The Effect of Labor Market Conditions at Entry on Workers' Long-Term Skills

Online Appendix

Appendix Figures and Appendix Tables

Jaime Arellano-Bover

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1. Appendix Figures

Figure A1: Example question, PIAAC numeracy assessment

Source: OECD "Technical Report of the Survey of Adult Skills (PIAAC)." 2013.

Figure A2: Average Literacy Skills by Age
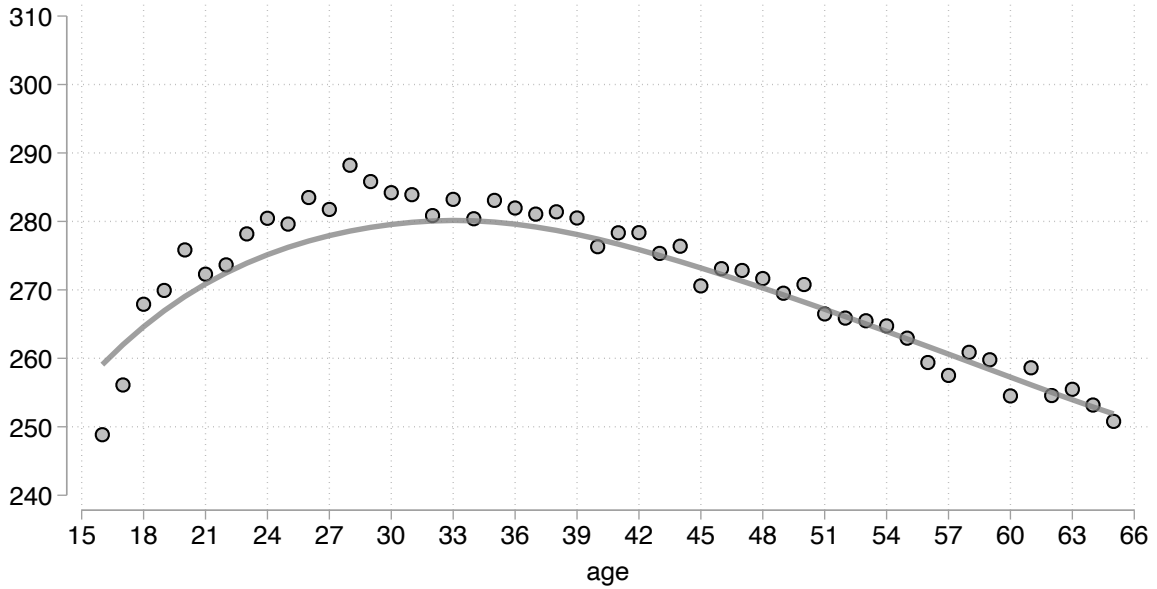
Notes: Average literacy skills by age, and local linear regression smoother. Employed workers who were born in their country of residence or migrated there before age 18. PIAAC respondents from countries listed in Table 1 in the main text.

Figure A3: National Unemployment Time Series By Country
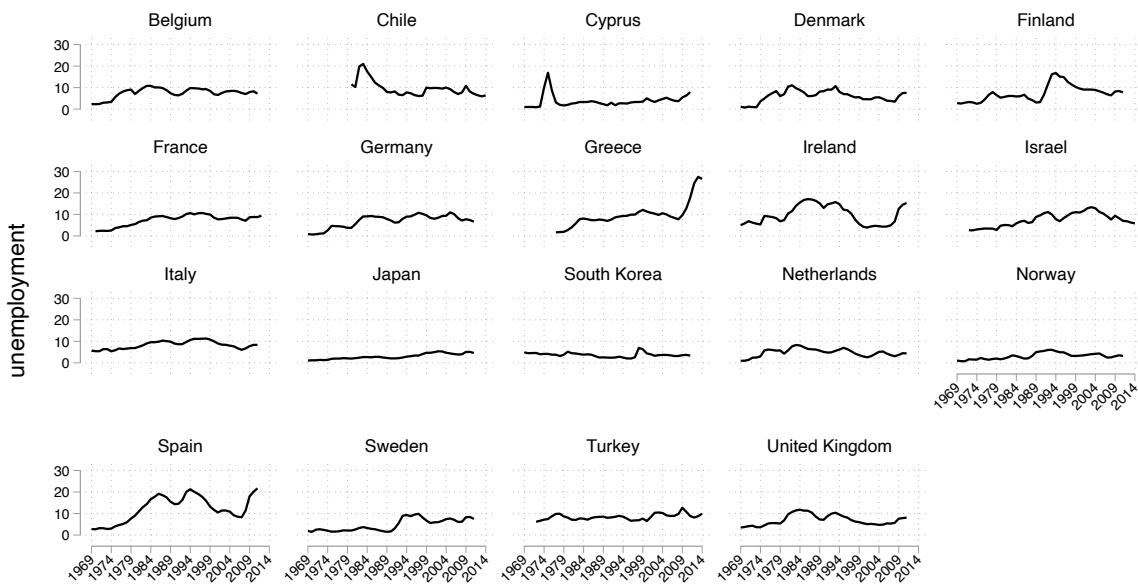
Notes: Unemployment time series for each country in the sample. Table 2 lists the source for each country.

