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Technical Appendix to

CHANGES IN COMPULSORY SCHOOLING, EDUCATION AND THE DISTRIBUTION OF WAGES IN EUROPE

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A. The Educational Reforms Used in This Study

In this Section we provide a brief description of the educational reforms considered in the study. Furthermore, we motivate the choice of the first cohort potentially affected. We devote a paragraph to each country considered. Further details on country specific education systems and reforms are in Fort (2006).

Austria

The 1962 School Amendment Act increased compulsory schooling by one year, from 8 to 9 years. Pupils who were 14 years old or younger at the time the reform was introduced were compelled to attend an additional year of schooling. This suggests that the individuals potentially affected by the reform are those born in 1948 and afterwards. However, individuals born in 1947 who might have already left school when the reform was introduced were required to go back to school and complete the additional year. Therefore, we select the cohort born in 1947 as the first cohort potentially affected by the reform.

Belgium

In 1983 (Law of 28 June 1983), the length of compulsory schooling was increased to 18 years (from 8 to 12 compulsory years of education), which could be completed with part time scholling during the final three years. Student potentially affected by the reform were those aged 14 or younger in 1983, i.e. those born after 1969.

Denmark

Two major reforms of compulsory schooling took place in Denmark in 1958 and 1971. In 1958 compulsory schooling years were increased by 3 years (from 4 to 7) and in 1971 they were further increased by additional two years (from 7 to 9). Pupils who were 14 years (or younger) in 1971 were potentially affected by the 1971 reform. We only consider this reform in this study.

Finland

The relevant reform considered in this study took place during the 1970s. The reform introduced a new curriculum and changed the structure of the educational system, increasing compulsory education from 6 to 9 years. The reform was adopted gradually by Finnish municipalities. Since we do not have access to data at the municipality level, we define the year of the reform in each area as the year when the largest share of municipalities in the area experienced the change in the schooling legislation, as reported in Table B.1 below. Following Pekkarinen (2005), we consider the cohort aged 11 when the reform was implemented as the first cohort potentially affected.

France

During the twentieth century, compulsory schooling age in France was extended twice: from 13 to 14 in 1936 and from 14 to 16 in 1959 (Bethoin Reform). The 1936 reform affected mainly pupils born after 1923, whereas the 1959 reform - which was implemented from 1967 after a long transition period – affected individuals who were born from 1953 onwards; see Grenet (2004).

Germany

The peculiar political situation of the country produced the separate evolution of two distinct education systems between 1949 and 1990. We refer to reader to Pischke *et al.* (2005) and Pischke (2003), for a description of the compulsory school reforms and for the selection of the first cohort potentially affected in each German Länder.

Greece

In 1975 the Greek Parliament increased compulsory education by three years (from 6 to 9). Individuals potentially affected by this change are those who were 12 in 1975. In particular, those born 1963 and later were compelled to attend 3 additional years of schooling, whereas those born in 1962 were not.

Ireland

Compulsory schooling was modified in 1972, when the school leaving age was raised to the age 15. A further raise in compulsory schooling age (to 16 years) announced in 1998, came into effect when the Education (Welfare) Act (2000) became law. Individuals potentially affected by the 1972 reform are the individuals who were 14 in 1972. These individuals where compelled to attend an additional year of schooling, whereas individuals who were 14 in 1971 were not. Therefore we choose 1958 as the first cohort potentially affected.

Italy

Junior high school became effectively compulsory in Italy only since 1963. Compliance with the 1963 reform was not instantaneous: only in 1976 the proportion of children attending junior high school approached 100%. According to Brandolini and Cipollone (2002), the individuals potentially affected by the reform were those born after 1949.

The Netherlands

From 1975 onwards, all three-year educational programmes in the Netherlands were extended to four years and compulsory schooling leaving age was increased by one year, from 15 to 16. Oosterbeek *et al.* (2004), highlight that the implementation of the extension of lower vocational education started in 1973. Since August 1 1973 all lower vocational programmes had a length of four years. Students who were behind the second year could still graduate in a three-year course. Students who started a three-year course of lower vocational education on August 1 1971 could still graduate in 1974. All the following cohorts had to take a four-year course. According to Oosterbeek *et al.* (2004) '..students born on or after August 1, 1959 had to follow ten years of full time education. This is also the first cohort of students to encounter a complete four-year lower vocational education regime'.

