

Supplementary material

Macro-determinants of NEET: an ecological study at the country level of analysis for the period 1997-2020

Youth

Table S1. Variables included in the principal analysis and their definition as extracted from the OECD database.

Variable	Definition
NEET	Share of young people who are not in employment, education or training, as a percentage of the total number of young people in the age group 15-29 years old. Young people in education include those attending part-time or full-time education but exclude those in non-formal education and educational activities of very short duration. Employment is defined according to the OECD/ILO Guidelines and covers all those who have been in paid work for at least one hour in the reference week of the survey or were temporarily absent from such work. Therefore, NEET youth can be either unemployed or inactive and not involved in education or training. OECD data are based on EU-LFS, EU-SILC and national labour force and household surveys (additional information at https://doi.org/10.1787/72d1033a-en and https://doi.org/10.1787/5js6363503f6-en).
Gross domestic product (GDP)	The standard measure of the value added created through the production of goods and services in a country during a certain period and is the single most important indicator to capture economic activity. The indicator used is based on nominal GDP (i.e., GDP at current prices or in value) in US thousand dollars per capita. Additional information at https://data.oecd.org/gdp/gross-domestic-product-gdp.htm .
Population density	Population per km ² . Additional information at https://stats.oecd.org/Index.aspx .
Life expectancy	How long, on average, a newborn can expect to live, if current death rates do not change. Additional information at https://data.oecd.org/healthstat/life-expectancy-at-birth.htm .

Social spending	Net total social expenditure is measured as a percentage of GDP. It includes both public and private expenditure. Social expenditure comprises cash benefits, direct in-kind provision of goods and services, and tax breaks for social purposes. Benefits may be targeted at low-income households, the elderly, disabled, sick, unemployed, or young persons. Additional information at https://data.oecd.org/socialexp/social-spending.htm .
Homicide	Intentional homicide rate (per 100,000 population). Additional information at https://stats.oecd.org/index.aspx?queryid=67085 .
Part-time employment	People in employment (whether employees or self-employed) who usually work less than 30 hours per week in their main job. Employed people are those aged 15 and over who report that they have worked in gainful employment for at least one hour in the previous week or who had a job but were absent from work during the reference week while having a formal job attachment. This indicator, presented as a total, shows the proportion of persons employed part-time among all employed persons. Additional information at https://data.oecd.org/emp/part-time-employment-rate.htm .
Poverty	The ratio of the number of people (total, i.e., all ages) whose income falls below the poverty line; is taken as half the median household income of the total population. Additional information at https://data.oecd.org/inequality/poverty-rate.htm .
Social inequality	Measured by the Gini coefficient. It is based on the comparison of cumulative proportions of the population against cumulative proportions of income they receive, and it ranges between 0 in the case of perfect equality and 1 in the case of perfect inequality. Additional information at https://data.oecd.org/inequality/income-inequality.htm .
Education spending	Measured as a percentage of GDP, it covers expenditure on schools and other public and private educational institutions (i.e., primary to post-secondary non-tertiary). Spending includes instruction and ancillary services for students and families provided through educational institutions. Additional information at https://data.oecd.org/eduresource/education-spending.htm .

Table S2. Descriptive characteristics (mean and standard deviation) of analysed OECD data for the period 1997-2020.

	Total M \pm SD (n observations, n countries)	Lowest M \pm SD (Country, n observation)	Highest M \pm SD (Country, n observation)
NEET	15.28 \pm 6.86 (767, 40)	7.24 \pm 0.86 (the Netherlands, 23)	37.76 \pm 1.59 (South Africa, 8)
Gross domestic product	34.51 \pm 16.47 (766, 40)	12.82 \pm 0.31 (South Africa, 8)	82.69 \pm 25.06 (Luxembourg, 23)
Population density	118.18 \pm 113.66 (767, 40)	2.8 \pm 0.30 (Australia, 24)	483.03 \pm 14.88 (the Netherlands, 23)
Life expectancy	78.76 \pm 3.44 (761, 40)	62.97 \pm 1.08 (South Africa, 7)	82.86 \pm 0.50 (Japan, 10)
Social spending	20.44 \pm 5.04 (274, 35)	6.88 \pm 1.04 (Mexico, 10)	29.97 \pm 1.66 (France, 9)
Homicide	2.52 \pm 3.87 (589, 36)	0.48 \pm 0.38 (Island, 13)	28.13 \pm 3.24 (Colombia, 4)
Part-time employment	14.78 \pm 7.29 (738, 39)	3.37 \pm 1.43 (Slovakia, 24)	35.59 \pm 2.71 (the Netherlands, 23)
Poverty	11.26 \pm 4.09 (385, 38)	5.74 \pm 0.36 (Denmark, 8)	27.45 \pm 0.35 (South Africa, 2)
Social inequality	0.32 \pm 0.06 (385, 38)	0.24 \pm 0.01 (Slovenia, 16)	0.62 \pm 0.01 (South Africa, 2)
Education spending	3.57 \pm 0.67 (391, 38)	1.21 (Switzerland, 1)	5.51 (Costa Rica, 1)