Figure A4: Cross-Country Variation in Unemployment Time Series—Year-by-year percentiles
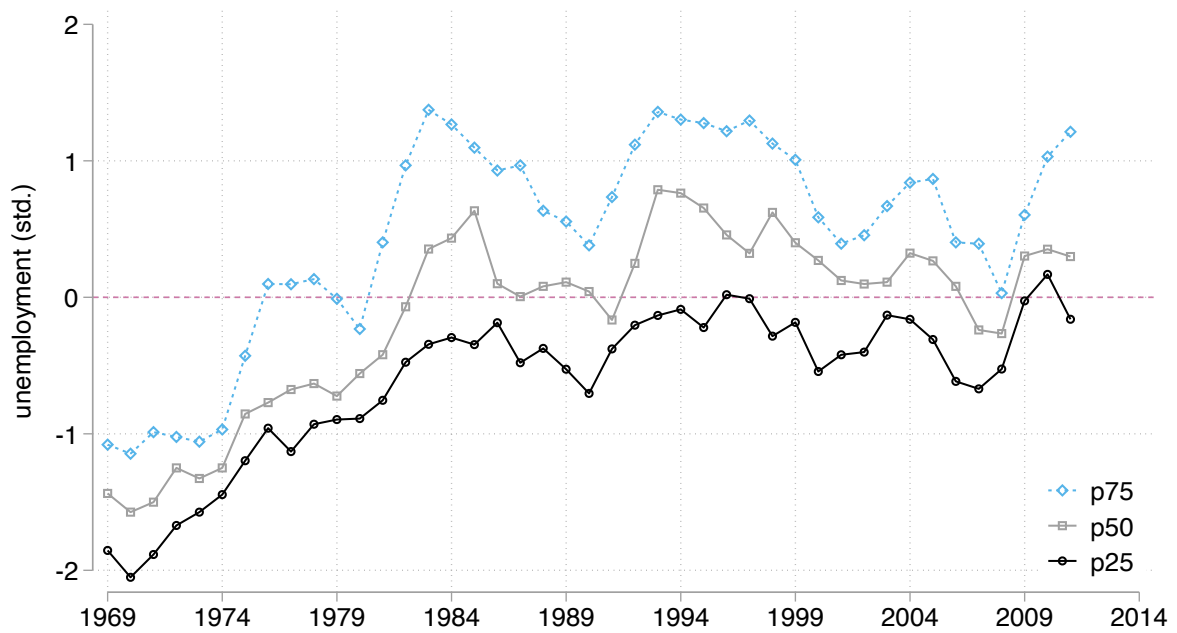
Notes: Year by year 75th, 50th, and 25th percentiles of the country-level distribution of standardized unemployment rates for each of the 19 countries in the sample.

Figure A5: Visual Relationship between 18-25 Unemployment and Skills, for Select Countries

(a) Denmark

(b) Italy

(c) Japan

(d) Turkey

(e) United Kingdom
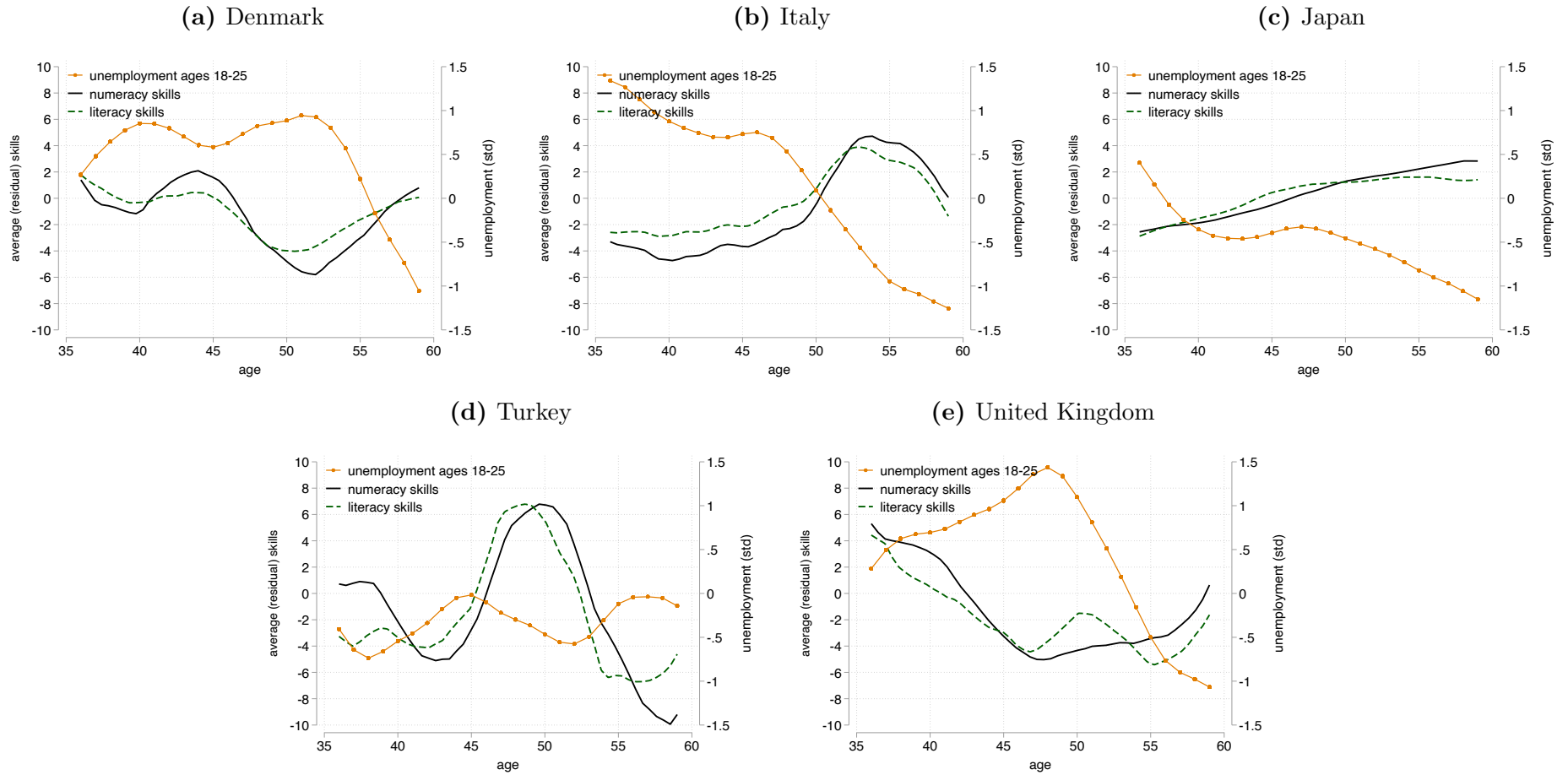
Notes: For select countries and each cohort in the sample this figure shows residualized and smoothed average skills (left axis) together with the average unemployment rate faced between ages 18–25. Residualized skills are net of a quadratic of age, gender, parents' education, and native-born status. The skills residuals–age gradient is smoothed using a kernel-weighted local polynomial regression. Average unemployment faced between ages 18–25 is measured in country-specific standard deviations. In the United Kingdom PIAAC was only carried out in England and Northern Ireland.