Spain

The compulsory school reform considered in this study was carried out under the 1970 General Act on Education and Financing of Educational Reform (LGE), and increased compulsory years of education from 6 to 8. Individuals potentially affected by the reform were those born in 1957 and after; see Pons and Gonzalo (2002, p.753, Table A1 p.767).

Sweden

According to Meghir and Palme (2005, 2003), compulsory school reform in Sweden was gradually implemented between 1949 and 1962. The take-up of the experiment varied over the period 1949-62 across municipalities with the largest number of municipalities involved in the years 1961/2 (39.4%; 18,665 classes; 436,595 students). It was fully implemented only in 1962. Unfortunately, we do not have access to data at the municipality level but only at the county level. For the purposes of this article, and based on personal communication with Marten Palme, we considered all the individuals born after 1950 as potentially affected by the reform

B. The Construction of the Key Variables

In this Section we provide further details on the construction of the key variables used in the empirical analysis.

Education

The ISSP survey generally includes information on the highest qualification attained at the time of the interview and on the number of years spent at school. When the latter variable is missing, years of education are computed using the information on the highest qualification attained and/or the age at which the individual finished his/her studies.

The SHARE survey collects information on the highest attained qualification and generates a variable corresponding to years of education (see the survey documentation at http://www.share-project.org/ for further details). Finally, the ECHP survey collects information on both years of education, age at which the individual finished his/her studies and the highest attained qualification. We use the variable pt024 in this dataset (see the User Manual for more details).

Wages

The heterogeneity across surveys increases as one examines earnings, labour force status and hours worked. Since earnings in the ISSP surveys are recorded on a categorical scale, with the number of categories varying across countries and surveys, we use mid-points of each category. The ECHP data include information both on net and on gross monthly earnings; we use the latter. Finally, the SHARE survey collects information only on gross yearly earnings. We transform the available information on earnings from the three surveys on a monthly basis, using 2000 consumer prices and PPP units. Depending on the survey, data on working hours are: total hours worked per week in the main job (SHARE); total hours – including paid overtime – worked per week in the main job or business (ECHP); total number of hours worked per week in the main job (ISSP). In the 1997 ISSP survey hours are reported on a categorical scale; we take mid-points. Finally, information on employment status is: self reported current employment status (SHARE); self-reported current employment status (ECHP); self-reported economic position (ISSP). Table B.6 presents detailed information on the earnings, hours, proportion employed and proportion of females by country and survey.

Table B.1

The Distribution of Individuals Born in 1960–66 *Across the Major Regions of Finland and the Year of Adoption of the Comprehensive School Reform*

	Adoption of the comprehensive school reform					
Major Regions	1972	1973	1974	1975	1976	1977
Uusimaa	0.00	1.15	0.00	6.19	25.16	67.50
Etelä-Suomi	4.26	6.65	12.22	28.36	48.51	0.00
Itä-Suomi	1.07	31.13	37.69	30.11	0.00	0.00
Väli-Suomi	4.79	37.61	26.14	31.45	0.00	0.00
Pohjois-Suomi	52.43	5.40	42.17	0.00	0.00	0.00

Note. We thank Tuomas Pekkarinnen for kindly providing this table. The Table is based on data from the Finnish Longitudinal Census Data Files (*FLCD* , Statistics Finland, years 1970,1975,1980,1985,1990,1995 and 2000).

Table B.2

Effect of School Reforms on Educational Attainment Across European Countries: *Evidence from the Literature*

Countries: Denmark, Finland, France, Germany (West), Italy, Ireland, Netherlands, Sweden

