An analysis of NEET youths in EU in a longitudinal perspective

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In recent years the number of NEETs has been rising alarmingly and profiling the most fragile individuals among youths can prompt more effective policies. We analyse the trajectories of European NEETs in the decade after the financial crisis, linking the trajectories to pre-crisis structural features of the countries. Using the EU-SILC to identify patterns in the NEET condition, we estimate a multilevel model to assess the impact of macro-variables on them. The main results show the effect of family support policies, training, labour market flexibilization and economic growth in decreasing the probability of being NEET for a long period of time.

Negli ultimi anni il numero di NEET è aumentato in modo allarmante e profilare gli individui più fragili tra i giovani può stimolare politiche più efficaci. In questo articolo analizziamo le traiettorie dei NEET europei nel decennio successivo alla crisi finanziaria, collegandole alle caratteristiche strutturali pre-crisi dei Paesi. Utilizzando EU-SILC identifichiamo diversi tipi di NEET con un'ottica longitudinale e stimiamo una regressione multilivello per valutare l'impatto delle variabili aggregate su di essi. I principali risultati mostrano l'effetto delle politiche di sostegno alla famiglia, della formazione, della flessibilizzazione del mercato del lavoro e della crescita economica nel diminuire la probabilità di essere NEET di lungo periodo.

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Introduction and aim of the research

According to Eurostat data, most countries across Europe and other advanced economies face an alarming number of NEETs (Caroleo *et al.* 2020). Not surprisingly, the phenomenon's incidence and persistence over time have increased particularly during the years following the 2008 financial crisis. We take a longitudinal perspective and investigate the differences in the extent of long-term NEET events among young Europeans in the 2008-2016 period, in relationship to the structural characteristics of their countries that are likely to enable or hamper the possibility of young individuals to exit the NEET condition. The paper focuses on structural/long-run relationships between countries' institutional/macro features and NEET trajectories, averaging over the 2008-2016 period and abstracting from the short-run effect of the business cycle, which

is different for timing and intensity across the EU countries considered.

To be more specific, we propose a classification of NEETs patterns[1] that associates each trajectory to a sequence-class that is defined *ex-ante* according to the persistency in the NEET status, and we analyse the relationship between the probability of experiencing these trajectories over the 2008-2016 period and context variables measuring structural characteristics of their countries. Trajectories identify – over 48 months – those who are not experiencing a problematic situation, *i.e.*, young individuals experiencing not more than 12 months as NEET, and those who, instead, are at risk because facing longer periods not in employment or education. Within the group at risk, we separate those churning in and out of employment and those constantly NEET, as facing different challenges. The first group is trapped in bouncing back and forth between work and non-work; the second group is more at risk of detachment and social exclusion.

We consider multiple contextual characteristics and public interventions at the country level that can influence those situations, as measured in pre-crisis years (2003-2007): the share of temporary jobs as a result of flexibilisation policies, the generosity of policies supporting families and childcare, and public expenditure for active labour market policies, as well as GDP growth. This is in order to measure the structural characteristics of countries that can provide more or less resilience to economic shocks and that can help or hamper youths' working prospects.

We estimate a multilevel model, controlling for individual characteristics and focussing on the mentioned structural characteristics at the country level. We find a positive effect of the selected policies and of economic growth in decreasing the probability of being NEET for a very long period of time, less so regarding the probability of churning in and out of NEET status for a long period of time.

The paper unfolds as follows. Section 1 reviews the literature discussing the concept of NEET, central to our analysis, while Section 2 refers to the literature related to the institutions likely to impact the NEET status. Section 3 presents the conceptual longitudinal framework of our work. Section 4 deals with data description, while Section 5 is devoted to descriptive statistics. Section 6 presents the multilevel model, whose results are discussed in section 7. The last Section concludes.

1. Literature. NEET: heterogeneity and a longitudinal approach

The use of the concept 'NEET' in the media and in public discourse contributed to promoting it as a useful indicator for monitoring the labour market and social condition of young individuals. However, the scientific community lively debated the usefulness of the concept.