Table S3. Results of mixed models predicting bivariate associations between NEET rate and variables of interest in countries considered for analysis controlling for the effect of time, 1997-2020 (OECD data).

	All fitted separately / bivariate association					
	N observation (n countries)	β (SE)	95%CI	t (df)	B	p
Gross domestic product	766 (40)	- 0.58 (0.07)	-0.71, -0.45	- 8.84 (724)	- 0.24	< 0.001
Population density	767 (40)	- 0.22 (0.15)	-0.52, 0.08	- 1.42 (725)	- 0.01	0.16
Life expectancy	761 (40)	- 0.18 (0.07)	-0.31, -0.04	- 2.61 (719)	- 0.37	0.009
Social spending	274 (35)	0.36 (0.07)	0.22, 0.4	5.13 (237)	0.43	< 0.001
Homicide	589 (36)	0.02 (0.05)	- 0.07, 0.11	0.4 (551)	0.03	0.69
Part-time employment	738 (39)	0.2 (0.07)	0.06, 0.34	2.8 (697)	0.19	0.005
Poverty	385 (38)	0.24 (0.07)	0.10, 0.38	3.39 (345)	0.31	< 0.001
Social inequality	385 (38)	0.36 (0.08)	0.21, 0.51	4.79 (345)	32.34	< 0.001
Education spending	391 (38)	0.15 (0.05)	0.05, 0.25	2.94 (351)	1.23	0.003

β : standardized coefficient, *SE*: standard errors, *CI*: confidence interval, *t*: value of the t statistic, *df*: degree of freedom, *B*: unstandardized coefficient. All predictors were centered to the mean.

Sensitivity analysis using open data of the World Bank Group

(<https://data.worldbank.org/>, accessed on 27/06/2022)

Data for 217 countries and territories were extracted on 27 June 2022. Time period considered for analysis was 1997-2020, as for principal analysis using OECD data. However, NEET rate data were completely missing for 50 countries/territories for the period considered. Therefore, the following countries/territories were excluded from the analysis: American Samoa, Andorra, Antigua and Barbuda, Azerbaijan, The Bahamas, Bahrain, Barbados, Bhutan, British Virgin Islands, Cayman Islands, Central African Republic, Channel Islands, China, Cuba, Dominica, Equatorial Guinea, Eritrea, Faroe Islands, French Polynesia, Gabon, Gibraltar, Greenland, Grenada, Guam, Isle of Man, Dem. People's Rep. Korea, Rep. Korea, Kuwait, Libya, Liechtenstein, Monaco, Morocco, Mozambique, Northern Mariana Islands, Oman, Puerto Rico, Qatar, San Marino, Sao Tome and Principe, Sint Maarten (Dutch part), South Sudan, St. Kitts and Nevis, St. Martin (French part), St. Vincent and the Grenadines, Syrian Arab Republic, Turkmenistan, Turks and Caicos Islands, United Arab Emirates, Uzbekistan, and Virgin Islands (U.S.).

