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Explaining the training disadvantage of less-educated workers: the role of labor market allocation in international comparison

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Explaining the training disadvantage of less-educated workers: The role of labor market allocation in international comparison

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Section A. Descriptive statistics of the variables used

Table S.A1: Descriptive statistics of the individual-level variables used

Country	Country code	%					Mean						
		Training participation	Less-educated (ISCED 0-2)	Intermed.-educated (ISCED 3-4)	Computer use at work	Part-time	Numeracy score	Learning motivation (factor)	Abstract tasks (factor)	Routine tasks (factor)	Manual-physical tasks	Manual-accuracy tasks	ISEI score
Austria	AT	47.7	16.5	83.5	73.2	23.8	275.2	0.1	0.1	-0.5	3.3	4.1	41.7
Belgium	BE	40.0	17.9	82.1	60.6	21.3	272.2	-0.4	-0.1	-0.2	3.5	4.0	37.0
Canada	CA	51.1	17.2	82.8	70.4	13.8	252.1	0.3	0.3	-0.0	3.5	4.3	42.1
Chile*	CL	45.1	34.6	65.4	36.5	13.1	199.1	0.4	-0.1	0.4	3.5	4.5	30.0
Czech Rep.	CZ	54.8	8.5	91.5	60.5	3.7	270.9	-0.0	0.1	-0.1	3.5	4.0	37.3
Denmark	DK	58.7	26.5	73.5	77.4	14.9	274.4	0.3	0.1	-0.5	3.5	4.3	39.1
Estonia	EE	44.4	15.8	84.2	52.4	6.3	265.9	-0.2	-0.2	-0.1	3.7	4.4	36.3
Finland	FI	58.7	13.4	86.6	77.0	10.6	280.4	0.4	0.3	-0.5	3.2	3.9	35.0
France	FR	34.9	26.7	73.3	56.3	15.4	244.6	0.2	-0.2	0.3	3.4	3.7	36.5
Germany	DE	42.6	10.9	89.1	64.5	28.9	267.6	0.0	0.1	-0.4	3.5	4.3	36.1
Greece*	GR	20.8	26.1	73.9	43.5	17.0	247.8	0.0	-0.3	0.7	3.6	4.0	33.9
Ireland	IE	47.1	27.3	72.7	59.7	32.8	248.4	0.2	0.1	0.3	3.6	4.4	37.0
Israel	IL	34.9	16.8	83.2	54.8	20.8	239.3	0.0	-0.1	-0.1	3.2	4.0	41.7
Italy	IT	25.6	48.8	51.2	47.3	18.8	252.6	0.2	-0.3	0.4	3.3	3.9	35.6
Japan	JP	35.8	13.5	86.5	71.8	17.6	284.5	-0.9	-0.0	-0.5	2.9	2.9	36.3
Lithuania*	KR	24.6	6.1	93.9	32.3	6.7	260.6	-0.5	-0.7	0.7	3.9	4.4	33.3
Netherlands	LT	60.0	34.5	65.5	78.3	36.6	275.3	-0.4	0.0	-0.0	3.4	3.8	42.7
New Zealand*	NL	61.5	35.6	64.4	66.0	23.7	260.4	0.3	0.5	-0.2	3.8	4.6	40.8
Norway	NZ	57.2	28.3	71.7	80.9	21.1	272.4	0.2	0.2	-0.4	3.6	3.4	38.0
Poland	NO	32.6	7.7	92.3	38.4	5.4	254.0	-0.0	-0.3	0.2	4.0	4.6	34.3
Slovak Republic	SK	37.8	9.4	90.6	49.0	4.8	279.2	0.1	-0.2	0.4	3.6	4.3	37.5
Slovenia	SK	43.1	18.2	81.8	55.6	5.4	252.7	-0.0	-0.2	0.4	3.9	4.6	36.1
South Korea	SI	40.8	18.0	82.0	53.7	13.4	250.6	-1.1	-0.1	0.4	3.6	2.7	32.5
Spain	ES	41.6	57.0	43.0	44.7	15.7	244.9	0.3	-0.3	0.2	3.6	3.7	33.2
Sweden	SE	56.6	19.1	80.9	83.0	13.7	277.0	0.3	0.2	-0.5	3.4	3.8	39.1
Turkey*	TR	32.4	64.4	35.6	31.6	5.1	225.5	-0.1	-0.4	0.2	4.1	3.9	35.0
United Kingdom	UK	55.7	32.2	67.8	70.2	24.7	258.1	0.1	0.3	0.0	3.3	4.3	37.6
United States	US	50.5	12.9	87.1	69.2	10.6	240.9	0.4	0.3	0.0	3.9	4.7	38.7
Mean		44.2	23.7	76.3	59.2	15.9	258.1	0.0	-0.0	0.0	3.6	4.1	36.9
Standard dev.		11.4	14.6	14.6	15.0	8.7	18.8	0.4	0.3	0.4	0.3	0.5	3.1

Table continues on next page.

Table S.A1: Descriptive statistics of the individual-level variables used (continued)

Country	Firm size (in %)					Economic sector (in %)								Public Sector (in %)	N
	1-10 employees	11-50	51-250	251-1000	1000+	Agri-culture	Mining	Manu-facturing	Electricity/ Water supply	Construc-tion	Commerce	Transport	Services		
Austria	24.6	31.1	20.4	15.8	8.2	1.1	0.4	20.9	1.3	7.8	16.4	5.9	46.1	23.2	1330
Belgium	20.0	27.6	30.0	13.9	8.5	0.5	0.1	25.5	1.7	8.3	11.2	10.6	41.9	24.6	1106
Canada	22.3	30.7	26.6	13.3	7.0	1.4	2.4	15.6	1.8	10.1	18.3	6.9	43.4	21.9	3497
Chile*	37.0	27.1	22.0	9.2	4.7	9.2	4.5	18.1	1.2	5.9	15.9	8.0	37.4	11.6	876
Czech Rep.	29.4	31.3	22.9	11.9	4.5	1.8	1.7	38.6	3.9	6.2	12.4	6.8	28.6	20.9	1308
Denmark	21.8	36.1	25.5	11.5	5.1	1.4	0.1	20.8	2.1	9.4	14.1	8.4	43.7	27.4	1134
Estonia	30.7	37.4	20.7	8.0	3.3	5.1	1.2	28.9	1.3	9.8	15.3	8.7	29.6	18.4	1419
Finland	29.6	35.2	22.8	9.0	3.4	2.1	0.4	21.8	1.2	9.6	15.2	10.3	39.4	25.2	871
France	28.4	29.3	21.6	13.7	7.0	1.3	0.2	18.5	1.6	8.9	14.2	8.0	47.4	22.4	1594
Germany	27.6	24.7	23.6	15.7	8.3	0.9	0.4	25.8	2.2	6.9	16.8	7.1	39.8	14.8	1517
Greece*	48.8	30.4	13.2	4.2	3.4	2.5	0.0	12.6	5.3	5.1	17.7	6.8	49.9	28.5	658
Ireland	33.2	33.9	18.1	10.3	4.4	2.0	0.4	15.4	1.8	6.1	17.1	5.2	51.8	22.5	974
Israel	36.4	28.7	19.2	8.1	7.5	0.8	0.1	13.8	1.1	8.7	16.4	5.7	53.3	25.9	692
Italy	36.5	27.9	18.9	8.3	8.4	3.7	0.1	27.0	2.6	7.2	12.7	6.8	40.0	18.3	1300
Japan	25.6	32.0	26.1	11.1	5.2	1.4	0.0	28.9	2.4	6.5	16.2	8.8	35.8	8.7	904
Lithuania*	23.2	32.7	28.3	12.9	2.9	6.5	0.4	28.1	1.8	9.7	16.1	8.5	28.9	21.2	1046
Netherlands	21.3	32.7	26.2	11.8	7.9	0.7	0.1	17.8	0.4	7.3	15.4	6.1	52.2	22.0	1241
New Zealand*	33.2	32.6	23.2	7.6	3.4	6.9	0.9	17.5	1.5	10.9	15.6	6.5	40.2	16.6	1120
Norway	24.6	36.4	20.8	9.6	8.6	1.0	2.3	11.9	1.0	12.5	20.9	7.5	43.0	27.6	1000
Poland	24.6	31.4	24.0	12.3	7.7	1.9	2.2	31.0	2.9	12.8	16.9	7.8	24.5	24.2	1093
Slovak Republic	22.9	33.4	22.6	13.4	7.8	3.0	0.5	29.3	2.1	7.1	16.2	8.9	32.9	23.0	1419
Slovenia	24.2	25.2	25.9	14.9	9.8	1.4	0.6	36.6	2.2	7.9	12.8	6.9	31.6	23.3	1327
South Korea	37.3	30.8	16.9	9.5	5.5	0.6	0.5	32.3	0.7	8.8	17.0	5.7	34.4	9.6	845
Spain	42.8	29.5	16.2	7.9	3.6	5.5	0.7	12.7	0.9	9.0	16.8	7.9	46.4	14.5	1086
Sweden	24.3	32.2	24.2	12.2	7.1	1.1	0.3	18.0	1.6	8.4	13.9	7.6	49.2	29.3	940
Turkey*	37.4	26.8	17.2	11.5	7.0	1.7	1.1	28.1	1.2	8.9	15.8	6.8	36.4	14.4	682
United Kingdom	19.8	28.7	25.1	16.5	9.9	0.2	0.1	13.8	3.5	5.5	15.4	9.0	52.5	25.3	1642
United States	19.8	30.3	23.7	16.1	10.0	0.7	1.1	17.2	1.2	8.8	13.5	6.7	50.8	18.3	902
Mean	28.8	30.9	22.4	11.4	6.4	2.4	0.8	22.4	1.9	8.4	15.6	7.5	41.1	20.8	
Standard dev.	7.5	3.2	3.9	3.0	2.3	2.2	1.0	7.6	1.0	1.9	2.0	1.3	8.3	5.6	

Notes: Alphabetical order. * Second PIAAC round. Survey weights applied. Values are averages across 10 imputations/plausible values. ISEI=International Socio-Economic Index of Occupational Status; ISCED=International Standard Classification of Education. Socio-demographics are not presented, but available upon request.

Source: PIAAC, authors' calculations.