The Not in Employment, Education or Training (NEET) category includes young people who do not study or work[2]. Often the concept of NEET is used as a synonym for the unemployed, but the former is a wider concept than the latter. In fact, the NEET category covers early school leaving, unemployment and labour market detachment, *i.e.*, several features of inactivity. There is a general agreement in considering the NEET term as a useful indicator for monitoring the labour market and social condition of young individuals. Especially from a comparative perspective, it gives an immediate grasp of the size of the youth population in a condition of potential vulnerability. However, two distinct types of problems overlap in the NEET condition as it appeared in the previous literature. On the one hand, the distinction among the various groups that constitute the category; on the other, the differentiation of the NEET by the severity of this condition. Beyond the differences in terms of the spread of the phenomenon, the likelihood of being NEET is higher for those with low educational qualifications and for women, especially if they have caring responsibilities (Eurofound 2016). This common composition shows well the limits of the

1 Following a method already adopted with EU-SILC Data by Contini *et al.* (2019).

2 NEET indicator is a well-known indicator. According to Eurostat the NEET indicator corresponds to the percentage of the population of a given age group and sex who is not employed and not involved in further education or training. The numerator of the indicator refers to persons meeting these two conditions: a) they are not employed (i.e., unemployed, or inactive according to the International Labour Organisation definition); b) they have not received any formal or non-formal education or training in the four weeks preceding the survey. The denominator is the total population of the same age group and sex, excluding the respondents who have not answered the question 'participation in regular (formal) education and training'.

concept. Notwithstanding the potential of the term NEET, it is well known that this category may turn out to be problematic as it may fail to clearly identify specific vulnerabilities and it encompasses a very heterogeneous group of people.

Despite the empirical attention that the NEET phenomenon has obtained, longitudinal analyses are scarce. This is surprising given that a longitudinal perspective can be very useful to disentangle the heterogeneity of the NEET construct and the severity of this status. In other words, the NEET status is a more problematic condition in the transition to adulthood trajectories the more it lasts. In recent years, some literature that studies NEETs longitudinally has emerged: Kleif (2020) and Ralston *et al.* (2021) deal with the longitudinal dimension of the NEET condition but they focus on single countries; Bruno *et al.* (2014) and Bradley *et al.* (2020) focus on comparisons at the regional level. Nevertheless, to the best of our knowledge, there is a lack of comprehensive longitudinal studies at the European level. In this work, we fill this gap by proposing a longitudinal analysis on 25 European countries.

To be more specific, previous literature has already highlighted the strengths and weaknesses of this concept. On one side, the NEET category overcomes the narrowness of the youth unemployment definition, to encompass a wide range of youth vulnerabilities, including the economically inactive – unemployed discouraged workers – but also those totally inactive who occupy an unconstructive and potentially threatening position in the social topography (Robson 2008). In addition to individuals whose condition raises concern, the NEET label includes others: young people in transitional states – for instance between school and further education –, between temporary contracts (Dorsett and Lucchino 2018) or overall school-to-work transitions (Pastore *et al.* 2021), as well as those who have made the decision not to work or study, in order to take care of their relatives or young children (Yates and Payne 2006). On the other side, some scholars criticise the NEET construct because it includes young individuals with very different experiences, characteristics and needs. They highlight that the NEET label has oversimplified the depiction of young people as a homogeneous group, struggling with an accumulation of personal, social, and educational risks (Holte 2018; Sergi *et al.* 2018; Simões *et al.* 2017; Cuzzocrea 2014; Furlong 2006).

In order to disentangle the heterogeneity of the NEET category, a variety of approaches have been used in the empirical investigation of the phenomenon. International institutions and scholars have proposed several classifications to disentangle the heterogeneity of the NEET experience. A first taxonomy assumes that NEETs are intrinsically vulnerable and distinguishes them according to the severity of their condition: *essentially confused, temporarily side-tracked, and deeply alienated* (Williamson 2010; Williamson and Middlemiss 1999). Alternatively, vulnerability can be used as a criterion of classification as in a later proposal that distinguishes the *conventionally unemployed,* the *unavailable*, the *disengaged*, the *opportunity-seekers* and the *voluntary NEET* (Eurofound 2012). All these classifications are defined in a cross-sectional framework. Indeed, cross-sectional studies constitute the main corpus of studies on the NEET phenomenon (Williamson 2010; Furlong 2006; Bynner and Parsons 2002). However, the relevance and explanatory efficacy of the longitudinal perspective have emerged in various studies. Bynner and Parsons (2002) propose to focus only on NEET experiencing at least 6 months in the state, implying that shorter episodes should not raise concern. Quintini and Martin (2006) analyse to what extent young people tend to experience repeated spells out of work and education. Some scholars highlight that the consequences of being NEET may vary greatly according to the length of the permanence in the NEET state (Thompson 2011). Ralston *et al.* (2021) use Census data for Scotland to estimate the long-term effects of being NEET in early adulthood and find that it is a predictor of long-term disadvantage. A longitudinal approach has been supported also by Eurofound (2016). It defines seven subgroups, taking into account the length of the unemployment spell and, to some extent, the individual motivation for being inactive. First, *re-entrants* are young people who plan to re-enter employment, education, or training soon. Second, *short-term unemployed* includes individuals with an unemployment spell of less than a year. Third, *long-term unemployed* encompass individuals that experience it for more than a year. The fourth category includes *unavailable due to illness or disability*, the fifth those *unavailable due to family responsibilities*, the sixth the *discouraged workers* and, the seventh the *other inactive*, as a residual category.