Figure A6: Firm size and skill growth: Estimated differential of size >1000 wrt. size 1–10, by age
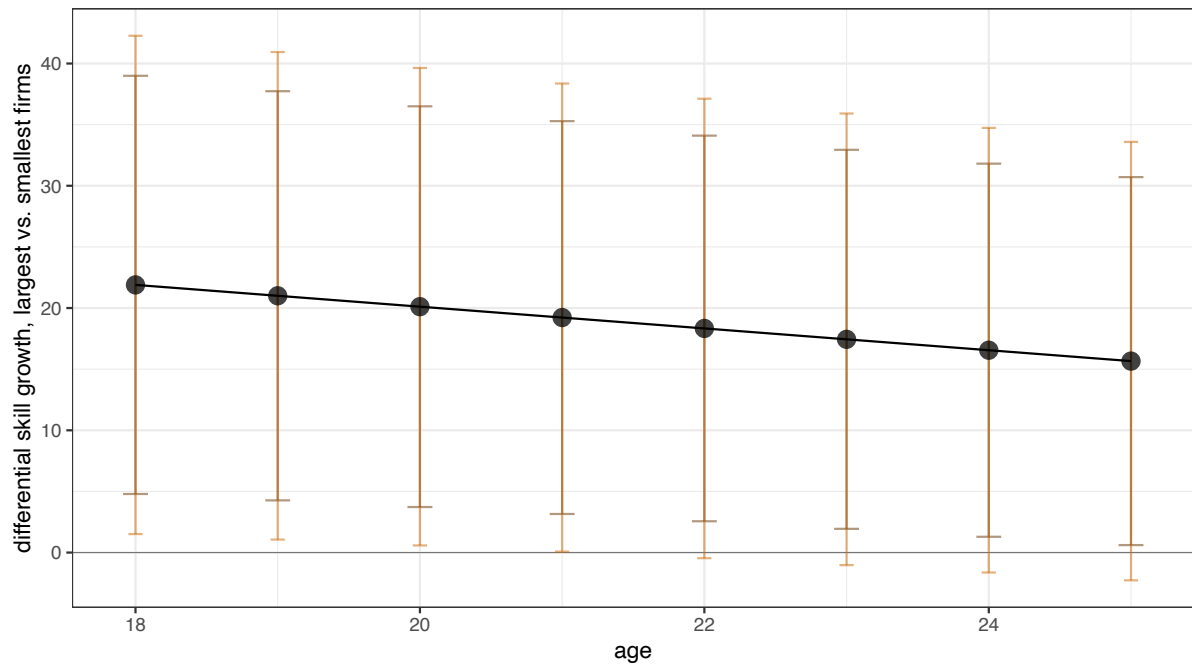
Notes: Estimated differentials in skill growth by age for workers in firms of size >1000 relative to workers in firms of size 1–10. Uses estimates from equation (6), found in Table 7 in the main text. Spikes represent 90% and 95% confidence intervals.