Country	Reform	Effect on Ed. Attainment	Data and References
Denmark	1958	+0.35(women)–+0.4(men) years of education controlling for trend	Danish National Work Environment Cohort (*WECS*) Study, 1990, 1995, see Arendt (2005)
Finland	1972–77	+0.36 in gender gap	Finnish Longitudinal Census Data (*FLCD*) yrs 1970, 1975, 1980, 1985, 1990, 1995, 2000) see Pekkarinnen (2005)
France	1957	+0.281 (women)- +0.262 (men) years of education (polynomial fit) +0.317 (women)- +0.267 (men) years of education (local linear regression)	Enquête Employ (INSEE) see Grenet (2008)
Germany (West)	1947–69	+ 0.28% years of schooling (applies to students in the basic track)	Qualification and Career Survey (*QaC*), MicroCensus, social security records (1% sample) period 1975–1995, see Pischke and Watcher (2005)
Italy	1963	+2.1% enrolment in 8th grade +0.21 years of schooling +38% (women), +12% men prop.of those achieving high school degree +3%-6% proportion of women achieving exactly junior high school degree	Annual Report on Schooling (1948–79) Labor Force Survey (October 1992–97) see Brandolini and Cipollone (2002) Survey on Household Income and Wealth, 1991, see Flabbi (1999) Census data (1981, 1991) junior high school degree see Fort (2007)
Ireland	1967 (Fees Abolition)	(−0.1)–(−1.8) years of schooling	see Denny and Harmon (2000)
Netherlands	1968	+0.71 years of schooling (males) +1.33 years of schooling (females)	OSA-Labour market Survey (1985, 1986, 1988, 1990, 1992 and 1994) see Plug (2001)

Table B.2

Continued

Country	Reform	Effect on Ed. Attainment	Data and References
Sweden	1962	+10% (males), +8% (females) prop. of those achieving jun. high sch. +0.27 (males), +0.22 (females) years of schooling (*via* propensity score match.) effect varies with ability level	Individual Statistics project data merged with administrative data, 1985–96 see Meghir and Palme (2003)
Sweden	1962	+10% (males), +8% (females) prop. of those achieving jun. high sch. +0.25 (males), +0.34 (females) years of schooling (average across ability levels and parental background but the effect varies with parental background and with individuals ability level (IQ level))	Individual Statistics project data merged with administrative data, 1985–96 see Meghir and Palme (2005)

Table B.3

Effect of School Reforms on Earnings Across European Countries: *Evidence from the Literature*
Countries: Finland, Germany(West), Italy, Sweden

Country	Reform	Effect on Earnings	Data and References
Finland	1972–77	−0.029 (men) 0.012 (women) −0.004 (all) non ac. fathers: −0.032 (men) −0.004 (women) −0.013 (all) academic fathers: −0.027 (men) 0.038 (women) 0.005 (all) (log taxable income, euros)	Finnish Longitudinal Census Data (*FLCD*) yrs 1970, 1975, 1980, 1985, 1990, 1995, 2000) see Pekkarinnen (2005)
Germany (West)	1947–69	0.004–0.019 (all) −0.013–0.010 (basic track) (log gross monthly wage) 0.003–0.005 (all) 0.001–0.002 (basic track) (log net monthly income) −0.003–0.005 (all) (log earnings)	Qualification and Career Survey (*QaC*) MicroCensus social security records records (1% sample) period 1975–95, see Pischke and Watcher (2005)
Italy	1963	−0.009 (men) 0.026 (women) north: −0.011 (men) 0.002 (women) centre: −0.018 (men) 0.058 (women) south: 0.011 (men) 0.065 (women) (log weekly real wage)	Annual Report on Schooling (1948–79) Labor Force Survey (October 1992–97) Brandolini and Cipollone (2002)

Table B.3
Continued

Country	Reform	Effect on Earnings	Data and References
Sweden	1962	0.044 (all) 0.026 (men) 0.053 (women) low fath. education &low/high/ both ability: 0.039/0.075/0.062 (all) 0.037/0.066/0.060 (men) 0.028/0.074/0.061 (women) high fath. education −0.046 (all) −0.053 (men) −0.006 (women) (log pre-tax earnings)	Individual Statistics project data merged with administrative data, 1985–96 Meghir and Palme (2003)
Sweden	1962	1.42 (all) 0.88 (men) 2.11 (women) low fath. education &low/high/ both ability: 2.62/4.53/3.36 (all) 1.66/6.71/3.79 (men) 3.23/2.97/3.06 (women) high fath. education −5.59 (all) −7.66 (men) −4.22 (women) (percentage change in earnings)	Individual Statistics project data merged with administrative data, 1985–96 Meghir and Palme (2005)