Sissons and Jones (2012) use retrospective questions allowing us to draw longitudinal information on the duration of NEET spells. Other studies analyse whether the NEET state is permanent or temporary in a single country: in Austria, the NEET situation is permanent for one-third of those affected at a certain moment (Tamesberger and Bacher (2014); in Denmark, repeated periods of unemployment or inactivity space out periods of employment, pointing in the direction of de-standardised work careers rather than a condition of vulnerability or social exclusion (Kleif 2020); in Italy, nearly 40% of young people experience the NEET condition for at least 12 months within a 4-year observation window (Contini *et al.* 2019).

In this framework, we contribute by applying a method similar to Contini *et al.* (2019) to 25 European Countries, as detailed in the next sections.

It is important here to keep in mind the distinction between the characteristics of young NEETs and the heterogeneity of the concept. On the one hand, as mentioned, NEETs are most often women with low levels of education, but there are also cases – although less frequent – of young men with tertiary education. Thus, there is a certain heterogeneity in the composition of the NEET population, especially if the persistence in the NEET state is not taken into account. On the other hand, the very concept of NEET is heterogeneous by holding together different degrees of labour market attachment (unemployment and inactivity mainly). Again, the longitudinal perspective can help to focus on the heterogeneity of the NEET phenomenon and the severity of this status.

2. Institutional context: a hypothesis to be tested

We consider the role that different economic and institutional characteristics at the country level can play. As we discuss in Section 3, we consider these characteristics as averages over a 5-year period, before the onset of the financial crisis, to proxy the structural features of each country in 'normal times'. This is for two reasons. The first is to measure the resilience each country had before the shock hit; resilience that then determines also how deep and how long the downturn has been in each country. The second reason is econometric, *i.e.*, predetermined variables measure a causal relationship more precisely. We do not claim a true causal estimate, as we have no experimental or quasi-experimental setting, but the use of predetermined variables cleans the estimates from endogeneity/simultaneity biases as much as possible.

Here we present the rationale for the choice of each macro-variable, based on consolidated literature, and the empirical implications we are going to test with the multilevel model.

First, economic growth and especially growth in aggregate demand are found to be positively correlated with youth employment (Caroleo *et al.* 2020; Ecchia *et al.* 2020; O'Higgins 2017; Karlsen *et al.* 2014). The channels are manifold as both private and public spending are expected to have a positive effect on youth employment. On the one hand, an increase in investment leads to job creation, both via increased employment and entrepreneurship (World Bank 2013). On the other hand, fiscal interventions contribute to the process and prove especially effective in sustaining youth employment during downturns (ILO 2013). Hence our first hypothesis is a reduction in the probability of experiencing a long-term NEET spell in countries where GDP growth has been higher, as we expect higher resilience to economic downturns in those countries.

Second, in the '90s, many European countries amended their legislation to promote the diffusion of temporary contracts with the purpose of providing a stepping-stone into the labour market for traditionally disadvantaged categories of workers – youths among them. However, this process has resulted in negative consequences for workers as well. Indeed, temporary contracts may represent a benefit in order to facilitate the access to the labour market or to interrupt unemployment periods, but disadvantaged workers still face fewer chances to get a permanent position (O'Reilly *et al.* 2019; Berton *et al.* 2016; 2011). Hence our second hypothesis is a reduction in the probability of experiencing a long-term NEET spell in countries where more temporary contracts are available. On the other hand, the probability of churning in and out of the NEET condition for a long time might be higher if the trapping effect prevails, while it could be lower if the stepping-stone effect prevails on average across countries. This is an open empirical issue.