2. Appendix Tables

Table A1: Countercyclical Education Responses: Heterogeneity by Parents' Education, including age 17

	=1 IF POST-SECONDARY EDUCATION				=1 IF COLLEGE EDUCATION			
u(16) ×								
parents' education = low	0.023** (0.011)				0.003 (0.008)			
parents' education = middle	0.029** (0.011)				0.008 (0.009)			
parents' education = high	0.039** (0.015)				0.018 (0.012)			
u(17) ×								
parents' education = low		0.024** (0.009)				0.006 (0.007)		
parents' education = medium		0.023** (0.011)				0.004 (0.009)		
parents' education = high		0.034** (0.014)				0.021* (0.012)		
u(18) ×								
parents' education = low			0.012 (0.008)				0.007 (0.007)	
parents' education = medium			0.011 (0.010)				0.005 (0.008)	
parents' education = high			0.024* (0.013)				0.032*** (0.011)	
u(18-25) ×								
parents' education = low				0.009 (0.017)				0.010 (0.014)
parents' education = medium				-0.006 (0.020)				0.004 (0.016)
parents' education = high				0.030 (0.022)				0.041** (0.019)
mean(Y)	.393	.391	.388	.388	.238	.237	.235	.235
SE Clusters	406	425	443	443	406	425	443	443
N	34066	35317	36460	36460	34066	35317	36460	36460

Notes: OLS estimates of regressions at the worker level, using survey weights. Sample consists of employed, experienced (ages 36-59) workers residing in the 19 countries listed in Table 1 in the main text, who are natives or immigrated before age 18. Dependent variable in left panel is a dummy that equals one if the worker has completed any post-secondary education; in right panel is a dummy that equals one if the worker has completed any college education. Unemployment is measured in country-specific standard deviations and averaged across the ages in parentheses. All regressions include age fixed effects, country fixed effects, country-specific quadratic age trends, a gender dummy, parents' education (maximum over mother and father), and a native-born dummy. Parents' education categories are: low = ISCED 1, 2, and 3C short; medium = ISCED 3 (excl 3C short) and 4; high = ISCED 5 and 6. Standard errors in parentheses are clustered at the level of country×age. * 0.10 ** 0.05 *** 0.01.

Table A2: Robustness, deviations from linear trend in standardized unemployment rates; Early-Career Labor Market Conditions and Skills

	NUMERACY SKILLS				LITERACY SKILLS			
u(18-25)	-4.69*	-5.45**	-6.42*	-7.51**	-3.52	-4.06*	-5.06	-5.72*
	(2.82)	(2.73)	(3.62)	(3.61)	(2.26)	(2.24)	(3.19)	(3.20)
u(26-30)			-1.01	-1.41			-1.09	-1.23
			(2.02)	(2.11)			(1.88)	(1.91)
u(31-35)			-2.21	-1.94			-1.34	-1.20
			(1.46)	(1.51)			(1.36)	(1.35)
Controls	no	yes	no	yes	no	yes	no	yes
mean(Y)	270	271	270	271	273	273	273	273
SD(Y)	52	52	52	52	47	47	47	47
SE Clusters	443	443	443	443	443	443	443	443
N	37160	36465	37160	36465	37160	36465	37160	36465

Notes: OLS estimates of regressions at the worker level, using survey weights. Sample consists of employed, experienced (ages 36-59) workers residing in the 19 countries listed in Table 1 in the main text, who are natives or immigrated before age 18. Dependent variable is a worker's level of numeracy or literacy skills. As opposed to the main specification, unemployment is measured as deviations from a country-specific linear time trend. All regressions include age fixed effects, country fixed effects, and country-specific quadratic age trends. "Controls" include a gender dummy, parents' education (maximum education over mother and father in the form of dummies for three educational levels), and a native-born dummy. Standard errors in parentheses are clustered at the level of country×age and take into account that skills are measured through multiple plausible values. * 0.10 ** 0.05 *** 0.01.

Table A3: Robustness, deviations from linear trend in standardized unemployment rates; Early-Career Labor Market Conditions and Skills: Heterogeneity by Parents' Education

	NUMERACY SKILLS		LITERACY SKILLS	
u(18-25) ×				
parents' education = low	-8.00***	-10.70***	-6.13***	-8.38***
	(2.80)	(3.58)	(2.34)	(3.18)
parents' education = medium	-3.63	-4.71	-3.61	-4.67
	(2.93)	(3.82)	(2.47)	(3.45)
parents' education = high	-0.09	-1.76	2.11	0.74
	(3.14)	(4.05)	(2.52)	(3.42)
u(26-30) ×				
parents' education = low		-1.52		-1.84
		(2.29)		(2.05)
parents' education = medium		-1.53		-0.65
		(2.24)		(2.12)
parents' education = high		-1.28		-0.45
		(2.49)		(2.19)
u(31-35) ×				
parents' education = low		-3.49**		-2.37
		(1.73)		(1.47)
parents' education = medium		1.07		1.12
		(1.82)		(1.74)
parents' education = high		-0.73		0.08
		(2.18)		(1.84)
Controls	yes	yes	yes	yes
mean(Y)	271	271	273	273
SD(Y)	52	52	47	47
SE Clusters	443	443	443	443
N	36465	36465	36465	36465

Notes: OLS estimates of regressions at the worker level, using survey weights. Sample consists of employed, experienced (ages 36-59) workers residing in the 19 countries listed in Table 1 in the main text, who are natives or immigrated before age 18. Dependent variable is a worker's level of numeracy or literacy skills. As opposed to the main specification, unemployment is measured as deviations from a country-specific linear time trend. All regressions include age fixed effects, country fixed effects, and country-specific quadratic age trends. "Controls" include a gender dummy, parents' education (maximum education over mother and father in the form of dummies for three educational levels), and a native-born dummy. Parents' education is the maximum among a respondent's two parents: low = ISCED 1, 2, and 3C short; medium = ISCED 3 (excl 3C short) and 4; high = ISCED 5 and 6. Standard errors in parentheses are clustered at the level of country×age and take into account that skills are measured through multiple plausible values. * 0.10 ** 0.05 *** 0.01.