Table B.4

Returns to Education across European Countries (identification exploiting instrumental variables, i.e. reforms of the schooling system) *Evidence from the Literature*
Countries: France,Germany (West), Italy, Ireland, Netherlands, Sweden

Country	Reform	Returns to Education	Data and References
France	1957	0.002 (women) – 0.016 (men) (global polynomial fit) 0.003 (women) – −0.012 (men) (local linear regression) (DDD estimate)	Enquête Employ (INSEE) see Grenet (2008)
Germany (West)	1947–69	0.007–0.032 0.005–0.010	Qualification and Career Survey (*QaC*), MicroCensus, social security records (1% sample) see Pischke and Watcher (2005)

Table B.4

Continued

Country	Reform	Returns to Education	Data and References
Italy	1963	Females, ft workers, (various IV-based id. strat.) −0.028–0.024 (1992) 0.051–0.138 (1997) 0.031–0.088 (1992–97) (log real gross weekly earnings) −0.022–0.018 (1992) 0.039–0.109 (1997) 0.024–0.072 (1992–97) (log real net weekly earnings) 0.03 (women) 0.05 (men) (log annual earnings less tax plus no monetary integration)	Annual Report on Schooling (1948–79) Labor Force Survey (October 1992–97) see Brandolini and Cipollone (2002) see Brandolini and Cipollone (2002) Survey on Household Income and Wealth, 1991, see Flabbi (1999)
Ireland	1967 (Fees Abolition)	0.136 over diff. specif. 0.1274–0.1680	see Denny and Harmon (2000)
Netherlands	1968	0.033–0.051 (males) −0.028–0.047 (females)	OSA-Labour market Survey (1985, 1986, 1988, 1990, 1992 and 1994) see Plug (2001)
Sweden	1962	0.036	Individual Statistics project data merged with administrative data, 1985–96 Palme and Meghir cited by Card (2001)

Table B.5

Summary on the Age at Which Individuals are Surveyed

Major Regions	Ref. $\bar{b}$	$(\bar{b}\text{-}7,\bar{b}+7)$	ECHP 2001 ISSP 2001	ISSP 2002
(a) Finland				
Uusimaa	1966	1957–75	28–42	29–43
Etelä-Suomi	1965	1956–74	29–43	30–44
Itä-Suomi	1963	1954–72	31–45	32–46
Väli-Suomi	1962	1953–71	32–46	33–47
Pohjois-Suomi	1961	1952–70	34–47	34–48

			International Social Survey							ECHP
Country	Ref. $\bar{b}$	$(\bar{b}\text{-}7,\bar{b}+7)$	1993	1995	1996	1997	1998	2000	2002	2001
(b) Germany										
Schleswig-Holstein	1941	1932–50	45–57	47–59	48–60	49–61	51–60	55–64	59–65	53–65
Hamburg	1934	1925–43	52–56	54–59	56–60	56–61	57–61	60	64–66	60–65
Niedersachsen	1947	1938–56	39–52	41–55	42–56	43–57	44–58	46–60	49–62	47–61
Bremen	1943	1934–52	50–55	n.a.	49–60	51–60	48–62	51–64	61	51–65
Nordr.-West., Hessen	1953	1944–62	33–47	35–49	36–50	37–51	38–52	40–54	42–56	41–55
Rhein.-Pf.,Baden-W.										
Bayern	1955	1946–64	31–45	33–47	34–48	35–49	36–50	38–52	40–54	n.a.
Saarland	1949	1940–58	34–57	39–53	47–49	49	43–56	53–56	48	45–57

