045 [5.33]***			0.0045 [4.65]***	0.0059 [6.31]***
coordination of wage bargaining x group1			0.0083 [0.77]			0.006 [0.56]	0.0326 [2.73]***	0.0116 [0.93]	0.0147 [1.18]
coordination of wage bargaining x group2			0.0122 [1.08]			0.0117 [1.07]	0.012 [0.98]	-0.0088 [0.97]	0.0078 [0.88]
coordination of wage bargaining			-0.0172 [2.73]***			-0.0158 [2.60]***	-0.0197 [3.18]***	0 [0.00]	-0.0027 [0.46]
minimum wage to the median OECD				-0.1476 [3.68]***	-0.065 [2.17]**	-0.1234 [2.92]***	-0.1426 [3.56]***	-0.0653 [2.12]**	-0.1118 [3.70]***
Observations	380	369	409	380	369	409	380	369	356
R ²	0.9	0.93	0.88	0.9	0.93	0.88	0.9	0.93	0.94
Log likelihood	456.21	522.6	467.53	462.3	524.44	472.43	465.91	526.81	521.63

See footnote to table A.4

Table A.6 – Correlations with return to education (estimated including gender, age, age squared, working part-time and union membership) – ISSP

	1	2	3	4	5	6	7	8	9
union density ISSP x group1	0.0172 [0.37]			-0.0083 [0.17]			-0.0241 [0.47]		-0.0227 [0.40]
union density ISSP x group2	0.0128 [0.26]			0.0155 [0.31]			-0.0246 [0.47]		0.0587 [1.11]
union density ISSP	-0.0717 [1.54]			-0.0731 [1.56]			-0.0048 [0.09]		-0.0316 [0.64]
bargaining (or union) coverage, adjusted x group1		0.0022 [1.94]*			0.0023 [1.90]*			0.0018 [1.64]	0.0021 [1.87]*
bargaining (or union) coverage, adjusted x group2		0.0002 [0.16]			0.0006 [0.49]			0.0001 [0.10]	-0.0003 [0.20]
bargaining (or union) coverage, adjusted		-0.0018 [1.69]*			-0.0024 [2.17]**			-0.0018 [1.98]**	-0.0019 [2.00]**
coordination of wage bargaining x group1			-0.0112 [3.08]***			-0.0119 [3.42]***	-0.0127 [3.49]***	-0.0056 [1.57]	-0.0046 [1.23]
coordination of wage bargaining x group2			-0.0036 [0.96]			-0.0024 [0.66]	-0.0019 [0.51]	-0.0033 [0.94]	-0.0013 [0.36]
coordination of wage bargaining			0.0047 [2.29]**			0.0047 [2.34]**	0.0048 [2.16]**	0.0034 [1.70]*	0.003 [1.24]
minimum wage to the median OECD				-0.0581 [2.60]**	-0.0933 [3.77]***	-0.0963 [4.71]***	-0.0985 [4.71]***	-0.0933 [3.73]***	-0.1074 [4.02]***
Observations	268	236	268	268	236	268	265	236	234
R ²	0.65	0.71	0.66	0.67	0.74	0.69	0.7	0.74	0.75
Log likelihood	744.63	672.93	747.12	750.59	685.54	761.37	754.84	686.18	682.79

See footnote to table A.4 – weighed by 1/s.e. of estimate

Table A.7 – Correlations with explained variance of log wages (R^2) when only age and age squared are included as regressors – LIS

	1	2	3	4	5	6	7	8	9
union density ICTWSS	0.0043 [2.15]**			0.0046 [2.22]**			0.0046 [1.96]*		-0.0039 [0.94]
bargaining (or union) coverage, adjusted		0.0046 [3.40]***			0.0047 [3.37]***			0.0046 [3.49]***	0.0064 [2.57]**
coordination of wage bargaining			0.0164 [0.79]			0.0161 [0.73]	0.016 [0.68]	0.0141 [0.72]	0.0134 [0.76]
minimum wage to the median OECD				0.078 [1.01]	0.0834 [1.52]	0.0219 [0.25]	0.0571 [0.67]	0.0644 [0.97]	0.0509 [0.61]
Observations	61	61	61	61	61	61	61	61	61
R ²	0.66	0.74	0.64	0.66	0.75	0.64	0.68	0.76	0.77
Log likelihood	99.49	107.62	98.18	100.02	108.43	98.22	101.82	110.25	111.7