Table A4: Robustness, no standardization of unemployment rates; Early-Career Labor Market Conditions and Skills

	NUMERACY SKILLS				LITERACY SKILLS			
u(18-25)	-1.52	-1.64	-2.18*	-2.43*	-1.23	-1.38	-1.77	-1.88
	(1.15)	(1.12)	(1.31)	(1.31)	(0.95)	(0.91)	(1.18)	(1.17)
u(26-30)			-0.67	-0.78			-0.46	-0.42
			(0.78)	(0.80)			(0.75)	(0.76)
u(31-35)			-0.08	-0.06			0.31	0.29
			(0.45)	(0.47)			(0.46)	(0.46)
Controls	no	yes	no	yes	no	yes	no	yes
mean(Y)	270	271	270	271	273	273	273	273
SD(Y)	52	52	52	52	47	47	47	47
SE Clusters	443	443	443	443	443	443	443	443
N	37160	36465	37160	36465	37160	36465	37160	36465

Notes: OLS estimates of regressions at the worker level, using survey weights. Sample consists of employed, experienced (ages 36-59) workers residing in the 19 countries listed in Table 1 in the main text, who are natives or immigrated before age 18. Dependent variable is a worker's level of numeracy or literacy skills. As opposed to the main specification, unemployment is measured as percentage points (no standardization). All regressions include age fixed effects, country fixed effects, and country-specific quadratic age trends. "Controls" include a gender dummy, parents' education (maximum education over mother and father in the form of dummies for three educational levels), and a native-born dummy. Standard errors in parentheses are clustered at the level of country×age and take into account that skills are measured through multiple plausible values. * 0.10 ** 0.05 *** 0.01.

Table A5: Robustness, no standardization of unemployment rates; Early-Career Labor Market Conditions and Skills: Heterogeneity by Parents' Education

	NUMERACY SKILLS		LITERACY SKILLS	
u(18-25) ×				
parents' education = low	-2.21**	-2.73**	-1.85**	-2.05*
	(1.12)	(1.33)	(0.92)	(1.17)
parents' education = medium	-1.16	-2.09	-1.15	-1.93
	(1.14)	(1.33)	(0.93)	(1.19)
parents' education = high	-0.76	-1.54	-0.31	-1.00
	(1.15)	(1.45)	(0.95)	(1.27)
u(26-30) ×				
parents' education = low		-0.45		-0.42
		(0.91)		(0.82)
parents' education = medium		-0.97		-0.31
		(0.83)		(0.84)
parents' education = high		-1.11		-0.48
		(0.95)		(0.89)
u(31-35) ×				
parents' education = low		-0.58		-0.05
		(0.53)		(0.47)
parents' education = medium		0.70		0.71
		(0.61)		(0.60)
parents' education = high		0.62		0.79
		(0.72)		(0.69)
Controls	yes	yes	yes	yes
mean(Y)	271	271	273	273
SD(Y)	52	52	47	47
SE Clusters	443	443	443	443
N	36465	36465	36465	36465

Notes: OLS estimates of regressions at the worker level, using survey weights. Sample consists of employed, experienced (ages 36-59) workers residing in the 19 countries listed in Table 1 in the main text, who are natives or immigrated before age 18. Dependent variable is a worker's level of numeracy or literacy skills. As opposed to the main specification, unemployment is measured as percentage points (no standardization). All regressions include age fixed effects, country fixed effects, and country-specific quadratic age trends. "Controls" include a gender dummy, parents' education (maximum education over mother and father in the form of dummies for three educational levels), and a native-born dummy. Parents' education is the maximum among a respondent's two parents: low = ISCED 1, 2, and 3C short; medium = ISCED 3 (excl 3C short) and 4; high = ISCED 5 and 6. Standard errors in parentheses are clustered at the level of country×age and take into account that skills are measured through multiple plausible values. * 0.10 ** 0.05 *** 0.01.

Table A6: Alternative Measures of Unemployment Conditions

	NUMERACY SKILLS				LITERACY SKILLS			
u(18-25)	-7.29**		-4.89	-8.10**	-5.41*		-4.51	-5.03
	(3.62)		(3.57)	(3.70)	(3.19)		(3.26)	(3.36)
max(u18-u25)		-3.22**	-2.87**			-1.99*	-1.29	
		(1.30)	(1.44)			(1.20)	(1.33)	
1(u25 > u18)				-0.59				-0.13
				(1.42)				(1.40)
u(18-25)				1.09				-0.74
× 1(u25 > u18)				(1.35)				(1.28)
Controls	yes	yes	yes	yes	yes	yes	yes	yes
Control for u 26–35	yes	yes	yes	yes	yes	yes	yes	yes
mean(Y)	271	271	271	271	273	273	273	273
SD(Y)	52	52	52	52	47	47	47	47
SE Clusters	443	443	443	443	443	443	443	443
N	36465	36465	36465	36465	36465	36465	36465	36465

Notes: OLS estimates of regressions at the worker level, using survey weights. Sample consists of employed, experienced (ages 36-59) workers residing in the 19 countries listed in Table 1 in the main text, who are natives or immigrated before age 18. Dependent variable is a worker's level of numeracy or literacy skills. Unemployment is measured in country-specific standard deviations and i) averaged across the ages in parentheses, or ii) the maximum is taken. All regressions include age fixed effects, country fixed effects, and country-specific quadratic age trends. "Controls" include a gender dummy, parents' education (maximum education over mother and father in the form of dummies for three educational levels), and a native-born dummy. All specifications control for unemployment conditions during ages 26–30 and 31–35, always with the same functional form as conditions at 18–25. Standard errors in parentheses are clustered at the level of country×age and take into account that skills are measured through multiple plausible values. * 0.10 ** 0.05 *** 0.01.