Table B.5
Continued

Country	Survey Year	Sample Size	Age Range*	Country	Survey Year	Sample Size	Age Range*
(c) Descriptive Statistics. Sub-sample of Individuals Born at Most 7 Years Before and 7 Years After the Year of Birth of the First Cohort Potentially Affected by the Reform.							
Austria	ISSP, 1994	172	41–55	Ireland	ISSP, 1993	298	28–42
	ISSP, 1995	191	41–55		ISSP, 1994	271	29–43
	ISSP, 1998	192	45–59		ISSP, 1995	315	30–44
	ISSP, 2000	177	47–61		ISSP, 1996	313	31–45
	ISSP, 2001	184	47–61		ISSP, 2000	349	36–50
	ECHP, 2001	1,065	47–61		ECHP, 2001	968	36–50
	SHARE, 2004	781	50–64	Italy	ISSP, 1993	237	37–51
Belgium	ISSP, 2002	329	26–40		ISSP, 1994	235	38–52
	ECHP, 2001	999	26–39		ISSP, 1997	198	41–55
Denmark	ISSP, 1997	297	33–47		ISSP, 1998	197	42–56
	ISSP, 1998	286	34–48		ECHP, 2001	2,447	45–59
	ISSP, 2000	200	38–52		SHARE, 2004	783	48–62
	ISSP, 2001	264	38–52	Netherlands	ISSP, 1993	630	27–41
	ISSP, 2002	343	38–52		ISSP, 1994	630	28–42
	ECHP, 2001	1,034	37–51		ISSP, 1995	711	29–43
	SHARE, 2004	381	41–54		SHARE, 2004	343	39–52
Finland	ISSP, 2001	335	Table B.5 pan. a	Spain	ISSP,1993	343	30–44
	ISSP, 2002	298	Table B.5 pan. a		ISSP,1995	271	31–45
	ECHP, 2001	1,332	Table B.5 pan. a		ISSP,1997	277	33–47
France	ISSP, 1996	342	37–51		ISSP,1998	262	34–48
	ISSP, 1997	280	38–52		ISSP,2000	480	36–50
	ISSP, 1998	243	38–52		ISSP,2002	174	39–53
	ISSP, 2002	477	42–56		ECHP,2001	461	37–51
	SHARE, 2004	424	44–58		SHARE,2004	2,435	41–54
Greece	ECHP, 2001	2,010	31–45	Sweden	ISSP,1994	345	37–51
	SHARE, 2004	113	38–48		ISSP,1995	321	38–52
Germany	ISSP, 1993	245	Table B.5 pan. b		ISSP,1996	352	39–53
	ISSP, 1995	327	Table B.5 pan. b		ISSP,1998	304	41–56
	ISSP, 1996	578	Table B.5 pan. b		ISSP,2000	270	44–58
	ISSP, 1997	304	Table B.5 pan. b		ISSP,2002	270	45–59
	ISSP, 1998	265	Table B.5 pan. b		SHARE,2004	1,167	47–61
	ISSP, 2000	273	Table B.5 pan. b				
	ISSP, 2002	216	Table B.5 pan. b				
	ECHP, 2001	1,047	Table B.5 pan. b				

Note. Sub-sample of individuals born at most 7 years before and 7 years after the year of birth of the first cohort potentially affected by the reform with no missing data on the following variables relevant for the analysis: age, gender, lagged country specific unemployment rate and GDP *per capita*, country and gender specific labour force participation rate at the estimated time of labour market entry, the country specific fertility rate, GDP per head and unemployment rate at the age affected by the country specific reform, employment status).
*at the time the survey was carried out. German data from SHARE 2004 have been excluded because there was no available information on the region of residence. Such information is necessary to assign individuals to the pre or post-reform groups.

Table B.6

Descriptive Statistics

Earnings (at 2000 prices and in PPP units), hours worked, proportion employed, and proportion of women. Sub-sample of individuals born at most 7 years before and 7 years after the year of birth of the first cohort potentially affected by the reform. Data: ISSP 1993–2002, ECHP 2001, SHARE 2004 (release 1).