Third, family-friendly policies and work-life balance enhancing policies have been increasingly

relevant topics among researchers and practitioners. Among them, expanded parental leave entitlements and universal or near-universal early education may increase the employment of parents – particularly mothers – by reducing the opportunity costs of work (Ruhm and Waldfogel 2012). Indeed, several studies already showed that the adoption of more generous woman-friendly measures enables the employability of mothers with young children (León 2009). Nevertheless, the effectiveness of these interventions is not uniform and depends on factors such as education. As Müller and Wrohlich (2020) show, increased availability of childcare slots increases mothers' labour market participation, with results driven by mothers with medium education. Hence, our third hypothesis is a reduction in the probability of experiencing a long-term NEET spell in countries where spending on family and children policies is higher.

Finally, Active Labour Market Policies (ALMPs) are aimed at improving the probability of finding a job (OECD 2011). In fact, over the last twenty years, welfare states have been undergoing an important restructuring that changed the levels and conditions for social assistance, putting increased emphasis on individual responsibility (van Berkel and Valkenburg 2007; Esping-Andersen 2002; Pierson 2001). This represented a shift of policy-making orientations towards the so-called 'activation paradigm', which sets different goals for the labour market and social policies. The goal of activation policies becomes that of increasing labour market entry and participation in order to prevent social exclusion and welfare dependency (Carriero and Filandri 2019). Hence our fourth and last hypothesis is a reduction in the probability of experiencing a long-term NEET spell in countries where spending on ALMP policies is higher.

3. The framework of analysis

Using EU-SILC rotating panel data (European Union Statistics on Income and Living Conditions), we focus on the persistency in the NEET condition over four consecutive years (48 months).

We analyse the 19-29 years-old to focus on the initial stages of the working career. Including younger subjects – the 16-18 years old, commonly considered in the NEET statistics – would have implied mixing labour market issues with early school leaving ones – another complex phenomenon that deserves an ad hoc study (Buchmann and Kriesi 2011). By doing so, we exclude high-school dropouts, at least until they turn 19.

For our purposes, individual status with respect to the labour market can be aggregated into two categories at each point in time (month): NEET or non-NEET (employed or student or trainee). The rationale is that employment and attendance of educational or training courses are human capital increasing activities, while detachment from activity in a broad sense causes human capital depreciation. Indeed, these two conditions alternate over time and form trajectories. We group such sequences according to an ex-ante classification based on the persistence in the NEET state, following Contini *et al.* (2019). Notice that the analysis done by Contini *et al.* (2019) aimed at describing the population of young individuals in Italy, focussing also on regularly employed and full-time students/trainees ones. We merge their 'Never NEET' and 'Episodic NEET' categories in a single group, while preserving the high granularity of their taxonomy of Long-Term NEETs, as we focus on more problematic situations.

The decision rule is stated in Table 1.

Individuals that experience a maximum of 12 months out of 48 not in employment or training/education constitute the groups of *Never NEET* or *Episodic NEET*. The rationale is that short and occasional periods of *NEET* can be considered frictional and not problematic. The other groups are problematic, and we focus on them. The first and the second constitute the *Medium-Long-term NEETs* and include individuals that are NEET for 13-36 months out of 48 and have respectively undergone a single (*One long NEET episode*) or more periods (*Frequently NEET*) in NEET status. The last group is composed of individuals that report at least 37 months in the NEET condition out of 48 months (*Always NEET*).

This classification considers that the consequences of episodes of non-employment/non-education can be harder for those who are NEET for a long period of time (Tanaka 2020). Indeed unemployment episodes (a subset of the NEET periods) impact in a cumulative way on the wage and employment profile of workers in both vocational (Helbling and Sacchi 2014) and intellectual jobs, with a stronger effect for low-educated and low-skilled individuals (Möller and Umkehrer 2015) and for women (Manzoni and Mooi-Reci 2011). A past

Table 1. Classification rules of NEETs by persistence in the state, over 48 months

Label	Description	
Never NEET or episodic NEET	≤12 months NEET over 48 months	
Medium-long term NEET, one NEET episode	13-36 months NEET over 48 months	Long-term NEET
	One NEET spell	
Medium-long term NEET, two or more NEET episodes	13-36 months NEET over 48 months	
	Two or more NEET spells	
Always NEET	37+ months NEET over 48 months	

Source: Authors' elaboration on Contini *et al* (2019)

unemployment and inactivity spell stigmatises workers and influences the hiring decision of an employer who judges workers' productivity and performance by their employment history (Manzoni and Mooi-Reci 2011). Moreover, both unemployment and inactivity are socially undesirable and are often associated with shame and with a negative self-presentation of young people as well (Karlsen *et al.* 2014).