Table A7: Breaking up u(18–25); Early-Career Labor Market Conditions and Skills

	NUMERACY SKILLS		LITERACY SKILLS	
u(18-21)	-3.44*	-3.80*	-2.50	-2.81
	(1.89)	(1.98)	(1.76)	(1.83)
u(22-25)	-2.22	-3.30	-1.67	-2.47
	(1.47)	(2.19)	(1.21)	(1.94)
u(26-30)		-1.04		-0.89
		(2.27)		(2.12)
u(31-35)		-1.74		-1.00
		(1.61)		(1.43)
Controls	yes	yes	yes	yes
mean(Y)	271	271	273	273
SD(Y)	52	52	47	47
SE Clusters	443	443	443	443
N	36465	36465	36465	36465

Notes: OLS estimates of regressions at the worker level, using survey weights. Sample consists of employed, experienced (ages 36-59) workers residing in the 19 countries listed in Table 1 in the main text, who are natives or immigrated before age 18. Dependent variable is a worker's level of numeracy or literacy skills. Unemployment is measured in country-specific standard deviations and averaged across the ages in parentheses. All regressions include age fixed effects, country fixed effects, and country-specific quadratic age trends. "Controls" include a gender dummy, parents' education (maximum education over mother and father in the form of dummies for three educational levels), and a native-born dummy. Standard errors in parentheses are clustered at the level of country×age and take into account that skills are measured through multiple plausible values. * 0.10 ** 0.05 *** 0.01.

Table A8: Alternative sample, active persons; Early-Career Labor Market Conditions and Skills

	NUMERACY SKILLS				LITERACY SKILLS			
u(18-25)	-4.04	-4.77*	-4.82	-5.89*	-3.06	-3.60	-4.45	-4.98
	(2.73)	(2.63)	(3.60)	(3.54)	(2.22)	(2.19)	(3.15)	(3.12)
u(26-30)			-0.32	-0.71			-1.08	-1.13
			(2.06)	(2.12)			(1.87)	(1.89)
u(31-35)			-1.51	-1.28			-0.91	-0.72
			(1.47)	(1.50)			(1.34)	(1.33)
Controls	no	yes	no	yes	no	yes	no	yes
mean(Y)	269	270	269	271	271	272	271	272
SD(Y)	53	52	53	52	48	48	48	48
SE Clusters	443	443	443	443	443	443	443	443
N	39157	38400	39157	38400	39157	38400	39157	38400

Notes: OLS estimates of regressions at the worker level, using survey weights. Sample consists of employed and unemployed, experienced (ages 36-59) workers residing in the 19 countries listed in Table 1 in the main text, who are natives or immigrated before age 18.Dependent variable is a worker's level of numeracy or literacy skills. Unemployment is measured in country-specific standard deviations and averaged across the ages in parentheses. All regressions include age fixed effects, country fixed effects, and country-specific quadratic age trends. "Controls" include a gender dummy, parents' education (maximum education over mother and father in the form of dummies for three educational levels), and a native-born dummy. Standard errors in parentheses are clustered at the level of country×age and take into account that skills are measured through multiple plausible values. * 0.10 ** 0.05 *** 0.01.

Table A9: Alternative sample, active persons; Early-Career Labor Market Conditions and Skills: Heterogeneity by Parents' Education

	NUMERACY SKILLS		LITERACY SKILLS	
u(18-25) ×				
parents' education = low	-6.60**	-7.82**	-5.00**	-6.46**
	(2.67)	(3.51)	(2.27)	(3.12)
parents' education = medium	-3.53	-4.40	-3.31	-4.88
	(2.74)	(3.61)	(2.29)	(3.20)
parents' education = high	-0.85	-1.87	0.50	-0.92
	(2.96)	(3.95)	(2.45)	(3.38)
u(26-30) ×				
parents' education = low		-0.54		-1.50
		(2.34)		(2.05)
parents' education = medium		-1.01		-0.50
		(2.24)		(2.06)
parents' education = high		-1.08		-1.25
		(2.47)		(2.26)
u(31-35) ×				
parents' education = low		-1.98		-1.24
		(1.74)		(1.46)
parents' education = medium		0.59		0.58
		(1.77)		(1.61)
parents' education = high		-1.46		-0.54
		(2.09)		(1.81)
Controls	yes	yes	yes	yes
mean(Y)	270	270	272	272
SD(Y)	52	52	48	48
SE Clusters	443	443	443	443
N	38400	38400	38400	38400

Notes: OLS estimates of regressions at the worker level, using survey weights. Sample consists of employed and unemployed, experienced (ages 36-59) workers residing in the 19 countries listed in Table 1 in the main text, who are natives or immigrated before age 18. Dependent variable is a worker's level of numeracy or literacy skills. Unemployment is measured in country-specific standard deviations and averaged across the ages in parentheses. All regressions include age fixed effects, country fixed effects, and country-specific quadratic age trends. "Controls" include a gender dummy, parents' education (maximum education over mother and father in the form of dummies for three educational levels), and a native-born dummy. Parents' education is the maximum among a respondent's two parents: low = ISCED 1, 2, and 3C short; medium = ISCED 3 (excl 3C short) and 4; high = ISCED 5 and 6. Standard errors in parentheses are clustered at the level of country×age and take into account that skills are measured through multiple plausible values. * 0.10 ** 0.05 *** 0.01.