					Average (st.err) [min-max]	
Country	Survey	Sample size wage-hours-states	Prop. Empl.	Prop. Fem.	Wage/month	Hours/week worked
Austria	ISSP*	614-322-916	49.8	83.8	1056.4 (709.1)[0-3820.3]	38.6 (15.8) [3–85]
	ECHP	503-623-1065	45.6	60.7	2063.5 (1180.3) [57.0–7838.5]	42.9 (13.4) [15–96]
	SHARE	255-328-781	36.0	62.6	1578.8 (2128.6) [0.1–13416.5]	39.3 (15.5) [0–100]
Belgium	ISSP*	70-294-329	78.7	51.7	1417.8 (1666.4) [266.1–14751.6]	39.9 (13.9) [6–96]
	ECHP	815-875-999	80.3	56.5	1915.0 (846.5) [106.6–6276.1]	39.4 (10.6) [15–90]
Denmark	ISSP*	1347-1245-1390	82.9	54.4	2529.1 (1152.9) [443.6–6183.7]	38.0 (8.1) [5–81]
	ECHP	867-928-1034	83.2	49.4	2607.1 (1067.7) [114.6–9261.4]	38.4 (8.9) [15–91]
	SHARE	321-328-381	82.7	54.3	2660.8 (3478.8) [1.7–60538.6]	37.5 (10.5) [0–84]
Finland	ISSP*	575-489-633	70.1	54.7	1656.4 (1576.3) [0.8–30518.5]	38.4 (9.6) [2–90]
	ECHP	1022-1200-1332	76.1	49.0	1762.2 (804.9) [41.6–8323.2]	41.4 (10.9) [10–96]
France	ISSP*	1220-1127-1342	80.0	51.6	1928.2 (1427.9) [234.2–8971.8]	38.4 (12.4) [0–80]
	SHARE	318-323-424	76.9	53.8	2376.1 (2804.1) [0.1–22902.7]	39.3 (13.9) [0–105]
Germany	ISSP*	1656-1324-2208	72.6	48.6	1555.0 (1014.3) [25.7–14296.3]	37.0 (15.1) [0–96]
	ECHP	768-798-1047	68.0	49.9	2412.0 (1470.6) [24.6–9334.1]	40.7 (11.9) [2–96]
	SHARE	n.a.	n.a.	n.a.	n.a.	n.a.
Greece	ECHP	964-1524-2010	47.6	50.7	1245.7 (694.9) [46.3–12198.8]	42.6 (11.1) [15–90]
	SHARE	40-45-113	37.2	99.1	1292.9 (759.3) [69.1–4053.9]	30.2 (21.6) [0–80]
Ireland	ISSP*	1060-1176-1546	65.6	54.4	1115.6 (886.7) [142.9–4427.7]	40.9 (14.9) [4–96]
	ECHP	592-689-968	58.3	50.9	1908.0 (1248.1) [47.5–10127.5]	39.0 (14.0) [9–90]
Italy	ISSP*	541-664-867	64.5	55.4	1508.7 (897.6) [103.4–7169.9]	35.3 (16.4) [0–90]
	ECHP	1127-1474-2447	45.7	56.2	1816.2 (972.3) [224.0–10192.5]	38.9 (9.9) [15–80]
	SHARE	251-347-783	41.5	65.9	1755.9 (1953.7) [0.1–19853.7]	35.0 (16.7) [0–100]
Netherlands	ISSP*	1736-1316-1971	59.9	57.1	1751.4 (818.8) [179.8–5413.8]	32.8 (13.1) [1–90]
	SHARE	245-268-343	74.9	60.0	2232.1 (1867.3) [46.5–19129.4]	33.7 (14.6) [4–80]
Spain	ISSP*	1143-1267-1925	54.8	51.6	1059.3 (693.4) [174.9–7589.1]	36.5 (15.6) [0–96]
	ECHP	1392-1714-2435	55.7	49.9	1758.2 (1216.1) [54.7–15442.7]	42.2 (10.7) [14–96]
	SHARE	191-214-354	55.9	63.5	1807.4 (5001.8) [0.5–62668.5]	32.8 (13.1) [1–90]
Sweden	ISSP*	1778-1719-1862	85.9	50.4	1613.1 (1130.7) [94.1–23512.7]	39.3 (9.4) [1–90]
	SHARE	926-974-1167	81.1	54.7	1991.4 (1544.5) [0.7–21840.4]	39.2 (11.0) [0–100]

Note. data on wages in the 1999 International Social Survey Program are reported as deciles of the wage distribution. n.a stands for 'not available'. *Not all the waves of ISSP provide data on all the European countries considered; the following list applies: Austria, ISSP 1994, 1995, 1998, 2000, 2001; Belgium, ISSP 2002; Denmark, ISSP 1997, 1998, 2000–2002; Finland, ISSP 2001, 2002; France, ISSP 1996–1998,2002; Germany, ISSP 1993,1995–1998, 2000, 2002; Ireland, ISSP 1993–1996, 2000; Italy, ISSP 1993, 1994, 1997, 1998; Netherlands: ISSP 1993–1995; Spain, ISSP 1993, 1995, 1997, 1998, 2000, 2002.