Table S.A2: Individual-level skills statistics by country and employment status, separately for less- and intermediate-educated adults

Country	Country code	% non-employed		Mean numeracy score				Mean literacy score			
		ISCED 0-2	ISCED 3-4	ISCED 0-2		ISCED 3-4		ISCED 0-2		ISCED 3-4	
				Employed	Non-employed	Employed	Non-employed	Employed	Non-employed	Employed	Non-employed
Austria	AT	36.0	16.6	240.9	231.5	282.0	266.9	243.1	232.4	273.6	262.7
Belgium	BE	35.6	16.4	245.0	218.3	278.1	261.1	240.3	215.7	271.9	258.6
Canada	CA	55.3	29.7	212.1	194.6	260.4	238.4	220.7	211.2	269.6	255.7
Chile*	CL	48.6	33.6	167.9	142.6	215.7	194.6	188.6	167.0	225.9	213.9
Czech Rep.	CZ	48.8	25.5	237.1	224.6	274.0	265.4	244.4	232.2	272.2	265.7
Denmark	DK	40.6	21.9	252.1	222.7	282.5	268.5	246.4	220.9	271.9	263.4
Estonia	EE	43.8	23.9	242.7	225.3	270.2	255.1	250.1	237.8	271.7	262.2
Finland	FI	41.2	24.5	264.4	231.3	282.9	262.1	266.0	240.3	288.9	272.8
France	FR	38.6	21.2	215.1	194.8	255.3	241.7	230.3	219.7	261.7	258.0
Germany	DE	47.6	18.4	220.3	211.2	273.4	251.8	220.2	215.1	268.4	256.7
Greece*	GR	71.8	55.9	228.1	229.8	254.8	249.9	225.2	242.9	253.0	255.8
Ireland	IE	63.6	41.7	229.2	208.3	255.6	248.5	238.2	224.9	268.3	261.7
Israel	IL	61.6	35.6	200.0	192.2	247.3	229.6	209.5	202.4	250.5	239.0
Italy	IT	43.6	26.2	233.9	216.0	270.4	255.9	234.7	230.6	267.0	257.3
Japan	JP	27.6	18.8	263.8	244.2	287.8	276.5	281.3	267.9	296.0	293.6
Lithuania*	LT	65.9	34.0	244.4	231.6	261.7	243.7	245.8	245.4	260.8	252.7
Netherlands	NL	25.6	15.2	254.6	215.2	286.3	269.4	257.6	227.4	290.9	277.9
New Zealand*	NZ	37.0	24.9	240.8	215.4	271.3	249.3	254.0	237.0	279.4	269.9
Norway	NO	29.0	16.4	255.7	223.4	279.0	262.0	260.5	238.2	277.0	265.8
Poland	PL	65.0	37.9	218.3	211.8	257.0	244.7	225.4	226.9	259.0	254.9
Slovak Republic	SK	66.9	26.9	244.0	209.6	282.8	266.4	248.6	224.7	278.8	270.9
Slovenia	SI	47.5	24.5	218.4	199.8	260.4	257.0	222.6	216.0	254.8	257.6
South Korea	KR	45.6	36.0	222.9	208.9	256.7	258.4	235.4	225.7	263.9	268.9
Spain	ES	52.7	34.8	233.7	212.2	259.8	250.3	238.6	222.5	261.4	258.3
Sweden	SE	36.9	16.2	248.3	205.7	283.8	252.5	252.8	214.8	284.6	258.4
Turkey*	TR	74.9	54.8	215.4	192.4	243.7	241.5	223.0	210.1	244.1	244.9
United Kingdom	UK	52.3	30.1	236.9	204.2	268.2	239.4	248.3	228.3	278.7	260.9
United States	US	70.0	50.7	190.9	190.1	248.3	228.1	203.1	212.5	264.9	249.3
Mean		49.1	29.0	231.3	211.0	266.0	251.0	237.7	224.7	268.2	259.6
Standard dev.		14.0	11.4	21.9	19.3	16.3	16.3	19.8	17.6	14.7	13.7

Notes: Alphabetical order. * Second PIAAC round. Survey weights applied. Values are averages across 10 plausible values.

Source: PIAAC, authors' calculations.

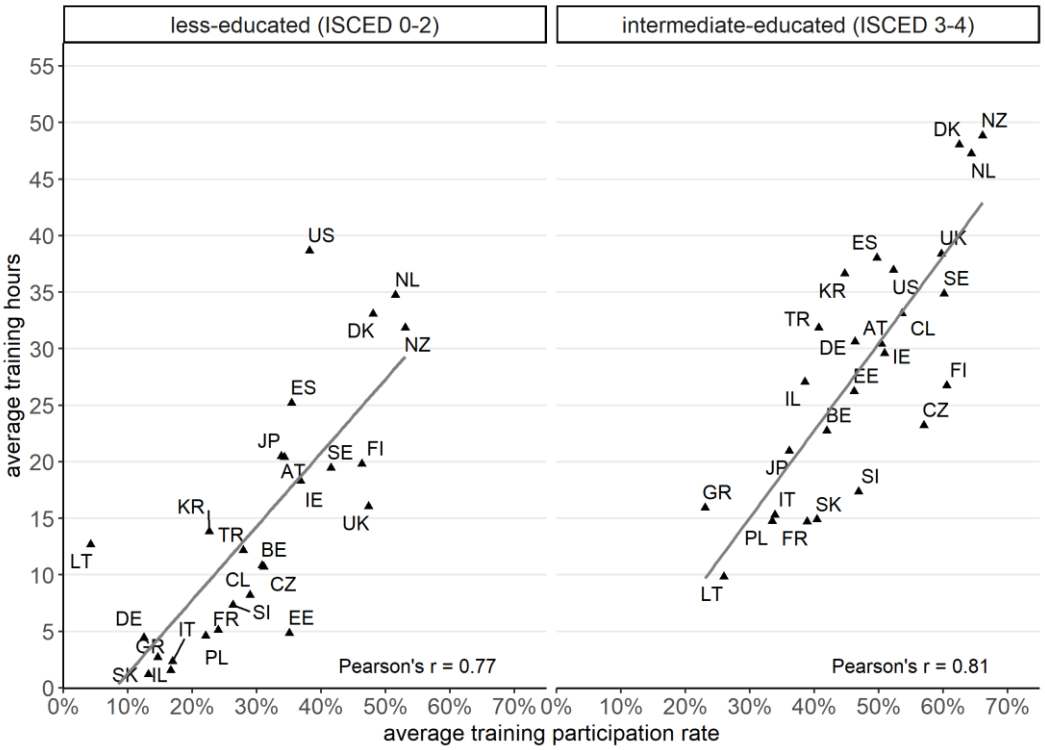
Table S.A3: Descriptive statistics of socio-demographic variables, separately for less- and intermediate-educated adults

Country	Mean age		% male		native-born native-language		native-born foreign-language		foreign-born native-language		foreign-born foreign-language		foreign degree		living with partner		having children < 13		N	
ISCED-level	0-2	3-4	0-2	3-4	0-2	3-4	0-2	3-4	0-2	3-4	0-2	3-4	0-2	3-4	0-2	3-4	0-2	3-4	0-2	3-4
Austria	44	41	33.7	51.3	77.1	86.8	2.2	1.2	3.3	3.4	17.3	8.5	17.1	9.2	72.7	75.1	31.2	35.5	201	1129
Belgium	44	41	59.2	59.1	82.5	91.6	4.1	2.2	2.0	2.1	11.5	4.0	9.8	4.0	83.0	80.0	30.6	40.9	197	909
Canada	43	42	65.6	51.9	71.7	78.2	4.5	5.3	8.1	5.6	15.7	10.8	20.4	8.9	74.7	73.3	32.0	38.3	630	2867
Chile*	43	39	63.4	59.7	94.8	96.4	1.2	0.1	4.1	3.5	0.0	0.0	3.6	2.4	64.6	62.8	44.8	54.9	302	574
Czech Rep.	44	40	30.5	54.1	84.6	96.9	0.0	0.0	12.7	2.0	2.7	1.1	2.4	1.2	68.0	68.5	20.8	37.2	86	1222
Denmark	43	41	48.8	58.2	84.7	91.1	0.6	0.8	2.1	1.0	12.7	7.1	9.4	4.6	72.2	74.7	28.9	42.9	298	836
Estonia	38	40	55.6	53.5	94.5	88.1	2.3	1.7	2.9	8.6	0.4	1.7	0.8	3.8	76.4	75.7	55.2	41.2	231	1188
Finland	44	40	62.6	60.1	90.4	93.9	4.4	1.3	0.6	2.0	4.6	2.7	3.0	2.0	67.4	72.7	30.3	38.1	104	767
France	44	41	53.0	56.0	74.3	90.7	1.9	2.1	7.3	3.6	16.4	3.6	16.0	2.7	68.3	74.8	37.9	45.9	415	1179
Germany	42	41	52.5	51.6	54.6	87.4	7.1	1.6	4.5	3.7	33.8	7.3	29.0	4.3	72.7	74.1	35.9	33.5	131	1386
Greece*	43	39	62.5	59.6	78.5	89.0	0.0	0.4	9.0	4.5	12.5	6.1	13.2	4.7	73.5	68.1	29.4	40.7	131	527
Ireland	42	38	54.6	49.6	87.0	74.6	0.6	1.1	7.5	12.0	5.0	12.2	9.4	18.3	70.6	70.8	40.9	48.5	238	736
Israel	41	38	70.2	55.4	72.6	71.1	7.5	6.0	2.1	6.2	17.7	16.6	11.9	10.0	83.4	74.9	57.4	48.4	152	540
Italy	42	39	65.5	54.3	85.6	86.7	2.5	1.9	2.2	2.7	9.7	8.8	9.3	8.4	69.6	58.8	34.3	36.9	431	869
Japan	40	41	65.8	57.6	97.1	99.8	0.0	0.1	2.9	0.1	0.0	0.0	0.9	0.1	64.3	65.3	35.6	37.3	118	786
Lithuania*	35	42	62.7	50.8	78.7	87.4	18.6	8.7	2.0	1.8	0.7	2.1	0.0	0.7	70.9	73.7	53.1	34.3	57	989
Netherlands	43	39	52.4	51.0	84.2	89.1	0.7	0.6	2.9	3.3	12.1	7.0	10.5	4.3	74.3	76.8	36.1	46.2	424	817
New Zealand*	43	39	50.0	56.1	83.0	73.1	2.2	3.3	7.1	11.8	7.6	11.8	10.7	15.1	72.1	72.8	44.5	47.5	408	712
Norway	41	41	56.6	55.4	80.0	85.5	1.5	0.7	1.3	0.7	17.1	13.0	13.7	8.9	66.0	78.0	42.3	46.2	262	738
Poland	42	40	63.6	59.6	98.2	99.1	1.8	0.9	0.0	0.0	0.0	0.0	0.0	0.2	65.3	75.4	29.3	43.2	77	1016
Slovak Rep.	42	40	52.8	53.3	86.2	93.7	10.7	4.8	2.0	0.7	1.0	0.8	1.5	0.2	72.4	72.8	23.7	32.5	148	1271
Slovenia	43	41	55.7	60.0	69.1	83.9	1.7	2.4	1.6	2.3	27.5	11.4	26.6	9.1	70.6	75.9	25.2	39.7	208	1119
South Korea	47	41	48.6	57.2	95.5	97.9	0.5	0.2	2.4	0.8	1.6	1.1	4.0	1.8	69.4	65.7	13.4	34.8	153	692
Spain	40	39	59.8	52.0	81.3	78.1	2.5	3.6	10.3	12.7	5.8	5.6	14.3	16.7	72.8	73.5	41.2	42.1	670	416
Sweden	43	41	54.7	54.9	70.3	84.8	2.5	2.3	1.9	2.2	25.3	10.7	16.2	5.6	72.3	71.7	39.4	40.1	154	786
Turkey*	38	38	86.8	78.0	96.7	96.2	3.1	3.6	0.0	0.2	0.2	0.0	0.2	0.8	83.9	86.4	65.7	68.1	404	278
United Kingdom	43	40	54.8	51.6	90.0	86.5	1.7	1.5	3.5	5.4	4.9	6.6	2.9	6.0	64.4	68.7	37.4	40.5	564	1078
United States	41	41	56.9	55.6	41.4	83.3	3.6	3.3	6.7	3.3	48.4	10.1	48.7	8.4	71.2	70.3	43.8	41.1	107	795
Mean	42	40	57.1	56.0	81.6	87.9	3.2	2.2	4.0	3.8	11.1	6.1	10.9	5.8	71.7	72.5	37.2	42.0		
Standard dev.	2	1	10.5	5.4	12.8	7.7	3.9	2.0	3.3	3.6	11.7	4.8	10.8	5.0	5.3	5.4	11.4	7.3		