Initially, principal analysis was repeated using World Bank data on the same 40 countries (restricted analysis). Subsequently, (all available) World Bank data from 167 countries and territories were considered for analysis. Included countries/territories were: Afghanistan, Albania, Algeria, Angola, Argentina, Armenia, Aruba, Australia, Austria, Bangladesh, Belarus, Belgium, Belize, Benin, Bermuda, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Brunei Darussalam, Bulgaria, Burkina Faso, Burundi, Cabo Verde, Cambodia, Cameroon, Canada, Chad, Chile, Colombia, Comoros, Dem. Rep. Congo, Rep. Congo, Costa Rica, Cote d'Ivoire, Croatia, Curacao, Cyprus, Czech Republic, Denmark, Djibouti, Dominican Republic, Ecuador, Arab Rep. Egypt, El Salvador, Estonia, Eswatini, Ethiopia, Fiji, Finland France, The Gambia, Georgia, Germany, Ghana, Greece, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, Hong Kong, Hungary, Iceland, India, Indonesia, Islamic Rep. Iran, Iraq, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kazakhstan, Kenya, Kiribati, Kosovo, Kyrgyz Republic, Lao PDR, Latvia, Lebanon, Lesotho, Liberia, Lithuania, Luxembourg, Macao, Madagascar, Malawi, Malaysia, Maldives, Mali, Malta, Marshall Islands, Mauritania, Mauritius, Mexico, Fed. Sts. Micronesia, Moldova, Mongolia, Montenegro, Myanmar, Namibia, Nauru, Nepal, Netherlands, New Caledonia, New Zealand, Nicaragua, Niger, Nigeria, North Macedonia, Norway, Pakistan, Palau, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, Rwanda, Samoa, Saudi Arabia, Senegal, Serbia, Seychelles, Sierra Leone, Singapore, Slovak Republic, Slovenia, Solomon Islands, Somalia, South Africa, Spain, Sri Lanka, St. Lucia, Sudan, Suriname, Sweden, Switzerland, Tajikistan, Tanzania, Thailand, Timor-

Leste, Togo, Tonga, Trinidad and Tobago, Tunisia, Turkey, Tuvalu, Uganda, Ukraine, United Kingdom, United States, Uruguay, Vanuatu, Venezuela, Vietnam, West Bank and Gaza, Rep. Yemen, Zambia, Zimbabwe.

Variables included and their definitions correspond to those of primary analysis, i.e., NEET rate, GDP (<https://data.worldbank.org/indicator/NY.GDP.PCAP.CD>), population density (<https://data.worldbank.org/indicator/EN.POP.DNST>), life expectancy (<https://data.worldbank.org/indicator/SP.DYN.LE00.IN>), social spending, homicide (<https://data.worldbank.org/indicator/VC.IHR.PSRC.P5>), part-time employment (<https://data.worldbank.org/indicator/SL.TLF.PART.ZS>), poverty (<https://data.worldbank.org/topic/poverty>), social inequality (<https://data.worldbank.org/indicator/SI.POV.GINI>), and education spending, with the following exception:

- NEET rate is the proportion of young people who are not in education, employment, or training. Unemployment is defined considering all persons of working age and their activity during a specified brief period, such as one week or one day. Labour force surveys are the preferred source of statistics whereas other types of household surveys and population censuses could also be used as sources of data on the youth NEET. However, countries vary somewhat in their operational definitions. In particular, the lower age limit for young people is usually determined by the minimum age for leaving school, where this exists. When data are available for more than two age groups in a given year, one value for persons aged 15 to 29 is taken, considering that not all people complete their education by the age of 24. (for additional information see <https://databank.worldbank.org/metadataglossary/world-development-indicators/series/SL.UEM.NEET.ZS> and <https://ilostat.ilo.org/resources/concepts-and-definitions/description-youth-neet/>). Thus, there could be some differences in age coverage for some countries between the two databases analysed in the present study.
- Social spending is measured using “subsidies and other transfers (percentage of expense)” as a proxy and is defined as “subsidies, grants, and other social benefits include all unrequited, nonrepayable transfers on current account to private and public enterprises; grants to foreign governments, international organizations, and other government units; and social security, social assistance benefits, and employer social benefits in cash and kind.” (additional information at <https://data.worldbank.org/indicator/GC.XPN.TRFT.ZS>).

- Education spending is measured using “government expenditure on education, total (percentage of GDP)”, “calculated by dividing total government expenditure for all levels of education by the GDP, and multiplying by 100.” (additional information at <https://data.worldbank.org/indicator/SE.XPD.TOTL.GD.ZS>).

The results of the analysis are reported in tables 4S, 5S, 6S and 7S.

1. Analysis restricted to the 40 countries included in the primary analysis

Table S4. Results of mixed models predicting bivariate associations between NEET rate and variables of interest in countries considered for analysis controlling for the effect of time (World Bank data restricted to 40 countries).