Robust t statistics in brackets - * significant at 10%, ** significant at 5%, *** significant at 1% - country and year controls included

Table A.8 – Gender differential (estimated including age, age squared, part-time, education and union membership)

	1	2	3	4	5	6	7	8	9	10	11	12
union density ISSP	0.1173 [4.22]***			0.1304 [4.25]***			-0.0987 [1.30]			-0.0421 [0.43]		0.118 [0.89]
bargaining (or union) coverage, adjusted		0.0024 [7.02]***			0.0025 [7.07]***			-0.0026 [1.52]			-0.0027 [1.54]	-0.003 [1.70]*
coordination of wage bargaining			0.0136 [2.51]**			0.0131 [1.93]*			-0.0076 [1.01]	-0.0096 [1.23]	-0.0054 [0.50]	-0.0061 [0.55]
minimum wage to the median OECD				0.0205 [0.65]	0.0513 [1.69]*	-0.0067 [0.19]	0.1193 [1.98]**	0.0249 [0.30]	0.1218 [1.82]*	0.1206 [1.77]*	0.0273 [0.33]	0.0412 [0.48]
Country fixed effects	no	no	no	no	no	no	yes	yes	yes	yes	yes	yes
Observations	278	236	279	278	236	279	278	236	279	275	236	234
R ²	0.12	0.31	0.11	0.13	0.31	0.11	0.69	0.71	0.69	0.69	0.71	0.72
Log likelihood	195.82	183.25	195.36	195.96	184.42	195.37	340.08	287.78	341.67	336.39	287.89	285.07

Robust t statistics in brackets - * significant at 10%; ** significant at 5%; *** significant at 1% – Year fixed effect included – weighed by 1/s.e. of estimate