Notes: Alphabetical order. * Second PIAAC round. Survey weights applied. Values are averages across 10 plausible values. Mean age derived from midpoints of five-year age categories.

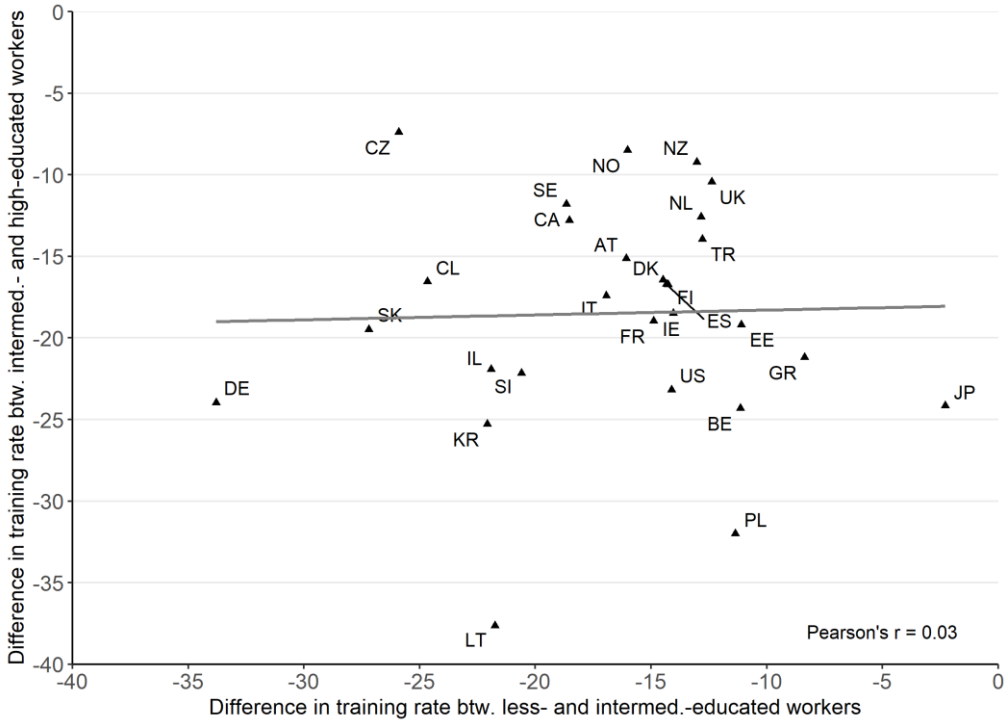
Source: PIAAC, authors' calculations.

Figure S.A1: Correlation of average training incidence and average training hours per worker by educational attainment



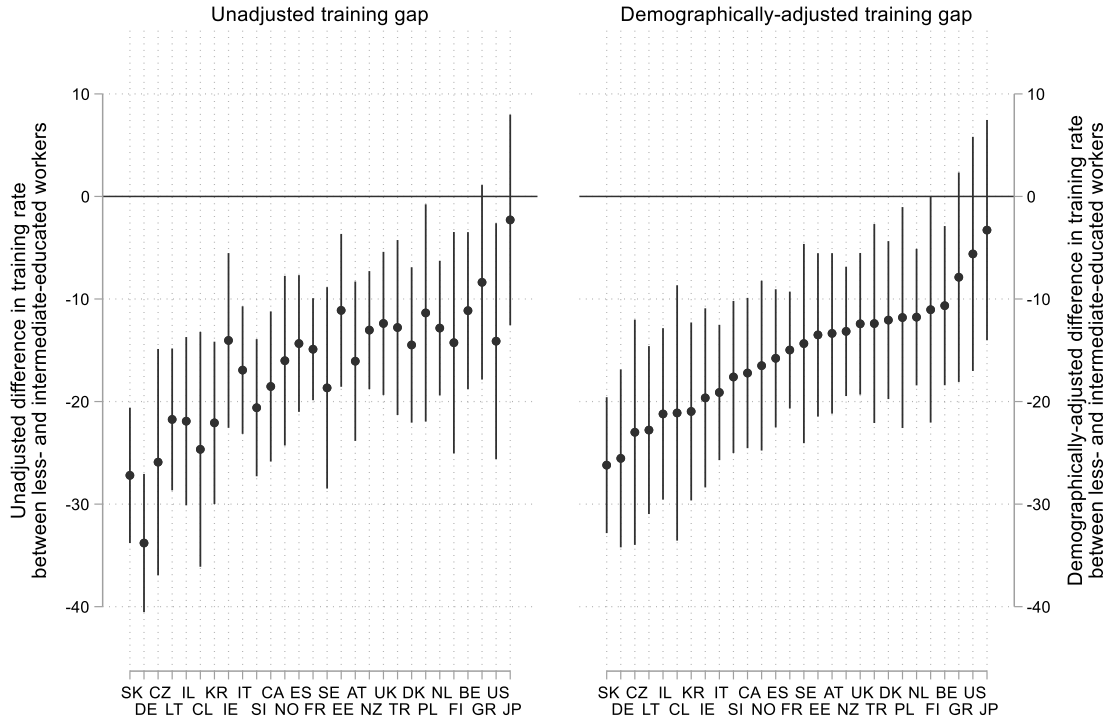
Notes: N = 26 (w/o Canada, Norway). Survey weights applied. Lines are linear fits estimated using linear least squares.
Source: PIAAC, authors' calculations.

Figure S.A2: Correlation of training gap between less- and intermediate-educated workers and intermediate- and high-educated workers



Notes: N = 28. Survey weights applied. Lines are linear fits estimated using linear least squares.
Source: PIAAC, authors' calculations.

Figure S.A3: Training disadvantage of less-educated workers relative to intermediate-educated workers in 28 countries (in % points)



Notes: Ordered by size of the demographically-adjusted training disadvantage. For the unadjusted training disadvantage survey weights are applied. For the demographically-adjusted gap entropy balancing weights are applied to account for differences in socio-demographic characteristics (see Table S.A3 above). Vertical lines indicate 95% confidence intervals.

Source: PIAAC, authors' calculations.

Table S.A3: Factor loadings

Abstract tasks[1]	**Factor**
Read diagrams, maps or schematics (G_Q01h)	0.603
Write reports (G_Q02c)	0.612
Face complex problems (F_Q05b)	0.668
Persuading/influencing people (F_Q04a)	0.746
Negotiating with people (F_Q04b)	0.749
Routine tasks[2]	
Choose/change sequence of tasks (D_Q11a)	0.852
Choose/change how to do the work (D_Q11b)	0.860
Choose/change speed/rate of work (D_Q11c)	0.811
Choose/change working hours (D_Q11d)	0.623
Motivation to learn[3]	
Like learning new things (I_Q04d)	0.785
Like to get to the bottom of difficult things (I_Q04j)	0.858
Like to figure out how different ideas fit together (I_Q04l)	0.850
Look for additional information to make things clearer (I_Q04m)	0.813

Notes: N = 33,523. Estimates based on factor analysis using the principal component method. Survey weights applied. Multiple imputation estimates (10 imputations). Item scales: [1] 1 (Never) to 5 (Every day); [2] 1 (Every day) to 5 (Never); [3] 1 (Not at all) to 5 (To a very high extent). Original item numbers in parentheses.

Source: PIAAC, authors' calculations.