	All fitted separately / bivariate association					
	N observation (n countries)	β (SE)	95%CI	t (df)	B	p
Gross domestic product	688 (40)	- 0.29 (0.05)	-0.38, -0.19	- 6.11 (646)	- 0.01	< 0.001
Population density	688 (40)	- 0.18 (0.14)	-0.45, 0.08	- 1.35 (646)	- 0.01	0.18
Life expectancy	688 (40)	- 0.35 (0.08)	-0.51, -0.20	- 4.48 (646)	- 0.55	< 0.001
Social spending (subsidies and other transfers)	603 (39)	0.12 (0.06)	0.01, 0.24	2.17 (562)	0.05	0.03
Homicide	601 (40)	0.20 (0.06)	0.08, 0.32	3.20 (559)	0.14	0.001
Part-time employment	650 (40)	0.07 (0.04)	- 0.01, - 0.15	1.68 (608)	0.04	0.09
Poverty	309 (33)	0.25 (0.05)	0.15, 0.36	4.70 (274)	0.28	< 0.001
Social inequality	569 (39)	0.44 (0.06)	0.32, 0.56	7.32 (528)	0.37	< 0.001
Education spending (total)	510 (38)	0.12 (0.03)	0.06, 0.17	3.84 (470)	0.73	< 0.001

β : standardized coefficient, *SE*: standard errors, *CI*: confidence interval, *t*: value of the t statistic, *df*: degree of freedom, *B*: unstandardized coefficient. All predictors were centered to the mean.

Table S5. Results of mixed models predicting associations between NEET rate and variables of interest (World Bank data restricted to 40 countries).

	Model 1 ^a					Model 2 ^b				
	β (SE)	95%CI	t (df= 559)	B	p	β (SE)	95%CI	t (df= 73)	B	p
Intercept	0.00 (0.13)	- 0.26, 0.27	0.02	13.63	0.98	0.07 (0.16)	- 0.24, 0.39	0.46	13.67	0.65
Time	0.00 (0.04)	- 0.07, 0.08	0.08	0.00	0.94	- 0.10 (0.05)	- 0.21, 0.00	- 1.92	- 0.12	0.06
Gross domestic product	- 0.28 (0.05)	- 0.38, - 0.17	- 5.04	- 0.01	< 0.001	- 0.33 (0.08)	- 0.49, - 0.17	- 4.05	- 0.01	< 0.001
Population density	- 0.06 (0.13)	- 0.32, 0.19	- 0.48	- 0.00	0.63	- 0.07 (0.14)	- 0.35, 0.21	- 0.50	- 0.01	0.62
Life expectancy	- 0.20 (0.10)	- 0.39, - 0.01	- 2.06	- 0.28	0.04	- 0.03 (0.13)	- 0.30, 0.23	- 0.26	- 0.05	0.80
Social spending (subsidies and other transfers)	0.10 (0.06)	- 0.01, 0.21	1.82	0.04	0.07	0.19 (0.13)	- 0.06, 0.44	1.47	0.06	0.14
Homicide	--	--	--	--	--	- 0.02 (0.11)	- 0.23, 0.20	- 0.16	- 0.02	0.88
Part-time employment	--	--	--	--	--	0.03 (0.08)	- 0.13, 0.20	0.41	0.02	0.68
Poverty	--	--	--	--	--	0.12 (0.09)	- 0.06, 0.29	1.32	0.10	0.19
Social inequality	--	--	--	--	--	0.39 (0.10)	0.19, 0.59	3.91	0.32	< 0.001
Education spending (total)	--	--	--	--	--	0.09 (0.06)	- 0.04, 0.21	1.38	0.37	0.17

^a: all variables fitted jointly except covariates (603 observations for 39 countries), ^b: all variables fitted jointly including covariates (228 observations for 27 countries), β : standardized coefficient, *SE*: standard errors, *CI*: confidence interval, *t*: value of the t statistic, *df*: degree of freedom, *B*: unstandardized coefficient. All predictors were centered to the mean.

2. Analysis of World Bank data from 167 countries

Table S6. Results of mixed models predicting bivariate associations between NEET rate and variables of interest in countries considered for analysis controlling for the effect of time (World Bank data).