Table A10: Early-Career Labor Market Conditions and Labor Force Participation

	=1 IF ACTIVE (EMPLOYED OR UNEMPLOYED)					
u(18-25)	0.019	0.015	0.015	-0.000	0.021	0.025
	(0.016)	(0.021)	(0.016)	(0.022)	(0.026)	(0.034)
u(26-30)		-0.004		-0.013		0.003
		(0.013)		(0.013)		(0.022)
u(31-35)		0.003		-0.004		0.005
		(0.009)		(0.010)		(0.013)
Controls	yes	yes	yes	yes	yes	yes
Sample	all	all	men	men	women	women
mean(Y)	.79	.79	.9	.9	.681	.681
SE Clusters	443	443	443	443	443	443
N	46962	46962	22494	22494	24468	24468

Notes: OLS estimates of regressions at the worker level, using survey weights. Sample consists of persons between the ages 36-59 residing in the 19 countries listed in Table 1 in the main text, who are natives or immigrated before age 18. Dependent variable is a dummy variable equal to one if person is in the labor force (employed or unemployed). Unemployment is measured in country-specific standard deviations and averaged across the ages in parentheses. All regressions include age fixed effects, country fixed effects, and country-specific quadratic age trends. "Controls" include a gender dummy, parents' education (maximum education over mother and father in the form of dummies for three educational levels), and a native-born dummy. Standard errors in parentheses are clustered at the level of country×age and take into account that skills are measured through multiple plausible values. * 0.10 ** 0.05 *** 0.01.

Table A11: No Unemployment-Induced International Migration

	Outcome: LOG NUMBER OF PEOPLE IN COHORT			
u(18-25)	0.0205	0.0018	0.0088	0.0054
	(0.0345)	(0.0464)	(0.0331)	(0.0450)
u(26-30)		-0.0142		-0.0000
		(0.0303)		(0.0292)
u(31-35)		-0.0367		-0.0264
		(0.0248)		(0.0238)
Cohort includes	employed	employed	labor force	labor force
p-value	.552	.419	.789	.566
N	443	443	443	443

Notes: OLS estimates of specifications (3) and (4) in the text at the cohort (country×age) level. Sample consists of persons between the ages 36-59 residing in the 19 countries listed in Table 1 in the main text, who are natives or immigrated before age 18. Dependent variable is log cohort size (computed using survey weights). Unemployment is measured in country-specific standard deviations and averaged across the ages in parentheses. All regressions include age fixed effects, country fixed effects, country-specific quadratic age trends, and controls for cohort composition: gender, parents' education, and native/foreign-born. Robust standard errors in parentheses. * 0.10 ** 0.05 *** 0.01. p-value in each column refers to a test where the null is all coefficients (one coefficient in odd columns, three coefficients in even columns) being equal to zero.

Table A12: German PIAAC Panel: Literacy Skills Growth By Firm Size and Age

	LITERACY SKILLS$_{2015}$			
firm size =				
11-50	2.57	2.04	0.72	0.55
	(3.42)	(3.47)	(6.41)	(6.34)
51-250	-5.22	-6.11*	-5.86	-5.60
	(3.74)	(3.71)	(7.02)	(7.03)
251-1000	2.72	1.40	9.25	8.58
	(3.60)	(4.00)	(6.91)	(7.28)
>1000	4.04	2.57	6.12	5.63
	(4.12)	(4.29)	(8.30)	(8.66)
(age-18) × firm size =				
11-50			0.08	0.07
			(0.26)	(0.26)
51-250			0.03	-0.02
			(0.32)	(0.32)
251-1000			-0.30	-0.33
			(0.29)	(0.29)
>1000			-0.10	-0.14
			(0.34)	(0.34)
skills$_{2012}$	0.80***	0.78***	0.80***	0.78***
	(0.03)	(0.03)	(0.03)	(0.03)
Industry FE	no	yes	no	yes
N	1321	1316	1321	1316

Notes: OLS estimates of different specifications of equations (5) and (6) in the text. Regressions at the worker level, using survey weights. Sample is a panel of salary workers who were employed in Germany in 2012 and 2015, and who were private-sector workers in 2012 between the ages of 18–59. Firm size categories refer to the size of the firm where a worker was employed in 2012. Omitted category is firm size 1–10. Outcome is the level of numeracy skills in 2015. All regressions control for numeracy skills in 2012, a quadratic in age and gender. Specifications labeled "Industry FE" further control for 7 categories of industry fixed effects. Robust standard errors in parentheses take into account PIAAC survey and assessment design, taking into account that skills are measured through multiple plausible values. * 0.10 ** 0.05 *** 0.01.