Section B. Country-specific Shapley-decompositions of the training gap

Table S.B1: Country-specific Shapley decompositions of less-educated workers' training disadvantage for the five predictor sets (in % points)

Country	Demographically-adjusted training disadvantage	Total explained part of the training disadvantage	Explained part attributable to sets of predictors				
			Labor market allocation			Learning disposition	
			Job tasks	Job characteristics	Firm characteristics	Skills	Motivation to learn
Slovak Rep.	-26.2***	-18.2***	-4.4**	-6.4***	-1.7	-5.2***	-0.6
Germany	-25.5***	-14.7***	-3.6**	-6.1***	0.9	-5.4***	-0.6
Czech Rep.	-23.0***	-14.7***	-4.0*	-5.9***	-3.2	-1.4	-0.3
Lithuania	-22.8***	-5.4	-3.0	-2.2	0.4	-0.6	0.0
Israel	-21.2***	-12.4***	-1.7	-4.8*	-2.9	-3.1+	-0.0
Chile	-21.1**	-19.5***	-2.5*	-7.5***	-4.0*	-5.1+	-0.4
South Korea	-21.0***	-12.9***	-2.4+	-3.2*	-5.9**	-0.6	-0.8+
Ireland	-19.6***	-9.4***	-1.9	-2.1*	-3.3*	-1.4	-0.7
Italy	-19.1***	-11.7***	-2.8**	-5.5***	-1.0	-2.4*	0.0
Slovenia	-17.6***	-13.7***	-6.0***	-4.9**	-1.7	-0.8	-0.4
Canada	-17.2***	-10.9***	-1.3	-3.5**	-2.4+	-3.6*	-0.0
Norway	-16.5***	-5.5***	-1.6**	-1.6*	-1.5+	-0.7	0.1
Spain	-15.8***	-10.6***	-3.0***	-5.5***	-0.6	-1.4+	-0.1
France	-15.0***	-9.5***	-2.9***	-3.4***	-0.6	-1.8**	-0.8**
Sweden	-14.3**	-7.3**	-1.9*	-1.8	-0.9	-2.7*	-0.1
Estonia	-13.5**	-14.9***	-3.5**	-6.1***	-3.1**	-1.8	-0.5
Austria	-13.3**	-13.9***	-5.7***	-4.7***	-0.4	-2.5*	-0.6
New Zealand	-13.2***	-7.1**	-2.3*	-2.8**	-0.3	-1.0	-0.7+
United Kingdom	-12.4***	-9.0***	-2.8**	-4.0***	0.8	-2.3*	-0.7
Turkey	-12.4*	-11.1***	-2.9**	-1.4	-4.8*	-1.4	-0.7
Denmark	-12.1**	-9.2***	-2.3**	-4.9***	0.8	-1.6+	-1.1*
Poland	-11.8*	-16.7***	-4.1*	-3.7*	-2.9	-3.1	-2.9*
Netherlands	-11.8***	-12.8***	-3.5***	-5.5***	-1.2	-1.8*	-0.9**
Finland	-11.0*	-5.5+	-4.7**	-1.6	1.4	-0.1	-0.5
Belgium	-10.6**	-9.2***	-3.5**	-3.4***	-0.2	-2.1*	-0.1
Greece	-7.9	-16.6***	-4.7*	-6.1***	-4.9**	-0.8	-0.2
United States	-5.6	-15.1***	-3.1*	-4.7*	-2.5	-4.4*	-0.4
Japan	-3.3	-7.2**	-2.4*	-3.4**	-1.0	-0.3	-0.1

Notes: Ordered by size of the demographically-adjusted training disadvantage. Negative values of the disadvantage indicate how much smaller the training participation rate of less-educated workers is compared to the intermediate-educated group. Correspondingly, negative (positive) values of explained part indicate that compositional differences with respect to the given set of predictors contribute to (reduce) the training disadvantage. Contributions of each predictor set are estimated as the average contribution to the training disadvantage over all possible permutations (Shapley decomposition). Multiple imputation estimates (10 imputations/plausible values). Entropy balancing weights applied. $^{+}p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$ (two-tailed tests).

Source: PIAAC, authors' calculations.

Section C. First-step regressions for estimating fully-adjusted training gap

Table S.C1: Country-specific regressions of training participation on individual-level predictors

	AT	BE	CA	CL	CZ	DE	DK	EE	ES
Education (highest degree)									
Low (ISCED 0-2) (ref.:	0.01	-0.01	-0.06	-0.02	-0.08	-0.11*	-0.03	0.01	-0.05
intermed. (ISCED 3-4))	(0.04)	(0.04)	(0.04)	(0.05)	(0.07)	(0.05)	(0.04)	(0.04)	(0.04)
Job tasks									
Abstract tasks	0.14***	0.06*	0.10***	0.04	0.00	0.10**	0.04	0.04+	0.05*
	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)	(0.03)	(0.03)	(0.02)	(0.02)
Routine tasks	0.02	-0.05*	0.01	0.00	-0.05	0.01	-0.01	-0.05*	-0.04**
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.01)
Manual-physical tasks	0.00	0.00	0.00	0.03	-0.02	0.04	0.03	0.02	0.02
	(0.02)	(0.02)	(0.02)	(0.03)	(0.04)	(0.03)	(0.02)	(0.02)	(0.02)
Manual-accuracy tasks	0.00	0.01	0.02	0.05	0.03	-0.01	0.03	0.02	0.00
	(0.02)	(0.02)	(0.02)	(0.04)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)
Job characteristics									
Computer use at work	0.11+	0.07	0.12*	0.15*	-0.02	0.05	0.18***	0.14**	0.07+
(ref.: non-user)	(0.06)	(0.05)	(0.06)	(0.05)	(0.09)	(0.06)	(0.05)	(0.05)	(0.04)
Part-time (<=30hrs)	-0.11**	-0.11*	-0.10+	0.05+	-0.15	-0.04	-0.12*	-0.13*	-0.08+
(ref.: full-time (>30hrs))	(0.04)	(0.05)	(0.06)	(0.03)	(0.11)	(0.05)	(0.05)	(0.05)	(0.04)
Occupational status (ISEI)	0.03	0.05+	-0.03	0.04	0.08*	0.08*	0.05*	0.03	0.06**
	(0.03)	(0.03)	(0.02)	(0.05)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)
Firm characteristics									
Firm size (ref.: 1 to 10 employees)									
11 to 50	0.07	-0.01	0.09+	0.13*	0.06	-0.05	0.12*	0.09*	0.09*
	(0.05)	(0.06)	(0.05)	(0.06)	(0.09)	(0.05)	(0.05)	(0.04)	(0.04)
51 to 250	0.12*	-0.05	0.14**	0.17*	-0.01	0.11	0.11+	0.15**	0.20***
	(0.06)	(0.05)	(0.05)	(0.06)	(0.09)	(0.07)	(0.06)	(0.05)	(0.06)
251 to 1000	0.11+	0.02	0.15*	0.41***	0.26*	0.09	0.13+	0.16*	0.23**
	(0.06)	(0.07)	(0.07)	(0.09)	(0.12)	(0.08)	(0.07)	(0.07)	(0.07)
More than 1000	0.01	0.02	0.29**	0.21	0.02	0.14	0.20*	0.04	0.24**
	(0.08)	(0.08)	(0.10)	(0.20)	(0.14)	(0.09)	(0.09)	(0.13)	(0.09)
Public sector	0.07	-0.04	0.08+	0.06	0.06	0.09	0.15**	0.12*	0.04
(ref.: private)	(0.06)	(0.05)	(0.05)	(0.07)	(0.11)	(0.08)	(0.04)	(0.05)	(0.05)
Economic sector (ref.: Agriculture)									
Mining	-0.12	-0.22	0.59***	0.10	0.54**	0.38	-0.65***	-0.30**	0.03
	(0.14)	(0.18)	(0.12)	(0.22)	(0.16)	(0.27)	(0.12)	(0.10)	(0.24)
Manufacturing	0.19*	0.05	0.12+	-0.12*	0.13	0.06	-0.01	0.00	-0.03
	(0.08)	(0.17)	(0.06)	(0.05)	(0.12)	(0.12)	(0.09)	(0.06)	(0.08)
Electricity/Water supply	0.25	0.21	0.44***	-0.29	0.58**	0.21	-0.09	-0.04	0.27
	(0.21)	(0.21)	(0.10)	(0.27)	(0.17)	(0.15)	(0.17)	(0.14)	(0.17)
Construction	-0.05	0.08	0.32***	-0.06	0.13	-0.05	-0.09	0.06	0.15+
	(0.08)	(0.16)	(0.08)	(0.11)	(0.13)	(0.13)	(0.09)	(0.09)	(0.09)
Commerce	0.18*	-0.02	0.16*	-0.13	0.23	0.11	-0.10	0.18*	-0.04
	(0.08)	(0.17)	(0.07)	(0.08)	(0.16)	(0.12)	(0.09)	(0.07)	(0.07)
Transport	0.08	0.15	0.36**	-0.02	0.56***	0.18	0.15	0.16+	0.17*
	(0.14)	(0.18)	(0.11)	(0.10)	(0.12)	(0.13)	(0.10)	(0.08)	(0.08)
Services	0.16*	0.14	0.24***	-0.12+	0.12	0.10	0.02	0.11	0.03
	(0.08)	(0.17)	(0.06)	(0.07)	(0.13)	(0.11)	(0.08)	(0.07)	(0.07)
Learning disposition									
Skills (Numeracy score)	0.02	0.02	0.03	0.05	0.01	0.06*	0.02	0.02	0.02
	(0.02)	(0.02)	(0.02)	(0.03)	(0.05)	(0.02)	(0.02)	(0.02)	(0.02)
Motivation to learn	0.01	0.03	0.00	0.02	0.01	0.01	0.08**	0.04+	-0.01
	(0.02)	(0.02)	(0.03)	(0.02)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)
Constant	0.18**	0.32+	0.07	0.41**	0.30*	0.24+	0.27***	0.22***	0.35***
	(0.07)	(0.16)	(0.07)	(0.11)	(0.15)	(0.13)	(0.08)	(0.06)	(0.07)
N	1330	1106	3497	876	1308	1517	1134	1419	1086
R2	0.21	0.14	0.20	0.20	0.20	0.31	0.23	0.17	0.14

Table continues on next page (ordered by country code).