Figure A.1 – Standard deviations in (log) earnings

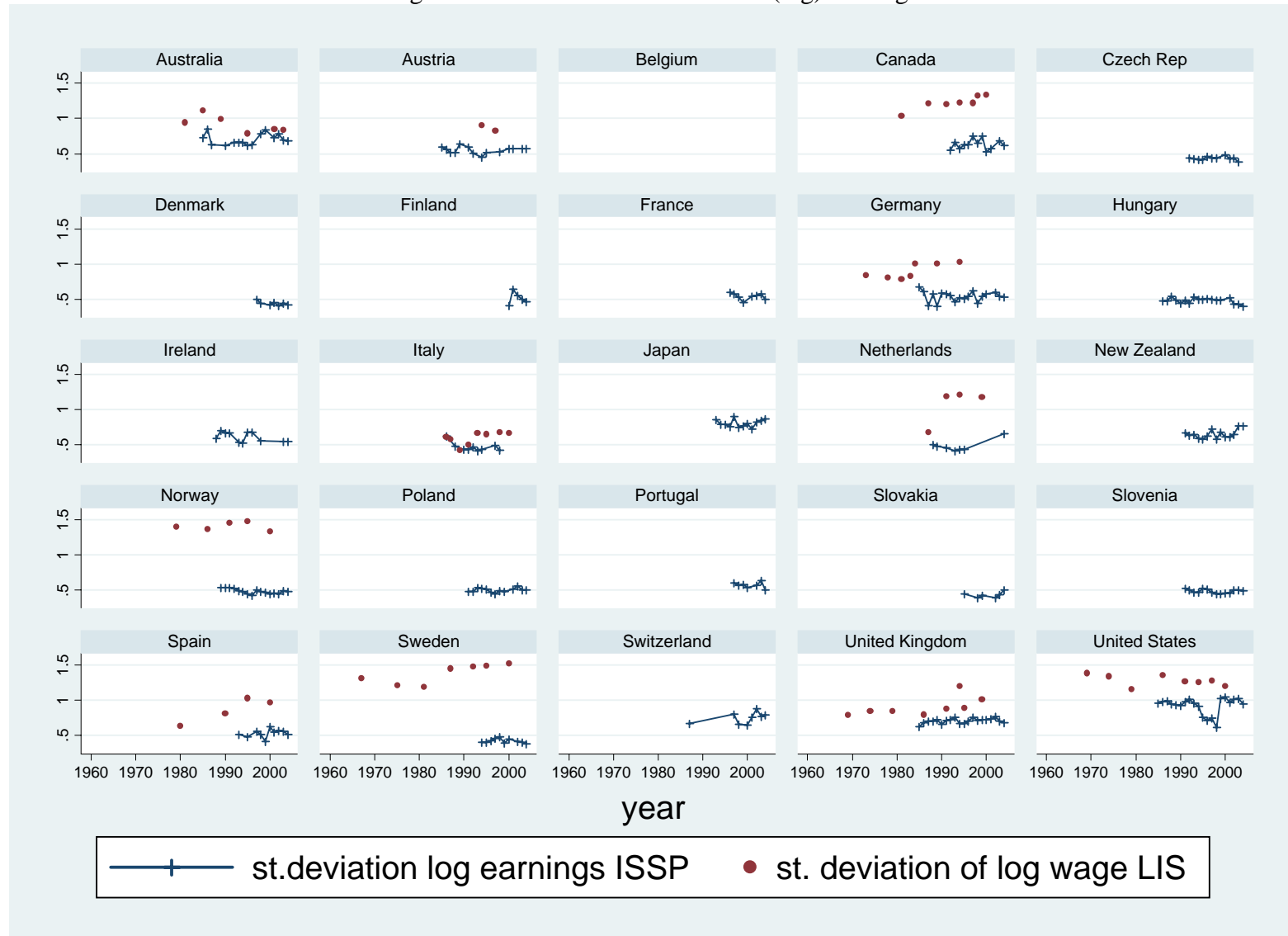


Figure A.2 – Decile ratios (OECD) and Gini