	All fitted separately / bivariate association					
	N observation (n countries)	β (SE)	95%CI	t (df)	B	p
Gross domestic product	1561 (167)	- 0.46 (0.05)	-0.57, -0.36	- 8.60 (1392)	- 0.02	< 0.001
Population density	1563 (167)	- 0.19 (0.08)	-0.34, - 0.03	- 2.39 (1394)	- 0.00	0.02
Life expectancy	1557 (163)	- 0.30 (0.06)	-0.41, -0.19	- 5.37 (1392)	- 0.44	< 0.001
Social spending (subsidies and other transfers)	1146 (123)	- 0.04 (0.04)	- 0.12, 0.04	- 0.91 (1021)	- 0.02	0.36
Homicide	1189 (129)	0.01 (0.04)	- 0.07, 0.08	0.18 (1058)	0.01	0.86
Part-time employment	1291 (148)	- 0.13 (0.03)	- 0.18, - 0.08	- 4.98 (1143)	- 0.11	< 0.001
Poverty	625 (100)	0.23 (0.05)	0.13, 0.33	4.46 (523)	0.18	< 0.001
Social inequality	1046 (116)	0.04 (0.06)	- 0.06, 0.15	0.81 (928)	0.05	0.42
Education spending (all)	1118 (146)	0.04 (0.03)	- 0.03, 0.10	1.05 (970)	0.23	0.30

β : standardized coefficient, *SE*: standard errors, *CI*: confidence interval, *t*: value of the t statistic, *df*: degree of freedom, *B*: unstandardized coefficient. All predictors were centered to the mean.

Table S7. Results of mixed models predicting associations between NEET rate and variables of interest (World Bank data).

	Model 1 ^a					Model 2 ^b				
	β (SE)	95%CI	t (df=234)	B	p	β (SE)	95%CI	t (df= 73)	B	p
Intercept	0.16 (0.09)	- 0.02, 0.34	1.70	20.11	0.09	0.13 (0.11)	- 0.09, 0.35	1.20	20.39	0.23
Time	0.09 (0.04)	0.02, 0.15	2.60	0.17	0.009	- 0.01 (0.04)	- 0.08, 0.07	- 0.12	- 0.01	0.90
Gross domestic product	- 0.35 (0.06)	- 0.46, - 0.23	- 5.88	- 0.01	< 0.001	- 0.36 (0.08)	- 0.51, - 0.21	- 4.77	- 0.01	< 0.001
Population density	- 0.07 (0.08)	- 0.23, 0.09	- 0.81	- 0.00	0.42	0.15 (0.10)	- 0.04, 0.35	1.53	- 0.00	0.13
Life expectancy	- 0.14 (0.07)	- 0.28, 0.00	- 1.94	- 0.20	0.05	- 0.23 (0.10)	- 0.43, - 0.03	- 2.28	- 0.34	0.02
Social spending (subsidies and other transfers)	- 0.03 (0.04)	- 0.11, 0.05	- 0.67	- 0.01	0.51	0.01 (0.08)	- 0.15, 0.16	0.06	0.00	0.95
Homicide	--	--	--	--	--	0.01 (0.07)	- 0.14, 0.12	- 0.14	- 0.01	0.89
Part-time employment	--	--	--	--	--	0.02 (0.06)	- 0.10, 0.13	0.31	0.01	0.75
Poverty	--	--	--	--	--	0.08 (0.06)	- 0.04, 0.21	1.30	0.07	0.20
Social inequality	--	--	--	--	--	0.27 (0.07)	0.13, 0.42	3.66	0.26	< 0.001
Education spending (all)	--	--	--	--	--	0.03 (0.04)	- 0.06, 0.12	0.59	0.13	0.55

^a: all variables fitted jointly except covariates (1144 observations for 121 countries), ^b: all variables fitted jointly including covariates (330 observations for 51 countries), β : standardized coefficient, *SE*: standard errors, *CI*: confidence interval, *t*: value of the t statistic, *df*: degree of freedom, *B*: unstandardized coefficient. All predictors were centered to the mean.

Time points and countries data included in model 2 of primary (OECD data) and sensitivity (World Bank data) analyses

Table S8. Countries data analysed per year in model 2.

Year	OECD data	World Bank data (restricted)	World Bank data (all)
	N observations	N observations	N observations
2003	0	5	6
2004	0	10	12
2005	9	12	13
2006	0	10	12
2007	0	12	14
2008	0	12	15
2009	14	13	19
2010	0	12	20
2011	19	14	21
2012	0	14	21
2013	24	13	20
2014	0	16	26
2015	23	22	34
2016	0	20	32
2017	22	23	37
2018	0	20	28

Table S9. Countries data analysed per country in model 2.