Table S.C1: Country-specific regressions of training participation on individual-level predictors (continued)

	FI	FR	GR	IE	IL	IT	JP	KR	LT
Education (highest degree)									
Low (ISCED 0-2) (ref.:	-0.06	-0.05*	0.09+	-0.10*	-0.09+	-0.07+	0.04	-0.08+	-0.17*
intermed. (ISCED 3-4))	(0.05)	(0.03)	(0.04)	(0.05)	(0.05)	(0.04)	(0.05)	(0.05)	(0.07)
Job tasks									
Abstract tasks	0.11**	0.10***	0.06*	0.06*	0.09**	0.06**	0.14***	0.06*	0.10*
	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.04)
Routine tasks	-0.05	-0.01	-0.03	0.03	0.03	0.00	0.02	-0.05*	0.02
	(0.04)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Manual-physical tasks	-0.06+	-0.01	0.00	0.02	0.04	0.01	-0.01	0.02	0.00
	(0.03)	(0.01)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)	(0.04)
Manual-accuracy tasks	0.04	0.02	0.02	0.00	0.01	0.02	0.01	-0.01	0.01
	(0.02)	(0.01)	(0.02)	(0.03)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)
Job characteristics									
Computer use at work	0.10	0.06	0.15*	0.02	0.09	0.01	0.07	0.09+	0.18*
(ref.: non-user)	(0.07)	(0.04)	(0.06)	(0.05)	(0.06)	(0.04)	(0.06)	(0.05)	(0.08)
Part-time (<=30hrs)	-0.14	0.02	-0.15***	-0.05	0.12*	0.03	0.05	-0.03	0.03
(ref.: full-time (>30hrs))	(0.09)	(0.03)	(0.04)	(0.05)	(0.06)	(0.04)	(0.06)	(0.06)	(0.09)
Occupational status (ISEI)	0.02	0.03	0.02	0.01	0.04+	0.07**	0.05+	0.01	0.02
	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.02)	(0.03)	(0.04)	(0.04)
Firm characteristics									
Firm size (ref.: 1 to 10 employees)									
11 to 50	0.08	0.05	0.08	0.20***	0.05	0.05	0.05	0.14**	0.00
	(0.06)	(0.03)	(0.05)	(0.05)	(0.05)	(0.03)	(0.06)	(0.05)	(0.06)
51 to 250	0.27***	0.12**	0.18*	0.16**	0.14+	0.09*	0.02	0.28***	-0.04
	(0.07)	(0.04)	(0.07)	(0.06)	(0.08)	(0.04)	(0.07)	(0.07)	(0.04)
251 to 1000	0.26**	0.05	0.29+	0.14+	0.18+	0.07	-0.02	0.20*	0.03
	(0.09)	(0.04)	(0.16)	(0.08)	(0.10)	(0.05)	(0.08)	(0.08)	(0.07)
More than 1000	0.26*	0.20***	0.21	0.34***	0.29*	0.09	0.02	0.34**	-0.01
	(0.11)	(0.05)	(0.13)	(0.09)	(0.13)	(0.06)	(0.08)	(0.10)	(0.16)
Public sector	-0.07	0.08*	-0.16**	0.08+	0.12+	0.07	0.05	0.23**	0.11
(ref.: private)	(0.06)	(0.04)	(0.05)	(0.05)	(0.07)	(0.05)	(0.09)	(0.07)	(0.07)
Economic sector (ref.: Agriculture)									
Mining	-0.27	-0.02	0.00	0.66***	-0.37*	-0.08	0.00	0.28	-0.19*
	(0.20)	(0.24)	(0.00)	(0.09)	(0.14)	(0.08)	(0.00)	(0.44)	(0.07)
Manufacturing	-0.13	-0.04	0.19**	0.28***	-0.17	0.04	0.02	0.04	-0.01
	(0.21)	(0.08)	(0.07)	(0.06)	(0.13)	(0.06)	(0.12)	(0.18)	(0.07)
Electricity/Water supply	0.31	0.17	0.15	0.33+	0.07	0.13	0.16	-0.14	-0.08
	(0.19)	(0.13)	(0.11)	(0.19)	(0.23)	(0.12)	(0.16)	(0.18)	(0.15)
Construction	-0.05	-0.05	-0.02	0.26**	-0.17	0.11	0.12	0.01	-0.10+
	(0.20)	(0.08)	(0.06)	(0.10)	(0.13)	(0.09)	(0.15)	(0.20)	(0.06)
Commerce	0.04	-0.01	0.11	0.28***	-0.26*	0.00	0.15	0.13	-0.06
	(0.20)	(0.08)	(0.07)	(0.06)	(0.13)	(0.07)	(0.13)	(0.19)	(0.06)
Transport	0.12	-0.01	0.25*	0.45***	-0.25+	0.04	-0.01	0.53*	-0.07
	(0.19)	(0.10)	(0.11)	(0.11)	(0.13)	(0.08)	(0.12)	(0.20)	(0.15)
Services	0.01	-0.01	0.20**	0.33***	-0.17	0.03	0.14	0.16	-0.03
	(0.19)	(0.07)	(0.07)	(0.06)	(0.13)	(0.06)	(0.12)	(0.19)	(0.08)
Learning disposition									
Skills (Numeracy score)	-0.03	0.01	0.01	0.02	0.03	0.03	-0.01	-0.01	0.00
	(0.03)	(0.01)	(0.03)	(0.03)	(0.03)	(0.02)	(0.04)	(0.03)	(0.03)
Motivation to learn	0.05	0.02+	0.01	0.04+	-0.02	-0.02	-0.01	0.02	0.00
	(0.04)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)	(0.03)
Constant	0.34+	0.30***	0.01	0.06	0.38**	0.23***	0.20	0.14	0.28***
	(0.20)	(0.08)	(0.08)	(0.07)	(0.13)	(0.07)	(0.12)	(0.22)	(0.07)
N	871	1594	658	974	692	1300	904	845	1046
R2	0.21	0.16	0.22	0.17	0.21	0.12	0.13	0.26	0.23

Table continues on next page (ordered by country code).

Table S.C1: Country-specific regressions of training participation on individual-level predictors (continued)

	NL	NO	NZ	PL	SE	SI	SK	TR	UK	US
Education (highest degree)										
Low (ISCED 0-2) (ref.:	0.01	-0.11**	-0.06	0.05	-0.07	-0.04	-0.08+	-0.01	-0.03	0.10
intermed. (ISCED 3-4))	(0.04)	(0.04)	(0.04)	(0.08)	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.07)
Job tasks										
Abstract tasks	0.08***	0.04	0.10***	0.09**	0.05+	0.10***	0.06*	0.10**	0.06**	0.05+
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)	(0.02)	(0.03)
Routine tasks	0.03	0.00	0.05*	0.00	-0.03	-0.02	-0.03	0.02	0.02	0.01
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)
Manual-physical tasks	0.04*	0.00	-0.01	-0.03	0.03	-0.02	0.01	0.00	0.05*	0.01
	(0.02)	(0.03)	(0.02)	(0.06)	(0.03)	(0.02)	(0.03)	(0.03)	(0.02)	(0.04)
Manual-accuracy tasks	0.01	-0.01	-0.02	0.07**	-0.02	0.05*	-0.01	0.01	-0.02	-0.04
	(0.01)	(0.02)	(0.03)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)
Job characteristics										
Computer use at work	0.17***	0.10+	0.11*	0.05	0.14*	0.00	0.15**	0.05	0.11*	0.09
(ref.: non-user)	(0.04)	(0.05)	(0.05)	(0.10)	(0.06)	(0.05)	(0.06)	(0.06)	(0.05)	(0.08)
Part-time (<=30hrs)	-0.05	-0.12*	-0.06	-0.06	-0.22***	-0.03	-0.06	-0.10	-0.08*	-0.02
(ref.: full-time (>30hrs))	(0.04)	(0.05)	(0.05)	(0.08)	(0.06)	(0.08)	(0.04)	(0.08)	(0.04)	(0.11)
Occupational status	0.04+	0.03	0.02	0.02	0.04	0.04	0.00	0.01	0.04*	0.01
(ISEI)	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)	(0.03)	(0.02)	(0.02)	(0.02)	(0.04)
Firm characteristics										
Firm size (ref.: 1 to 10 employees)										
11 to 50	0.12*	0.11*	0.08+	0.10	0.19**	0.06	0.12**	0.11**	0.23***	-0.02
	(0.04)	(0.05)	(0.04)	(0.07)	(0.06)	(0.04)	(0.04)	(0.04)	(0.06)	(0.08)
51 to 250	0.12*	0.10+	0.13*	0.15+	0.16*	0.18***	0.19***	0.23***	0.28***	0.09
	(0.05)	(0.05)	(0.05)	(0.08)	(0.07)	(0.05)	(0.04)	(0.06)	(0.06)	(0.09)
251 to 1000	0.10+	0.11	0.15*	0.26*	0.19*	0.18**	0.22***	0.29***	0.30***	0.16+
	(0.05)	(0.07)	(0.07)	(0.10)	(0.09)	(0.06)	(0.06)	(0.07)	(0.06)	(0.09)
More than 1000	0.09	0.09	0.08	0.18	0.44***	0.17*	0.28**	0.47***	0.25**	0.27+
	(0.07)	(0.09)	(0.09)	(0.13)	(0.08)	(0.07)	(0.09)	(0.10)	(0.08)	(0.14)
Public sector	0.06	0.06	0.07	0.09	0.12*	0.08	0.03	0.04	0.02	0.27**
(ref.: private)	(0.04)	(0.05)	(0.05)	(0.07)	(0.05)	(0.06)	(0.05)	(0.06)	(0.05)	(0.08)
Economic sector (ref.: Agriculture)										
Mining	0.53**	0.12	-0.14	0.33	-0.55**	-0.33+	-0.20	0.42**	0.15	0.85***
	(0.18)	(0.15)	(0.22)	(0.21)	(0.17)	(0.17)	(0.16)	(0.14)	(0.30)	(0.10)
Manufacturing	-0.06	-0.19	-0.12	0.19+	-0.19	-0.05	-0.11	0.16*	-0.33	0.22*
	(0.17)	(0.14)	(0.08)	(0.11)	(0.13)	(0.11)	(0.08)	(0.06)	(0.28)	(0.11)
Electricity/Water supply	0.50*	0.19	0.07	0.10	-0.16	0.17	0.02	0.11	-0.01	0.38+
	(0.19)	(0.16)	(0.12)	(0.12)	(0.28)	(0.21)	(0.17)	(0.18)	(0.29)	(0.20)
Construction	0.15	-0.20	0.20*	0.19	-0.08	0.01	0.00	0.12	-0.16	0.37**
	(0.18)	(0.15)	(0.09)	(0.15)	(0.13)	(0.13)	(0.11)	(0.09)	(0.26)	(0.12)
Commerce	0.08	-0.15	-0.04	0.27+	-0.04	0.06	-0.04	0.04	-0.16	0.28**
	(0.17)	(0.14)	(0.09)	(0.13)	(0.13)	(0.12)	(0.08)	(0.07)	(0.27)	(0.09)
Transport	0.02	-0.18	-0.04	0.14	-0.06	0.07	0.00	-0.06	-0.20	0.07
	(0.17)	(0.15)	(0.10)	(0.16)	(0.14)	(0.13)	(0.10)	(0.09)	(0.27)	(0.10)
Services	0.15	-0.11	-0.01	0.11	-0.05	0.04	-0.11	0.07	-0.15	0.40***
	(0.16)	(0.14)	(0.08)	(0.11)	(0.12)	(0.11)	(0.08)	(0.08)	(0.27)	(0.11)
Learning disposition										
Skills (Numeracy score)	0.02	0.01	0.00	0.04	0.04+	0.00	0.08**	0.02	0.04+	0.07+
	(0.02)	(0.02)	(0.02)	(0.04)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.04)
Motivation to learn	0.03	0.04	0.04+	0.06*	0.02	0.02	-0.01	0.00	0.01	0.00
	(0.02)	(0.03)	(0.02)	(0.03)	(0.03)	(0.02)	(0.01)	(0.02)	(0.02)	(0.04)
Constant	0.28	0.57***	0.47***	0.02	0.32*	0.32**	0.24**	0.15+	0.46+	0.02
	(0.17)	(0.15)	(0.08)	(0.14)	(0.12)	(0.11)	(0.09)	(0.08)	(0.26)	(0.10)
N	1241	1000	1120	1093	940	1327	1419	682	1642	902
R2	0.16	0.11	0.17	0.19	0.22	0.15	0.22	0.18	0.17	0.21

Notes: Multiple imputation estimates (10 imputations/plausible values). Entropy balancing weights applied. Standard errors in parentheses. Metric variables are z-standardized. $^{+}p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$ (two-tailed tests). ISCED = International Standard Classification of Education. ISEI = International Socio-Economic Index of Occupational Status. Ref. = Reference category.