concentration index (LIS) - earnings

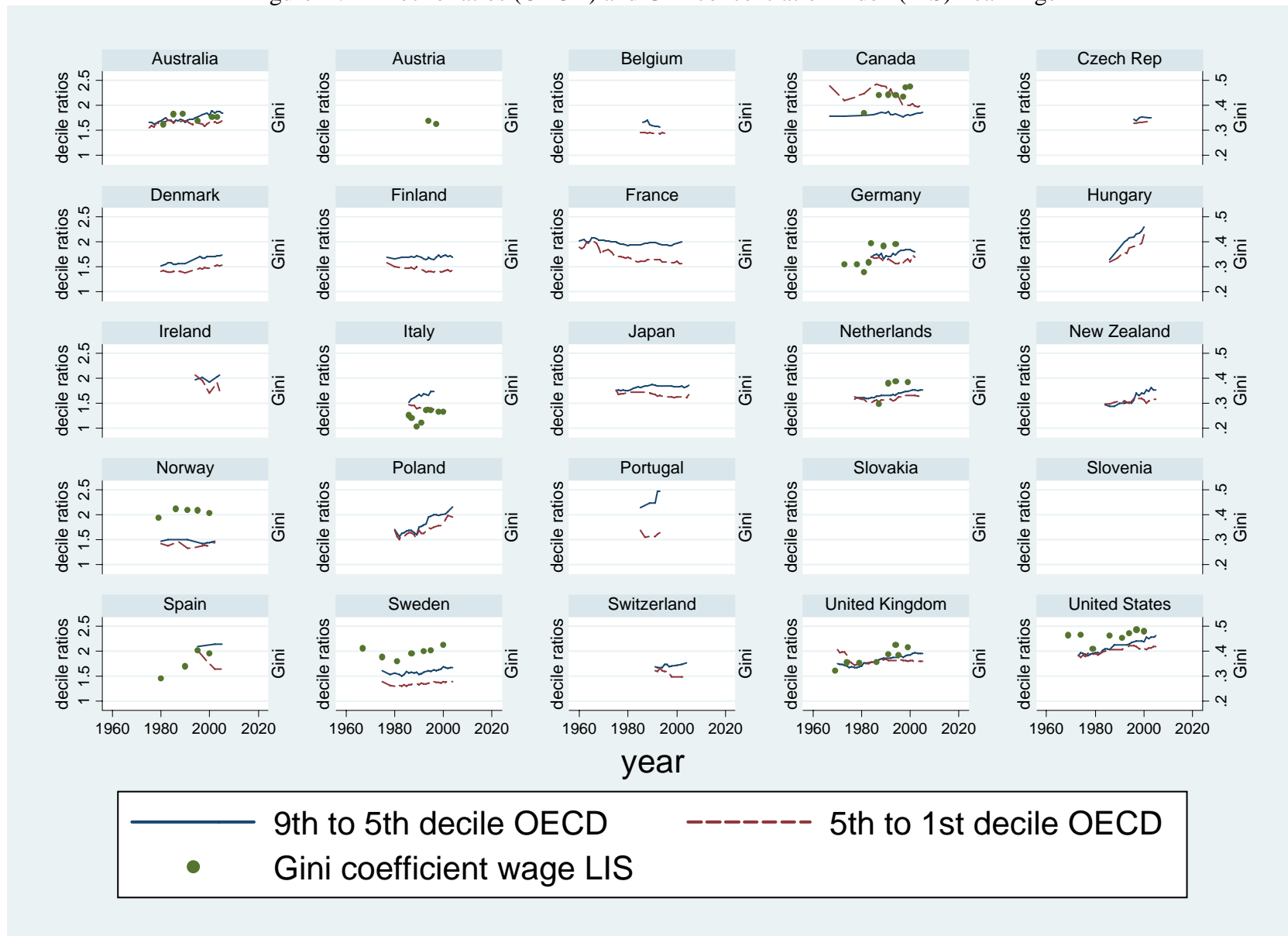


Figure A.3 – Union density (membership/dependent employment)