Table A13: German PIAAC Panel: Numeracy Skills Growth By Firm Size and Age; Sample of Stayers

	NUMERACY SKILLS$_{2015}$			
firm size =				
11-50	-2.49	-3.21	5.37	4.38
	(4.31)	(4.49)	(12.71)	(12.70)
51-250	-4.27	-5.48	3.38	1.85
	(4.61)	(4.96)	(11.30)	(11.57)
251-1000	1.29	-0.00	11.49	10.14
	(4.95)	(5.61)	(12.82)	(13.22)
>1000	1.13	-0.15	24.22*	22.71*
	(5.10)	(5.33)	(13.44)	(13.48)
(age-18) × firm size =				
11-50			-0.33	-0.31
			(0.48)	(0.49)
51-250			-0.32	-0.30
			(0.46)	(0.47)
251-1000			-0.43	-0.43
			(0.48)	(0.48)
>1000			-0.99*	-0.98*
			(0.54)	(0.54)
skills$_{2012}$	0.81***	0.80***	0.82***	0.81***
	(0.04)	(0.04)	(0.04)	(0.04)
Industry FE	no	yes	no	yes
N	988	986	988	986

Notes: OLS estimates of different specifications of equations (5) and (6) in the text. Regressions at the worker level, using survey weights. Sample is a panel of salary workers who were employed in Germany in 2012 and 2015, and who were private-sector workers in 2012 between the ages of 18–59. Sample further restricted to workers who in 2015 were in the same job as in 2012. Firm size categories refer to the size of the firm where a worker was employed in 2012. Omitted category is firm size 1–10. Outcome is the level of numeracy skills in 2015. All regressions control for numeracy skills in 2012, a quadratic in age and gender. Specifications labeled "Industry FE" further control for 7 categories of industry fixed effects. Robust standard errors in parentheses take into account PIAAC survey and assessment design, taking into account that skills are measured through multiple plausible values. * 0.10 ** 0.05 *** 0.01.

Table A14: German PIAAC Panel: Numeracy Skills Growth By Firm Size and Age; Skill change as outcome

	ΔNUMERACY SKILLS			
firm size =				
11-50	-2.93	-3.24	3.02	2.62
	(3.52)	(3.61)	(8.20)	(8.16)
51-250	-5.93	-6.02	4.35	3.90
	(4.46)	(4.50)	(8.39)	(8.46)
251-1000	-2.20	-1.79	4.61	4.97
	(4.19)	(4.62)	(8.68)	(8.94)
>1000	-3.46	-3.36	21.11**	20.13*
	(4.49)	(4.60)	(10.43)	(11.08)
(age-18) × firm size =				
11-50			-0.27	-0.26
			(0.34)	(0.34)
51-250			-0.47	-0.44
			(0.37)	(0.37)
251-1000			-0.31	-0.30
			(0.36)	(0.36)
>1000			-1.11**	-1.06**
			(0.43)	(0.45)
Industry FE	no	yes	no	yes
N	1321	1316	1321	1316

Notes: OLS estimates of different specifications of equations (7) and (8) in the text. Regressions at the worker level, using survey weights. Sample is a panel of salary workers who were employed in Germany in 2012 and 2015, and who were private-sector workers in 2012 between the ages of 18–59. Firm size categories refer to the size of the firm where a worker was employed in 2012. Omitted category is firm size 1–10. Outcome is the change in numeracy skills between 2012 and 2015. All regressions control for a quadratic in age and gender. Specifications labeled "Industry FE" further control for 7 categories of industry fixed effects. Robust standard errors in parentheses take into account PIAAC survey and assessment design, taking into account that skills are measured through multiple plausible values. * 0.10 ** 0.05 *** 0.01.

Table A15: German PIAAC Panel: Numeracy Skills Growth By Firm Size and Age; Skill percentage change as outcome

	%ΔNUMERACY SKILLS			
firm size =				
11-50	-1.09	-1.23	1.00	0.81
	(1.42)	(1.46)	(3.23)	(3.21)
51-250	-2.33	-2.36	1.54	1.30
	(1.86)	(1.86)	(3.43)	(3.43)
251-1000	-1.31	-1.11	1.01	1.13
	(1.63)	(1.81)	(3.35)	(3.47)
>1000	-1.61	-1.52	7.58*	7.15
	(1.67)	(1.73)	(4.11)	(4.38)
(age-18) × firm size =				
11-50			-0.09	-0.09
			(0.13)	(0.14)
51-250			-0.17	-0.16
			(0.15)	(0.15)
251-1000			-0.10	-0.10
			(0.14)	(0.14)
>1000			-0.42**	-0.39**
			(0.17)	(0.18)
Industry FE	no	yes	no	yes
N	1321	1316	1321	1316

Notes: OLS estimates of different specifications of equations (7) and (8) in the text. Regressions at the worker level, using survey weights. Sample is a panel of salary workers who were employed in Germany in 2012 and 2015, and who were private-sector workers in 2012 between the ages of 18–59. Firm size categories refer to the size of the firm where a worker was employed in 2012. Omitted category is firm size 1–10. Outcome is the percentage change in numeracy skills between 2012 and 2015. All regressions control for a quadratic in age and gender. Specifications labeled "Industry FE" further control for 7 categories of industry fixed effects. Robust standard errors in parentheses take into account PIAAC survey and assessment design, taking into account that skills are measured through multiple plausible values. * 0.10 ** 0.05 *** 0.01.