Country	OECD data	World Bank data (restricted)	World Bank data (all)
	N	N	N
	observations	observations	observations
AUS	0	0	0
AUT	3	15	15
BEL	0	0	0
BRA	0	0	0
CAN	6	0	0
CHE	1	13	13
CHL	5	5	5
COL	0	0	0
CRI	0	8	8
CZE	6	5	5
DEU	2	13	13
DNK	3	0	0
ESP	5	2	2
EST	2	14	14
FIN	5	16	16
FRA	3	0	0
GBR	6	2	2
GRC	3	6	6
HUN	3	3	3
IRL	6	0	0
ISL	5	15	15
ISR	4	0	0
ITA	6	15	15
JPN	0	0	0
LTU	0	4	4
LUX	2	0	0
LVA	3	4	4
MEX	0	1	1
NLD	1	4	4
NOR	5	16	16
NZL	0	0	0
POL	6	15	15
PRT	6	14	14
RUS	0	4	4
SVK	6	15	15
SVN	5	4	4
SWE	1	12	12
TUR	2	1	1

USA	0	0	0
ZAF	0	2	2
ALB	-	-	2
ARG	-	-	2
BGD	-	-	1
BGR	-	-	1
CYP	-	-	13
DOM	-	-	2
GEO	-	-	1
GTM	-	-	1
HND	-	-	1
HRV	-	-	5
IDN	-	-	12
KGZ	-	-	5
LKA	-	-	1
MLT	-	-	11
MMR	-	-	1
MNG	-	-	6
MUS	-	-	2
PAN	-	-	4
PER	-	-	7
PHL	-	-	4
PRY	-	-	4
SRB	-	-	6
THA	-	-	9
TUN	-	-	1

Figure captions

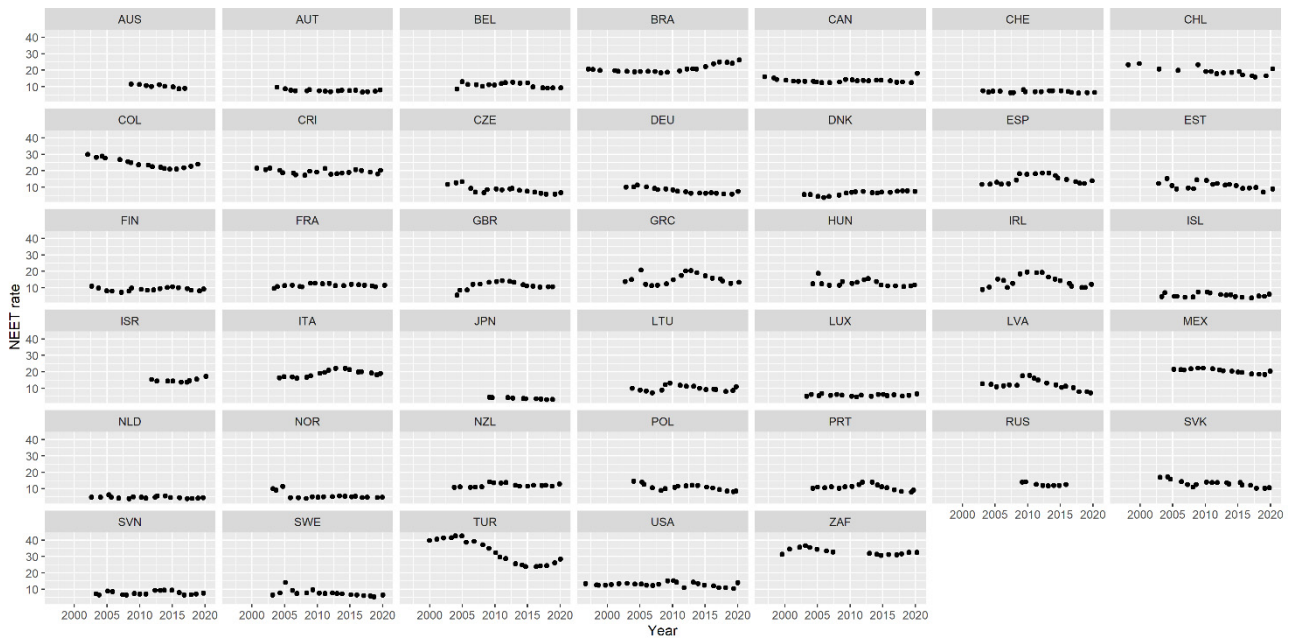


Figure S1. National trends in NEET rate for the 40 countries considered for sensitivity analysis, 1997-2020 (World Bank data).