Table B.7

Heterogenous Returns to Schooling
Quantile treatment effects. Sample size: 7,804; ECHP 2001 only

Males	$\tau_u = 0.10$	$\tau_u = 0.30$	$\tau_u = 0.50$	$\tau_u = 0.70$	$\tau_u = 0.90$
$\tau_a = 0.10$	0.0638	0.0072	0.0073	0.0182	0.0101
	(0.0768)***	(0.0667)***	(0.0607)***	(0.0582)***	(0.0815)***
$\tau_a = 0.30$	0.0090	0.0058	0.0055	0.0078	0.0088
	(0.0642)***	(0.0561)***	(0.0528)***	(0.0476)***	(0.0647)***
$\tau_a = 0.50$	0.0092	0.0064	0.0058	0.0086	0.0107
	(0.0717)***	(0.0612)***	(0.0563)***	(0.0549)***	(0.0747)***
$\tau_a = 0.70$	0.0093	0.0067	0.0068	0.0077	0.0101
	(0.0669)***	(0.0532)***	(0.0543)***	(0.0512)***	(0.0636)***
$\tau_a = 0.90^{\dagger}$	0.007	0.005	0.005	0.006	0.009
	(0.0553)***	(0.0381)***	(0.0451)***	(0.0418)***	(0.0540)***
Mean Effect‡	0.0670	0.0551	0.0538	0.0507	0.0677
Females	$\tau_u = 0.10$	$\tau_u = 0.30$	$\tau_u = 0.50$	$\tau_u = 0.70$	$\tau_u = 0.90$
$\tau_a = 0.10$	0.0289	0.0055	0.0062	0.0170	0.0088
	(0.0980)***	(0.0830)***	(0.0836)***	(0.0898)***	(0.0883)***
$\tau_a = 0.30$	0.0070	0.0055	0.0057	0.0061	0.0091
	(0.0863)***	(0.0723)***	(0.0751)***	(0.0797)***	(0.0826)***
$\tau_a = 0.50$	0.0073	0.0059	0.0063	0.0064	0.0097
	(0.0894)***	(0.0702)***	(0.0700)***	(0.0756)***	(0.0869)***
$\tau_a = 0.70$	0.0067	0.0056	0.0064	0.0068	0.0098
	(0.0824)***	(0.0656)***	(0.0687)***	(0.0754)***	(0.0857)***
$\tau_a = 0.90^{\dagger}$	0.007	0.005	0.005	0.005	0.009
	(0.0693)***	(0.0505)***	(0.0550)***	(0.0602)***	(0.0678)***
Mean effect‡	0.0851	0.0683	0.0705	0.0826	0.0823

Note. Each quantile regression included a constant, country dummies, q, q^2 and their interaction with country dummies, a gender dummy, the country and gender specific labour force participation rate at the estimated time of labour market entry, the country specific GDP per head and unemployment rate at the age affected by the country specific reform and their interaction with the gender dummy, the interaction of age and age squared with the gender dummy. See also footnote 19 in the published article in this JOURNAL. Countries included: Austria, Belgium, Denmark, Finland, Germany, Greece, Ireland, Italy, Spain. †These estimates are reported for completeness but should be treated with caution since the corresponding first stage estimates are imprecise. ‡Mean effect: average (over τ_a) quantile treatment effect. ***, ** and *, statistically significant coefficients at the 1%, 5% and 10% level.

Additional variables

The aggregate variables used in the estimates are: – labour force, population and unemployment: ILO Labor Force Statistics, http://www.laborsta.org. – completed fertility rate: Eurostat online statistics – GDP per head in 1990 international dollars: Maddison (2007). We use linear interpolation to replace the few missing values in each of these variables.