Source: PIAAC, authors' calculations.

Section D. Second-step regressions and Shapley decompositions of institutional effects

Table S.D1: Separate country-level regressions of the training disadvantage of less-educated workers (in % points)

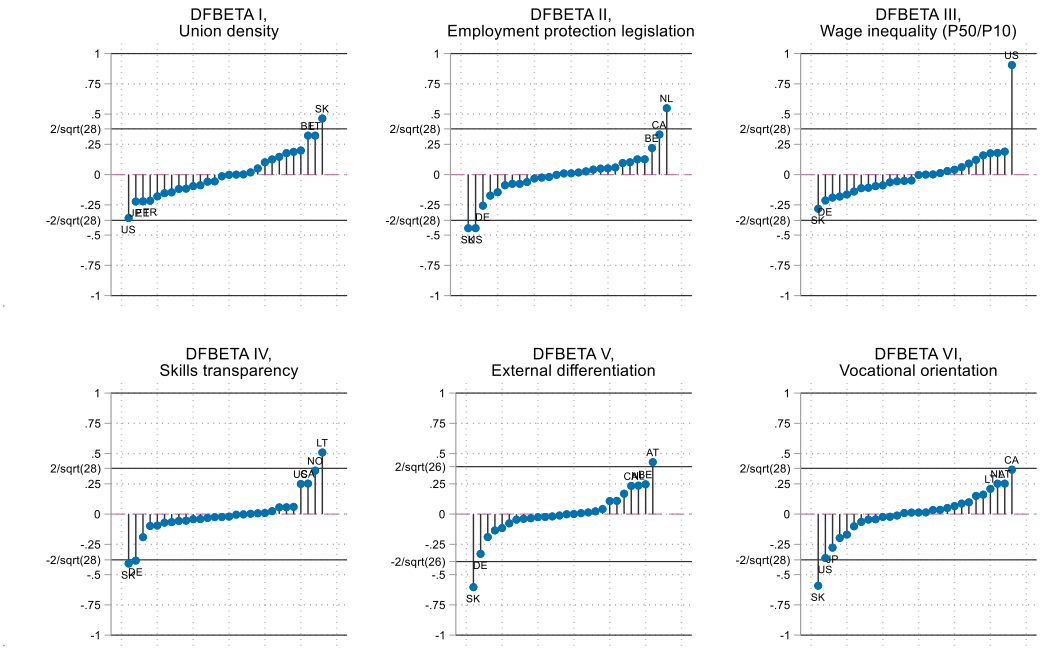
	Dem.-adjusted dis-advantage M0	Mediation via sets of predictors: Job tasks	Job char.	Firm char.	Skills	Motivation to learn	**Fully-adjusted dis-advantage** M1
Labor market institutions							
Union density	1.28^{+}	0.19	0.52	0.97*	0.23	0.05	-0.68
	(0.73)	(0.23)	(0.35)	(0.26)	(0.26)	(0.11)	(0.83)
Employment protection legislation	-1.51	-0.48*	-0.37	0.05	-0.12	0.06	-0.64
	(1.01)	(0.16)	(0.24)	(0.30)	(0.33)	(0.07)	(1.12)
Wage inequality (P50/P10)	-1.45	-0.11	-0.62^{+}	-0.71^{+}	-0.43	-0.07	0.49
	(1.05)	(0.23)	(0.33)	(0.41)	(0.27)	(0.10)	(1.14)
Educational institutions							
Skills transparency (skills gap btw. less- and intermediate-educated adults)	-2.20^{+}	0.13	-0.75*	-0.22	-0.95*	-0.00	-0.42
	(1.24)	(0.32)	(0.33)	(0.40)	(0.28)	(0.10)	(1.31)
External differentiation in secondary education (tracking)[a)]	-2.21	-0.71*	-0.65*	-0.12	-0.65^{+}	-0.02	-0.02
	(1.30)	(0.19)	(0.29)	(0.43)	(0.38)	(0.07)	(1.08)
Vocational orientation of upper secondary education	-1.39	-0.70*	-0.36	0.74*	-0.15	-0.02	-0.90
	(1.27)	(0.22)	(0.27)	(0.31)	(0.38)	(0.07)	(1.28)

Notes: N = 28 countries; [a)] N = 26 (w/o Estonia, Lithuania). This table shows the values depicted in Figure 4 in the main article. Please see main article and notes to Figure 4 for further details. Robust HC3 standard errors in parentheses. $^{+}p < 0.10$, $^{*}p < 0.05$, $^{**}p < 0.01$, $^{***}p < 0.001$ (two-tailed tests). Country-specific regressions for estimating the fully-adjusted training gap are reported in Section C above.

Source: PIAAC, authors' calculations.

Section E. Outlier Analysis

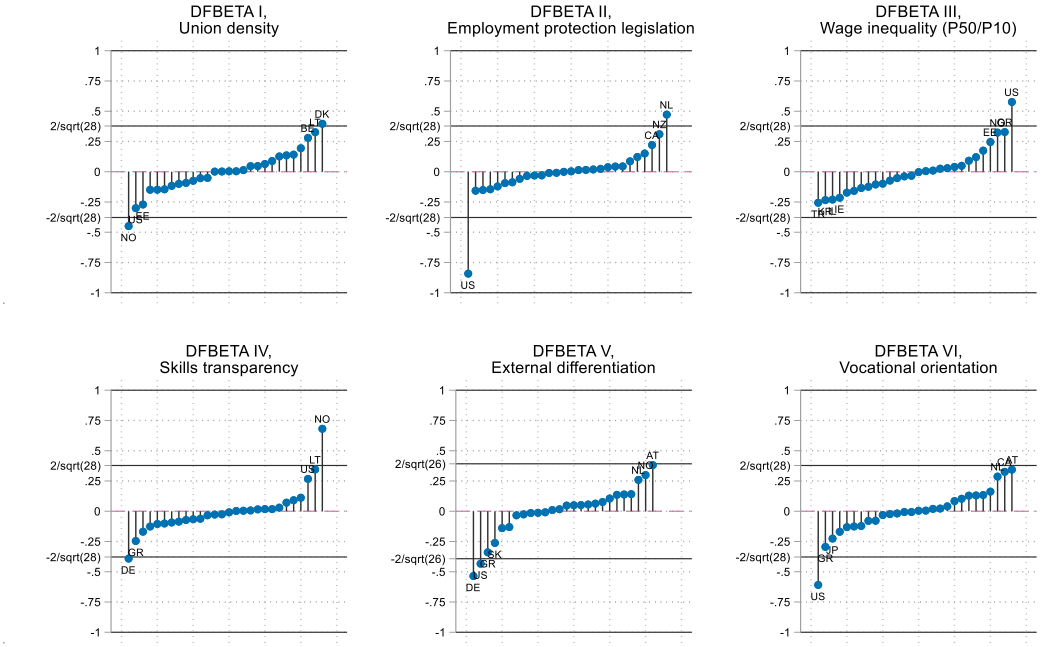
Figure S.E1: Delete-1 influence statistics for 28 country sample (M0)



Notes: "Delete-1" statistics for country-level regressions on the demographically-adjusted training diadvantage (see Table S.D1, model M0, in Section D above). Negative (positive) DFBETA values indicate that the respective country case draws the institutional estimate downward (upward), which is toward an increase (decrease) in the training disadvantage of less-educated employees (reversed coded). The solid lines indicate common cut-off values for DFBETA.

Source: PIAAC, authors' calculations.

Figure S.E2: Delete-1 influence statistics for 28 country sample (M1)



Notes: "Delete-1" statistics for country-level regressions on the fully-adjusted training diadvantage (see Table S.D1, model M1, in Section D above). For interpretation see Figure S.E1.

Source: PIAAC, authors' calculations.

Table S.E1: Separate country-level regressions of the training disadvantage of less-educated workers (in % points) without US