Note. AUS: Australia, AUT: Austria, BEL: Belgium, BRA: Brazil, CAN: Canada, CHE: Switzerland, CHL: Chile, COL: Colombia, CRI: Costa Rica, CZE: Czech Republic, DEU: Germany, DNK: Denmark, ESP: Spain, EST: Estonia, FIN: Finland, FRA: France, GBR: United Kingdom, GRC: Greece, HUN: Hungary, IRL: Ireland, ISL: Island, ISR: Israel, ITA: Italy, JPN: Japan, LTU: Lithuania, LUX: Luxembourg, LVA: Latvia, MEX: Mexico, NLD: the Netherlands, NOR: Norway, NZL: New Zealand, POL: Poland, PRT: Portugal, RUS: Russia, SVK: Slovakia, SVN: Slovenia, SWE: Sweden, TUR: Turkey, USA: United States, ZAF: South Africa.

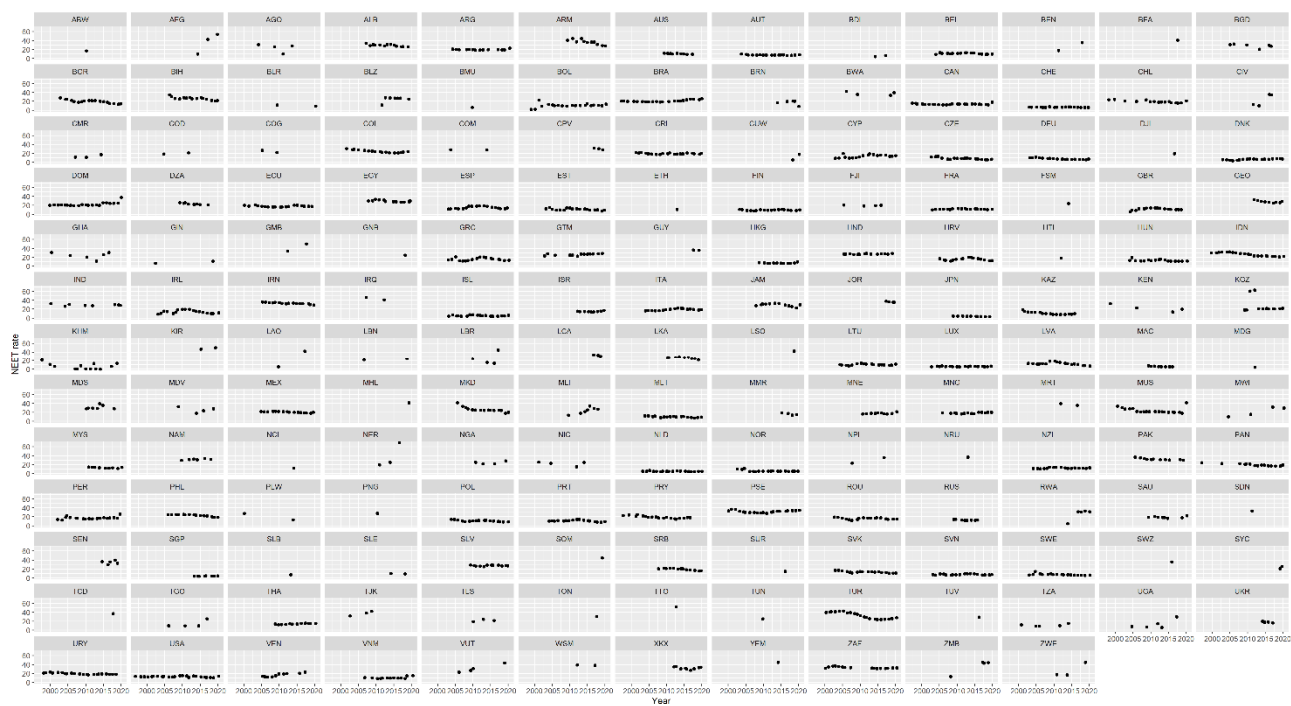


Figure S2. National trends in NEET rate for the 167 countries considered for sensitivity analysis, 1997-2020 (World Bank data) (including countries in supplementary material).