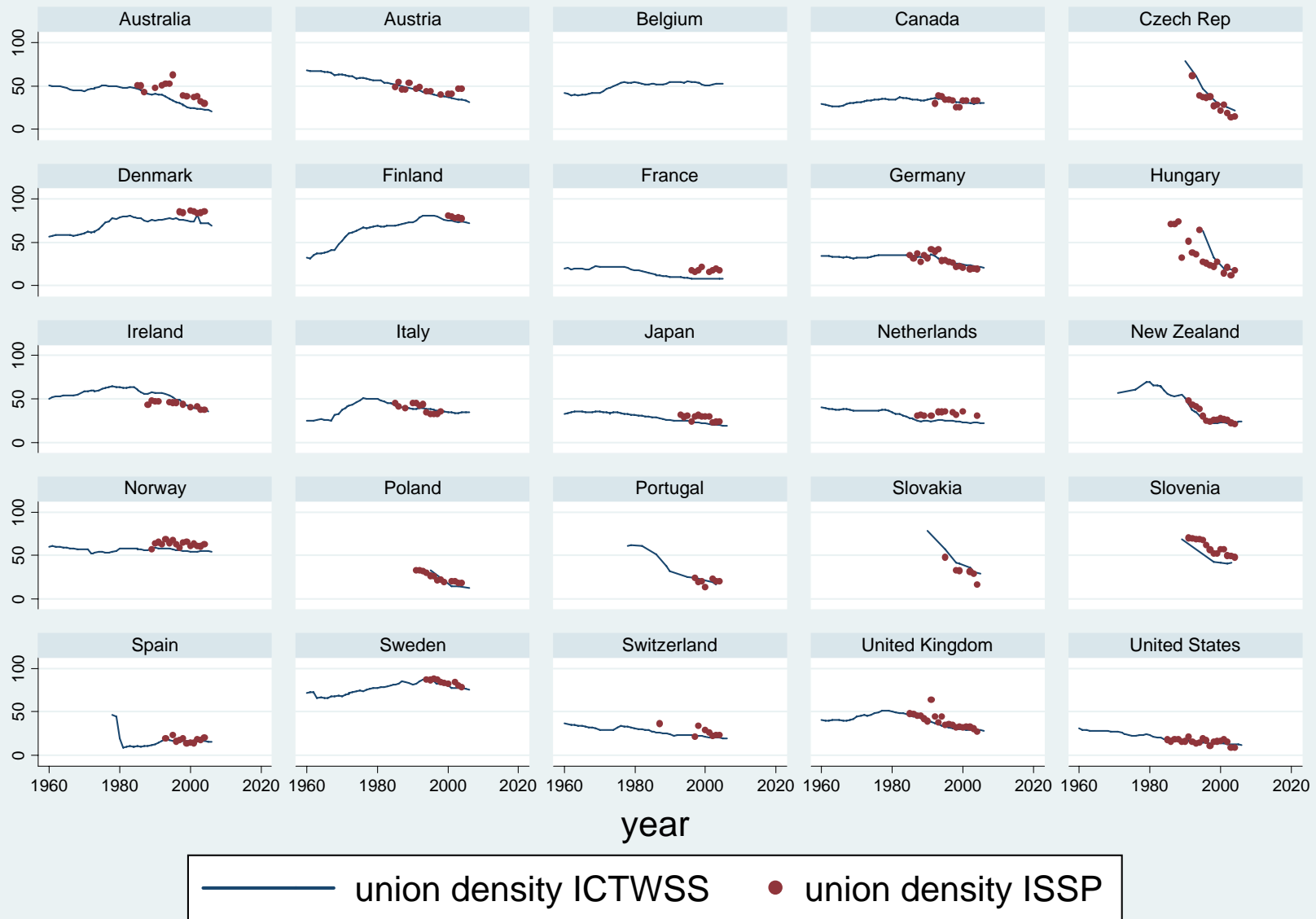


Figure A.4 – Gender differential (percent points)