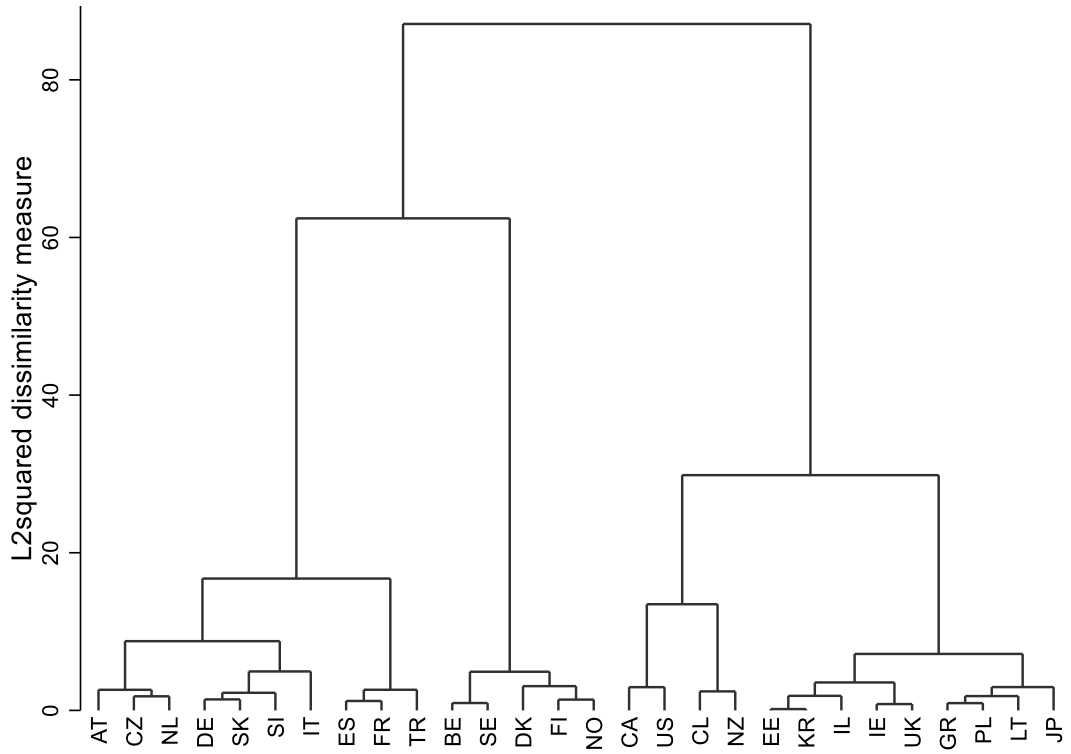
	Dem.-adjusted dis-advantage M0	**Mediation via sets of predictors** Job tasks	Job char.	Firm char.	Skills	Motivation to learn	**Fully-adjusted dis-advantage** M1
Labor market institutions							
Union density	1.53*	0.22	0.55	0.94*	0.22	0.04	-0.44
	(0.71)	(0.22)	(0.35)	(0.27)	(0.26)	(0.11)	(0.79)
Employment protection	-1.07	-0.52*	-0.39	-0.08	-0.22	0.06	0.06
legislation	(0.99)	(0.19)	(0.27)	(0.34)	(0.37)	(0.09)	(0.85)
Wage inequality (P50/P10)	-2.20*	-0.17	-0.75*	-0.70	-0.43	-0.05	-0.11
	(0.84)	(0.25)	(0.32)	(0.44)	(0.30)	(0.11)	(1.04)
Educational institutions							
Skills transparency	-2.50+	0.10	-0.78*	-0.15	-0.92*	0.00	-0.75
(skills gap btw. less- and	(1.26)	(0.33)	(0.35)	(0.41)	(0.30)	(0.10)	(1.28)
intermediate-educated adults)							
External differentiation in	-1.96	-0.74*	-0.64*	-0.20	-0.74*	-0.02	0.42
secondary education	(1.32)	(0.20)	(0.32)	(0.44)	(0.36)	(0.07)	(1.03)
(tracking)[a)]							
Vocational orientation of	-0.91	-0.78*	-0.36	0.74*	-0.27	-0.03	-0.21
upper secondary education	(1.30)	(0.23)	(0.29)	(0.35)	(0.40)	(0.08)	(1.13)

Notes: N = 27 countries; [a)] N = 25 (w/o Estonia, Lithuania). M0 and M1 represent coefficient estimates from country-level regressions for the demographically-adjusted (M0) and the fully-adjusted (M1) training disadvantage of less-educated relative to intermediate-educated workers. Country-level regressions are estimated using Feasible Generalized Least Squares (FGLS), with dependent variables obtained from country-specific regressions adjusting only for demographics (demographically-adjusted gap) or additionally for all labor market allocation and learning disposition measures (fully-adjusted gap). Institutional predictors are entered one at a time (i.e., other country characteristics are not controlled for). Negative (positive) values indicate that institutional characteristics are associated with a larger (smaller) training disadvantage of less-educated workers. Contributions of each predictor set to the institutional 'effects' are estimated as the average contribution over all possible permutations of the different sets (Shapley decomposition). All country-level variables are z-standardized (mean of 0, standard deviation of 1). Robust HC3 standard errors in parentheses. $^{+}p < 0.10$, $^{*}p < 0.05$ (two-tailed tests). Country-specific regressions for estimating the fully-adjusted training gap are reported in Section C above.

Source: PIAAC, authors' calculations.

Section F. Analysis of institutional clusters

Figure S.F1: Hierarchical Cluster Analysis using macro-level predictors



Notes: N=28. The dendrogram is based on the Ward clustering method with squared Euclidian as distance measure. Different specifications yielded similar results. All country-level predictors included are z-standardized (mean of 0, standard deviation of 1). Tracking indicator not included due to missing information for Estonia and Lithuania.

Sources: Union density, EPL, and wage inequality: OECD online database (https://stats.oecd.org/), measured at time of survey (2011/12 for round 1 and 2014/15 for round 2); Skills transparency: PIAAC (rounds 1 and 2), authors' calculations; Prevalence of vocational enrollment: OECD (2006: Table C2.5) and UNESCO online database (http://data.uis.unesco.org/). Authors' calculations.

Table S.F1: Statistics for selecting the number of clusters

Number of clusters	Pseudo-F (1)	Je(2)/Je(1) (2)	Pseudo-T^2 (3)
1	-	0.677	12.38
2	12.38	0.457	15.43
3	15.51	0.560	8.63
4	**15.83**	**0.605**	**5.23**
5	15.25	0.285	5.03
6	15.25	0.596	3.39
7	14.79	0.627	4.16
8	14.48	0.423	2.72
9	13.84	0.523	2.74
10	13.59	0.443	3.77

Notes: Based on cluster specification presented in Figure F1. Distinct clustering is characterized by large Calinski–Harabasz pseudo-F values (1), large Duda–Hart Je(2)/Je(1) values (2), and small Duda–Hart pseudo-T^2 values (3). Selected solution is presented in bold.

Sources: See Figure S.F1.

Table S.F2: Descriptive statistics of the country-level variables used by cluster

Country	Country code	Dem.-adjusted training disadvantage (1)	Fully-adjusted training disadvantage (2)	Union density (3)	Employment protection legislation (4)	Wage inequality (P50/P10) (5)	Skills gap (6)	Index of external differentiation (7)	Vocational enrolment (8)
Coordinated Market Economy (CME) – Conservative									
Slovak Rep.	SK	-26.2	-8.0	14.5	2.8	1.8	35.8	1.6	73.6
Germany	DE	-25.5	-10.8	18.3	2.8	1.8	42.6	1.9	60.3
Czech Rep.	CZ	-23.0	-8.3	15.1	2.9	1.9	26.0	1.6	79.2
Italy	IT	-19.1	-7.5	35.4	3.2	1.5	33.5	0.2	61.7
Slovenia	SI	-17.6	-3.9	26.6	2.4	1.7	34.7	0.1	64.1
Spain	ES	-15.8	-5.2	17.8	2.4	1.6	26.8	-1.0	40.6
France	FR	-15.0	-5.4	10.8	2.8	1.4	27.0	-0.5	49.6
Austria	AT	-13.4	0.6	28.1	2.4	1.7	24.9	1.8	78.3
Turkey	TR	-12.4	-1.3	7.5	2.7	1.2	29.9	1.2	37.6
Netherlands	NL	-11.8	1.0	19.0	3.2	1.6	27.1	0.9	68.5
CME – Social-Democratic									
Norway	NO	-16.5	-11.0	49.9	2.3	1.4	14.2	-1.0	60.2
Sweden	SE	-14.3	-7.0	67.5	2.6	1.3	22.5	-0.9	55.8
Denmark	DK	-12.1	-2.9	68.8	1.8	1.4	23.1	-0.9	50.6
Finland	FI	-11.0	-5.6	69.4	2.1	1.5	14.5	-0.9	57.1
Belgium	BE	-10.6	-1.5	54.1	2.8	1.4	23.1	1.0	61.8
Liberal Market Economy (LME) – North American									
Chile	CL	-21.1	-1.6	14.9	1.8	1.6	35.9	0.3	37.0
Canada	CA	-17.2	-6.4	27.1	1.3	1.9	42.7	-1.3	2.8
New Zealand	NZ	-13.2	-6.0	18.3	1.1	1.6	30.9	-0.4	24.3
United States	US	-5.6	9.5	11.1	1.0	2.1	35.1	-1.3	0.0
LME – European									
Lithuania	LT	-22.8	-17.4	8.0	2.5	1.8	18.5	Not avail.	28.2
Israel	IL	-21.2	-8.8	22.8	2.4	2.0	32.0	-0.1	34.8
Korea	KR	-21.0	-8.0	9.8	2.2	2.0	26.1	0.1	28.6
Ireland	IE	-19.6	-10.2	30.9	1.9	1.9	31.5	-0.3	32.9
Estonia	EE	-13.5	1.4	6.5	2.1	2.0	28.1	Not avail.	31.0
United Kingdom	UK	-12.4	-3.4	26.1	1.8	1.8	26.4	-1.0	36.6
Poland	PL	-11.8	4.9	16.9	2.4	2.0	22.5	-0.1	47.3
Greece	GR	-7.9	8.8	23.1	2.5	1.8	23.6	-0.5	33.9
Japan	JP	-3.3	4.0	18.5	2.1	1.6	22.5	-0.5	24.6
Mean		-15.5	-3.9	26.3	2.3	1.7	27.9	0.0	45.0
Standard dev.		5.7	6.1	18.7	0.6	0.2	7.1	1.0	20.5

Notes: Ordered by size of the demographically-adjusted training disadvantage within institutional clusters (see Figure S.F1). * Second PIAAC round. Training gap estimates are controlled for socio-demographics by including entropy balancing weights.

Sources: 1-2, 6: PIAAC (rounds 1 and 2), authors' calculations; 3-5: OECD online database (https://stats.oecd.org/), measured at time of survey (2011/12 for round 1 and 2014/15 for round 2); 7: Educational Systems Database, version 4 (Bol and van de Werfhorst, 2013); 8: OECD (2006: Table C2.5) and UNESCO online database (http://data.uis.unesco.org/).