C. The Monte Carlo Simulations

Chesher's model requires that outcomes and covariates exhibit continuous variation. In the specification adopted in this article, wages are indeed continuous but the schooling variable and the instruments are not. We investigate how severely this problem may affect our estimates with the help of Monte Carlo simulations. Our Monte Carlo exercise is designed adapting the design of the Monte Carlo simulations in Ma and Koenker (2006) to our setting. We assume the following specification $Y_1 = \alpha_1 + \alpha_2 x + \alpha_3 Y_2 + \alpha_4 \alpha_5 v_2 Y_2 + \alpha_4 v_1 Y_2 + v_1 + v_2 Y_2 = \gamma_0 + \gamma_1 x + \gamma_2 z + v_2$ where Y_1 and Y_2 are for the log wage and the years of schooling, z is the instrument – $z \sim \mathrm{N}(8,1.315)$ – the two errors are $v_1 \sim \mathrm{N}(0,1)$ and $v_2 \sim \mathrm{N}(0,0.5^2)$, there is a single covariate

Table B.8

p-values of the Test that the Marginal Effect of Years of Schooling Does not Vary Between Subsamples (Sample size: 7,804; ECHP only)

Males	$\tau_u = 0.10$	$\tau_u = 0.30$	$\tau_u = 0.50$	$\tau_u = 0.70$	$\tau_u = 0.90$
$\tau_a = 0.10$	0.787	0.945	0.898	0.325	0.486
$\tau_a = 0.30$	0.965	0.820	0.970	0.536	0.397
$\tau_a = 0.50$	0.375	0.724	0.631	0.352	0.893
$\tau_a = 0.70$	0.290	0.576	0.748	0.282	0.878
$\tau_a = 0.90$	0.695	0.984	0.831	0.451	0.453
Females	$\tau_u = 0.10$	$\tau_u = 0.30$	$\tau_u = 0.50$	$\tau_u = 0.70$	$\tau_u = 0.90$
$\tau_a = 0.10$	0.990	0.458	0.314	0.056*	0.724
$\tau_a = 0.30$	0.687	0.146	0.311	0.074*	0.828
$\tau_a = 0.50$	0.037	0.009***	0.947	0.442	0.953
$\tau_a = 0.70$	0.085	0.007	0.0741	0.0643	0.954
$\tau_a = 0.90$	0.053*	0.021**	0.840	0.667	0.896

Note. Each quantile regression included a constant, country dummies, q, q^2 and their interaction with country dummies, survey dummies, age, age squared, a gender dummy, the lagged country specific unemployment rate and GDP *per capita*, the country and gender specific labour force participation rate at the estimated time of labour market entry, the country specific GDP per head and unemployment rate at the age affected by the country specific reform; a dummy taking the value 1 for the 'high education' group of countries, namely Belgium, Denmark, Finland and Germany and its interaction with macro variables, survey dummies, age and age squared. ***, ** and **, statistically significant coefficients at the 1%, 5% and 10% level.

Table C.1

Monte Carlo Simulation Results (Number of replications: 100. Sample size: 1000)

τ_1	τ_2	$\Pi(\tau_1,\tau_2)$ (true)	$\Pi(\widehat{\tau_1, \tau_2})$ (continuous data est.)	$\Pi(\widehat{\tau_1, \tau_2})$ (rounded data est.)
0.10	0.10	0.0627	0.0546	0.0541
0.30	0.30	0.0552	0.0524	0.0560
0.50	0.50	0.05	0.0498	0.0514
0.70	0.70	0.0448	0.0443	0.0419
0.90	0.90	0.0372	0.0442	0.0398

$x \sim t_3$ and we set the parameters at $(\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5) = (2, 4, 0.05, -0.0089, 0.236)$ and $(\gamma_0, \gamma_1, \gamma_3) = (3,2,1)$ to mimic the results in Table 7. We draw samples of 100 units from v_1, v_2, z, x and generate Y_1 and Y_2 according to the equations above. We then use the generated variables to estimate the model both when Y_2 and z are continuous and when they are rounded to their nearest integer. Table C.1 in the Appendix compares the true estimates of the diagonal of matrix π based on the continuous and rounded data, and shows that the differences among these estimates are in general rather small. Therefore, we conclude that the use of non continuous variables in our empirical model does not produce a significant bias.

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