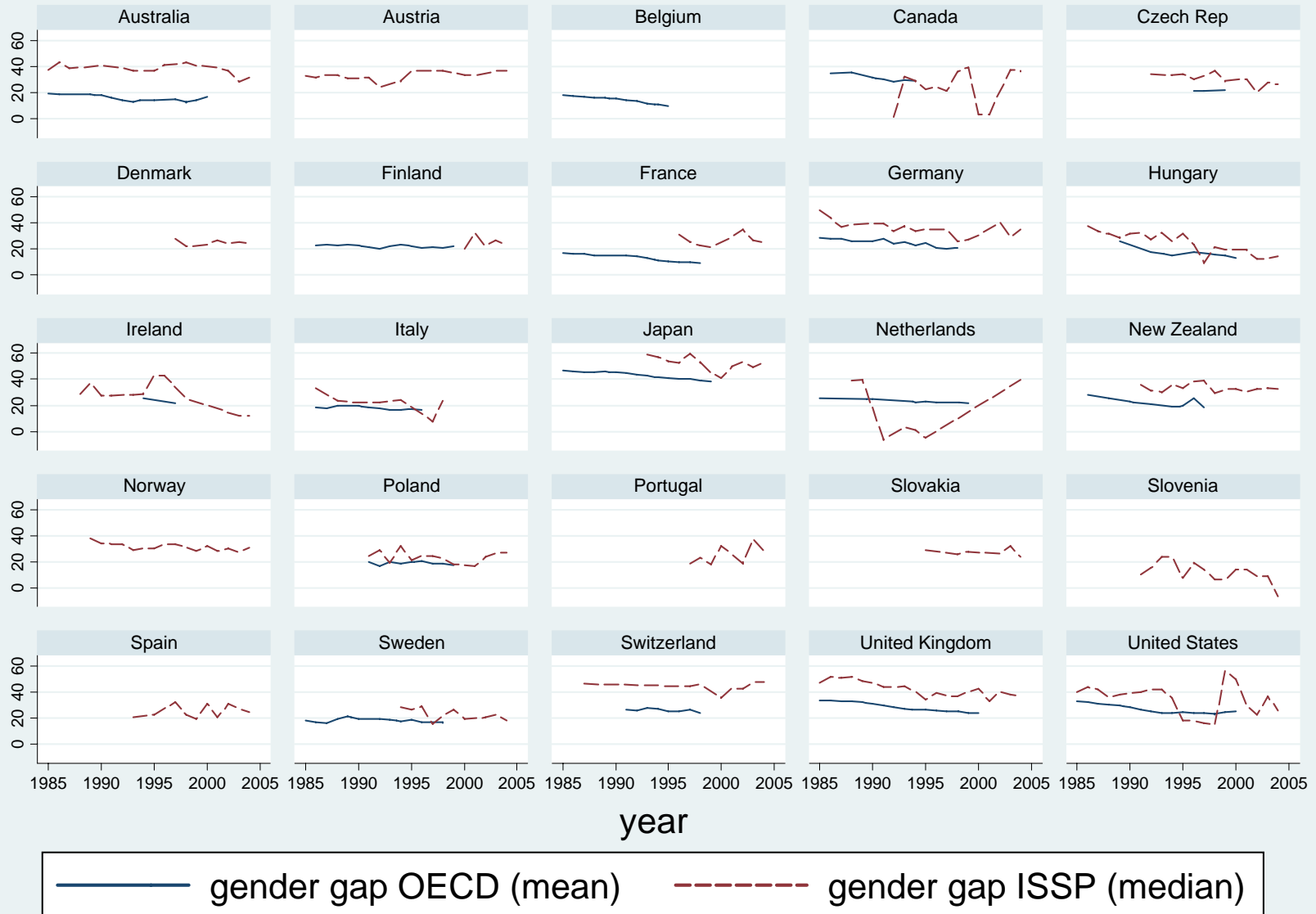
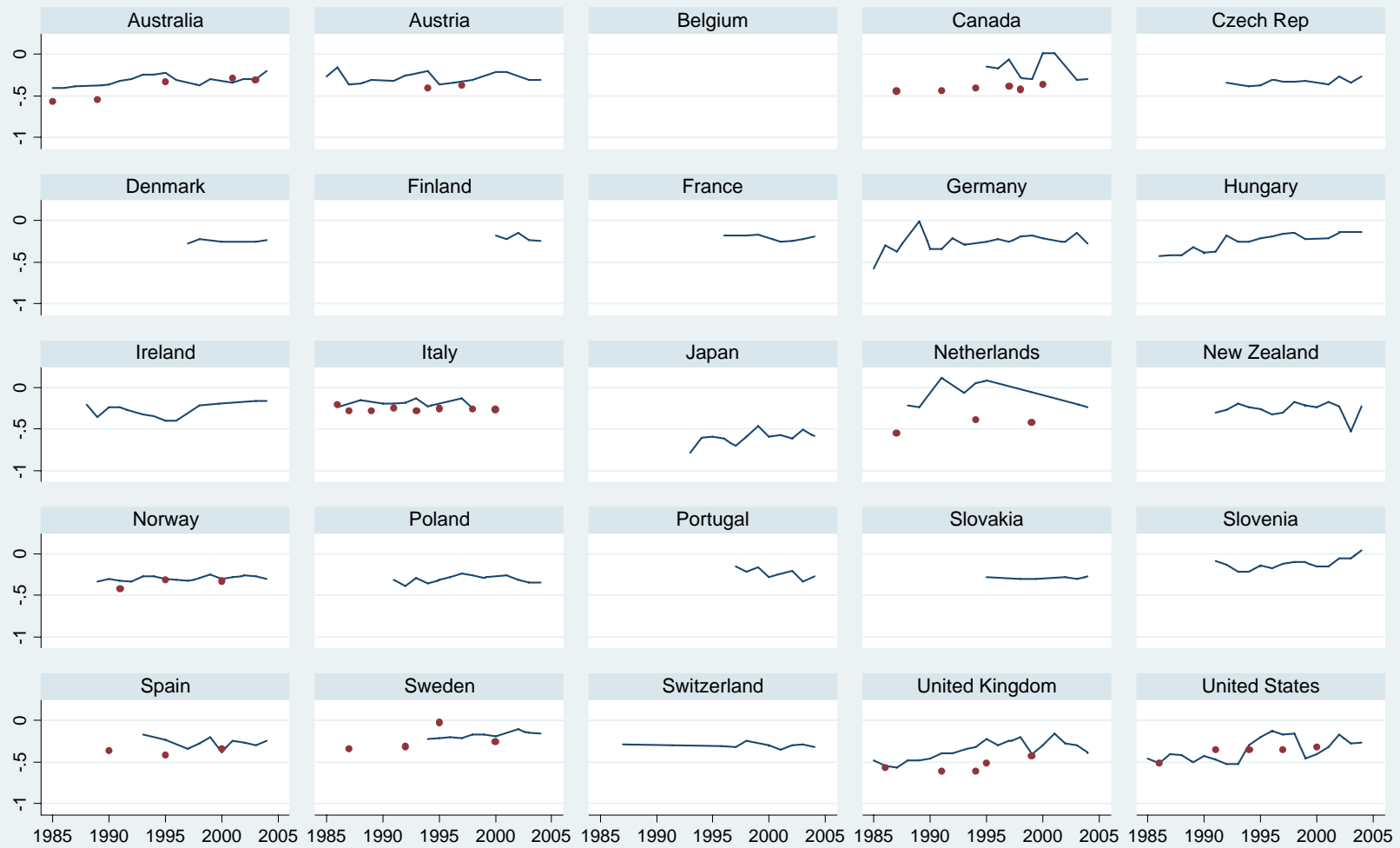