Table S.F3: Country-level regressions of the training disadvantage of less-educated workers on clusters

Institutional cluster	**Dem.-adjusted dis-advantage** M0	**Mediation via sets of predictors** Job tasks	Job char.	Firm char.	Skills	Motivation to learn	**Fully-adjusted dis-advantage** M1
Reference: CME - Conservative							
CME – Social-Democratic	4.84*	1.24+	2.11*	1.22+	0.95	0.11	-0.78
	(2.19)	(0.66)	(0.82)	(0.72)	(0.73)	(0.28)	(2.38)
LME – North American	3.38	1.92*	0.85	-0.88	-0.58	0.05	2.03
	(3.26)	(0.51)	(1.04)	(0.91)	(1.20)	(0.17)	(3.38)
LME – European	2.41	0.85	0.70	-1.56+	0.77	-0.09	1.75
	(2.81)	(0.55)	(0.70)	(0.89)	(0.77)	(0.21)	(3.02)
Constant	-17.78						-4.62
	(1.76)						(1.26)

Notes: N = 28. M0 and M1 represent coefficient estimates from country-level regressions for the demographically-adjusted (M0) and the fully-adjusted (M1) training disadvantage of less-educated relative to intermediate-educated workers. Country-level regressions are estimated using Feasible Generalized Least Squares (FGLS), with dependent variables obtained from country-specific regressions adjusting only for demographics (demographically-adjusted gap) or additionally for all labor market allocation and learning disposition measures (fully-adjusted gap). Cluster-dummy on conservative CMEs excluded as reference category. Negative (positive) values indicate that institutional cluster is associated with a larger (smaller) training disadvantage of less-educated workers than in conservative CMEs. Contributions of each predictor set to the cluster 'effects' are estimated as the average contribution over all possible permutations of the different sets (Shapley decomposition). Robust HC3 standard errors in parentheses. $^{+}p < 0.10$, $^{*}p < 0.05$ (two-tailed tests). Country-specific regressions for estimating the fully-adjusted training gap are reported in Section C above.

Source: PIAAC, authors' calculations.

Section G. Multiple imputation procedure

We used the `mi impute chained` routine in Stata 15 to fill in missing values by multiple imputation via chained equations, after deleting 433 cases with missing information on economic sector and foreign-birth/foreign-language status, two variables whose unordered polytomous nature would require imputation through multinomial logistic regressions, which regularly failed to converge on our data.

We ran imputations separately by country and obtained one imputation for each of the ten sets of plausible values for literacy and numeracy skills, using a burn-in period of 15 cycles. Trace plots of covariate means and standard deviations (van Buuren, 2018) indicated that this number of cycles was more than sufficient for the imputation procedure to converge (i.e., means and standard deviations showed only random cycle-to-cycle fluctuation and no systematic trends after 15 cycles and generally much earlier).

The imputation models included all variables used in the analysis as well as a few key auxiliary variables (italicized). Specifically, we included the following variables:

- the outcome variable (an indicator for participation in job-related non-formal training in the last 12 months before the interview),
- *three variables indicating participation in other types of training over the same period (formal job-related, formal non-job-related, non-formal non-job-related),*
- *actual work experience in years,*
- *potential work experience in years, based on the year when the last educational degree was obtained,*
- an indicator for computer use at work,
- an indicator for part-time (vs. full-time) work,
- an indicator for having obtained the highest qualification abroad (i.e., not in the country where the respondent was surveyed),
- an indicator for working in the public sector,
- *an indicator for having a permanent (vs. fixed-term or no) contract (not available for Canada and the United States),*
- an indicator for living with a partner,
- an indicator for living with children under age 13,
- *an indicator for currently being enrolled in formal education,*
- a five-category measure of firm size,
- *the hourly earnings decile rank,*
- the ISEI score based on one-digit ISCO-08 groups,
- *a three-category measure of parental education,*
- 4 five-category measures underlying the motivation to learn measure used in the main analysis
- 5 five-category measures underlying the abstract tasks factor score used in the main analysis,
- 4 five-category measures underlying the routine tasks factor score used in the main analysis,
- 1 five-category measure of the frequency of manual/physical job tasks,
- 1 five-category measure of the frequency of manual/accuracy job tasks,
- *the literacy score (plausible value; completely observed),*

- the numeracy score (plausible value; completely observed),
- an indicator for being male (vs. female; completely observed),
- age in five-year groups (completely observed),
- foreign-birth foreign-language status, a four-category measure capturing whether the respondent was born abroad (i.e., not in the country where the respondent was surveyed) and whether the language of the PIAAC test was the respondent's first language (no missings due to deletion of cases with missing values, see above),
- an eight-category measure of economic sector/industry (no missings due to deletion of cases with missing values, see above),
- *a four-category measure of highest educational degree further differentiating less-educated workers into those who completed lower secondary education and those who completed primary education at most and differentiating intermediate-educated workers into those who completed upper-secondary education and those who completed a non-tertiary post-secondary program (completely observed),*
- *employer tenure in years (completely observed), and*
- *a five-category measure capturing the respondent's quintile rank with respect to the PIAAC final sample weight (completely observed) to incorporate information about the complex sampling design in the absence of design variables (cf. Carpenter and Kenward, 2013).*

Given the need to obtain separate imputations for 28 countries, we had to deviate from textbook procedures in two respects to avoid convergence problems in maximum likelihood estimation and make the imputation task manageable.

First, we imputed most binary and ordered categorical variables using predictive mean matching with 10 nearest neighbors rather than the more standard approach of using (ordered) logistic regression. Ordered logistic regression proved feasible for only four variables: firm size, hourly earnings decile rank, ISEI score (which takes only ten different values as it is based on the ten ISCO-88 main groups and was therefore treated as categorical in the imputations), and parental education.

Second, we had to coarsen the education variable in one prediction equation for the Japanese case (prediction of firm size) and the Slovak Republic (prediction of parental education). That is, we used a binary indicator for intermediate (vs. low) education identical to the one used in the main analysis.

Section H. Algorithmic description of empirical strategy

In the first part of our analysis, our goal is to estimate, for each of the 28 countries, the magnitude of the training disadvantage of less-educated workers and the extent to which it can be attributed to different aspects of labor market allocation (job tasks, other job characteristics, firm characteristics) and individual learning disposition (numeracy skills, motivation to learn).

We therefore execute the following three steps for each of the 28 countries:

1.1 For each of the 10 imputations/plausible values, perform the following steps (1.1.1-1.1.3):

1.1.1 Use entropy balancing to obtain weights that achieve a balanced demographic composition of less-educated and intermediate-educated workers, with the (weighted) composition of less-educated workers being the target distribution (i.e., specify the `wttreat` and `basewt` options of the Stata command `ebalance`). Do this for both the final sample and all (up to 80) jackknife replicate weights.

1.1.2 Perform a Shapley decomposition of the difference between the demographically-adjusted and the fully-adjusted training disadvantage with respect to the five variable sets capturing differences in labor market allocation and individual learning disposition. Do this for both the balance-achieving final sample and all balance-achieving jackknife replicate weights from Step 1.1.1. The model fit to the data in this step is a (weighted) linear probability model with participation in job-related non-formal training as the outcome and an indicator variable for being "less-educated" as the focal predictor. To compute the Shapley decomposition this model is fit repeatedly, with all possible combinations of the five variable sets capturing differences in labor market allocation and individual learning disposition.

1.1.3 Use the decomposition results for the balance-achieving jackknife weights from Step 1.1.2 to obtain within-imputation variance estimates for the Shapley decomposition results, applying the formulas for jackknife variance estimation provided in OECD (2016). Note that the corresponding point estimates are simply the Shapley decomposition results for the balance-achieving final sample weights.

1.2 Combine the point and (within-imputation) variance estimates from Step 1.1.2 to obtain the final point estimates and variance estimates/confidence limits/p-values (Little and Rubin, 2002).

In the second part of the analysis, we are interested in a) the relationships between the (demographically-adjusted) training gap and six country-level predictors (education system and labor market regulation measures) and b) the extent to which these relationships can be attributed to differences in labor market allocation and individual learning disposition between less- and intermediate educated workers.

We therefore perform the following steps for each of the six country-level predictors:

2.1 For each country and for each of the 10 imputations/plausible values, do the following:

2.1.1 Use entropy balancing to obtain weights that achieve a balanced demographic composition of less-educated and intermediate-educated workers, with the (weighted) composition of less-educated workers being the target distribution (i.e., specify the `wttreat` and `basewt` options of the Stata command `ebalance`). Do this for both the final sample and all (up to 80) jackknife replicate weights. (This step is identical to Step 1.1.1 above.)

2.1.2 For each possible combination of the five variable sets capturing differences in labor market allocation and individual learning disposition, including the empty and the full set, do the following:

2.1.2.1 Estimate a (weighted) linear probability model with participation in job-related non-formal training as the outcome and an indicator variable for being "low education" as well as and the current set of labor market allocation/learning disposition measures as predictors. Do this for both the balance-achieving final sample and all balance-achieving jackknife replicate weights from Step (2.1.1). (The same models are estimated in conducting the Shapley decomposition in Step 1.1.2.)

2.1.2.2 Store the point estimate for the coefficient on the "low education" measure (which is the estimate for the balance-achieving final sample weight from Step 2.1.2.1), along with its jackknife variance/standard error estimate (based on estimates for the balance-achieving jackknife replicate weights from Step 2.1.2.1), applying the formulas for jackknife variance estimation provided in OECD (2016).

2.2 For each of the 10 imputations/plausible values, do the following:

2.2.1 For the full country sample and for 999 bootstrap samples, do the following:

2.2.1.1 If applicable (bootstrapping phase), draw a (block/cluster) bootstrap sample by sampling with replacement from the 28 countries included in the analysis.

2.2.1.2 Perform a Shapley decomposition of the difference between the "effect" of the country-level predictor on the demographically-adjusted training disadvantage and the "effect" of the country-level predictor on the fully-adjusted training disadvantage with respect to the five variable sets capturing differences in labor market allocation and individual learning disposition. The (country-level) model fit to the data in this step is a linear regression estimated by FGLS, as described in Lewis and Linzer (2005). The outcome in this regression is the coefficient on the "low education" indicator (the estimated training disadvantage). The predictor is the respective education system/labor market regulation measure. To compute the Shapley decomposition this model is fit repeatedly, with the coefficient on the "low education" indicator adjusted for all possible combinations of the five variable sets capturing differences in labor market allocation and individual learning disposition. The point estimates used here were stored in Step 2.1.2.2, along with their jackknife standard errors which are used to determine the weights for the FGLS regression (cf. Lewis and Linzer, 2005).

2.2.2 Use the results from 2.2.1.2 to obtain point estimates and bootstrap standard errors (i.e., standard deviation of estimates across bootstrap replicates) for the (Shapley) contributions of the five variable sets capturing differences in labor market allocation and individual learning disposition to the difference between the "effect" of the country-level predictor on the demographically-adjusted training disadvantage and the "effect" of the country-level predictor on the fully-adjusted training disadvantage.

2.3 Combine the point and (within-imputation) variance estimates (i.e., squared bootstrap standard errors from Step 2.2.2) to obtain the final point estimates and variance estimates/confidence limits/p-values (Little and Rubin, 2002).

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