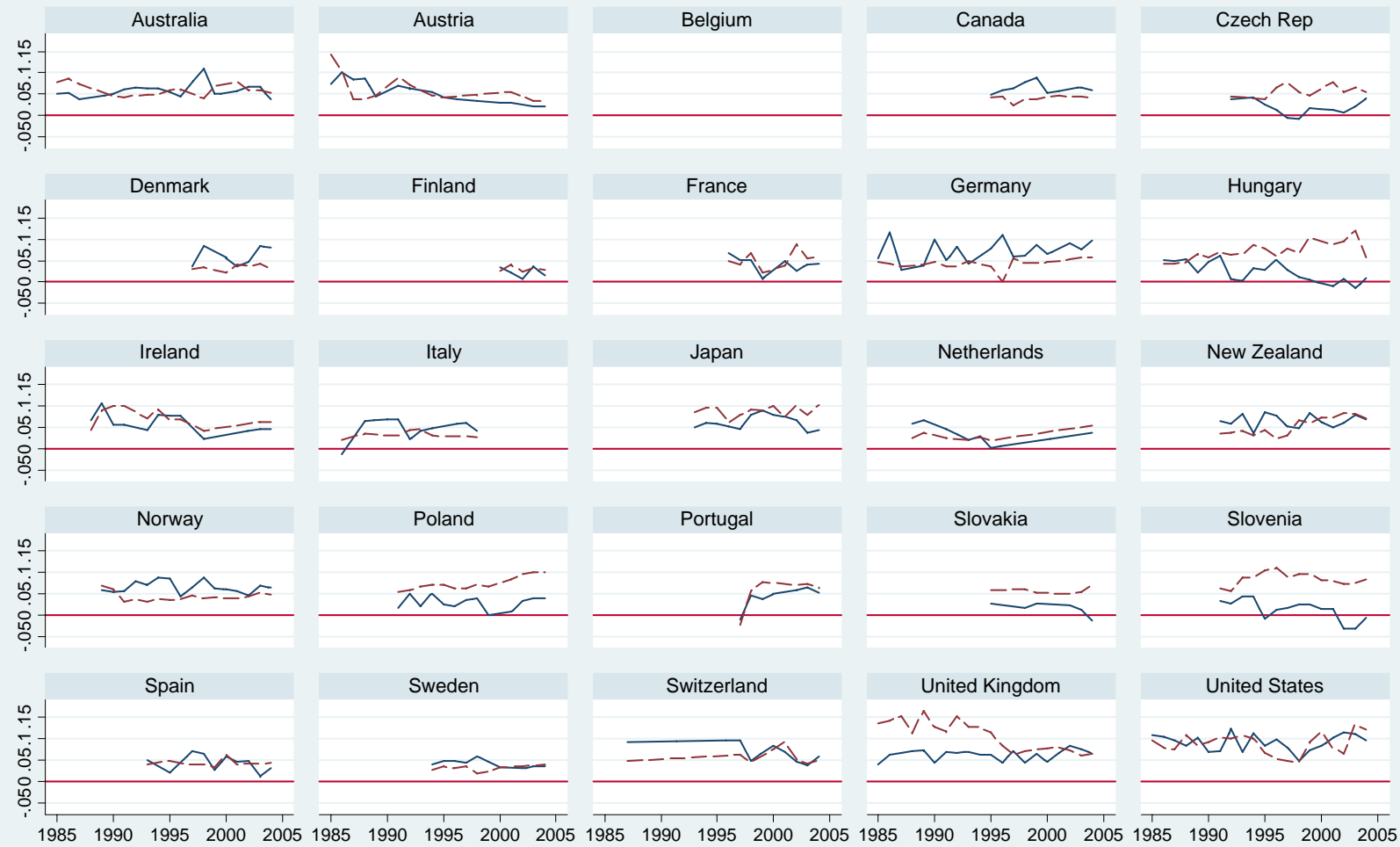
Figure A.5 – Gender penalty



controls for age, age2, education included



Figure A.6 – Return to age and education



controls for gender, age, age2, education, partime and union status included



Figure A.7 – Return to union membership - ISSP