On top of these regularities, as discussed, the economic and institutional context plays a role. As above discussed, the probability of being a long-term NEET can be different according to the labour market tightness and social policies in place in the country. Based on this scenario, in order to consider the interplay between different institutional configurations in which young people may experience a long-term NEET spell, we selected the above-mentioned four macro-level factors in our multilevel analysis.

4. Data

We select our sample from the EU-SILC longitudinal database that features information relevant to our analysis. First, it covers up to 48 months of activity for each respondent, recording a high-frequency pattern of work, education, training, unemployment, and inactivity[3]. Second, individuals' activity is based on the self-declaration of the respondents, therefore offering the advantage of capturing the attitude of the individuals toward the labour market[4].

The sample we select consists of all individuals in the 6 waves from 2012 to 2016, aged 19-29 at the first interview. Pooling all waves, we obtain an observation period spanning from 2008 to 2016.

Finally, not all European countries can be included in the analysis, due to data availability on the time span of interest, reliability and sample size[5]; we focus on 25 countries: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czechia, Denmark, Estonia, Greece, Finland, France, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Portugal, Slovenia, Spain, Sweden, United Kingdom.

As above discussed, country characteristics are measured as averages over the 2003-2007 period, *i.e*, predetermined with respect to our observation period to exclude endogeneity issues and to measure structural resilience in each country. Appendix 1 details the data sources on country-level characteristics.

5. Descriptive evidence

Table 2 summarises the availability and magnitude of information of context variables by country, averaged over the 2003-2007 period. Here and in the estimated model, we normalise the magnitude of the expenditure for family and children and for training: being quite small with respect to GDP growth rate and the share of temporary contracts, we multiplied the first by 10 and the second by 100, in order to have comparably meaningful sizes

3 See Mack (2016) for in-depth description of EU-SILC database.

4 Operatively, the definition implementation is based on questions PL211a through PL211l of the EU-SILC questionnaire, which records the monthly self-declared main activity of the respondent from January through December of each year. The original variable reports eleven states, with great detail on the type of employment contract, working time and causes of inactivity (*e.g.*, domestic tasks, disability). For our purposes, we recode the variable into two broad groups: NEET and non-NEET.

5 In particular, Iceland and Slovakia lack the 2017 wave, Romanian data are not reliable because of issues in reporting training and the 2017 longitudinal sample for Poland has an attrition problem.

Table 2. Longitudinal and cross section NEET rate and country characteristics

Country	GDP growth (p.p.) (*)	Temporary contract share/Total employment (p.p.) (§)	Family and child support policies/GDP (0.1 p.p.) (§)	Training/GDP (0.01 p.p) (†)	Longitudinal NEET rate (p.p)	Cross section NEET rate (p.p) (§)
AT	2.60	10.82	30.00	37.21	6.04	11.2
BE	2.48	9.14	20.40	15.23	9.54	16.93
BG	6.58	-	10.33	2.91	22.33	25.73
CY	4.46	9.04	18.20	4.06	9.00	18.34
CZ	5.50	19.95	16.20	1.44	7.68	17.87
DK	2.04	10.23	37.40	47.42	0.35	10.3
EE	8.24	-	14.20	6.51	8.73	18.48
EL	4.10	20.55	8.20	5.72	23.65	29.06
ES	3.62	30.88	11.60	13.91	12.23	23.74
FI	3.60	22.34	28.20	43.15	3.50	13.94
FR	2.02	9.92	24.80	31.10	7.38	18.12
HR	4.76	11.60	-	13.42	14.51	22.08
HU	3.50	-	25.60	4.78	10.17	22.84
IE	5.18	5.40	19.80	25.62	13.16	21.75
IT	1.24	15.13	10.20	19.09	12.26	28.40
LT	8.66	-	11.00	5.83	11.80	18.14
LU	4.40	4.38	35.40	9.03	5.54	9.97
LV	9.86	-	11.80	9.20	10.10	20.49
MT	2.54	-	11.20	1.79	13.06	14.78
NL	2.30	15.02	11.80	9.80	1.12	9.29
NO	2.58	8.42	29.80	24.78	1.61	9.05
PT	1.16	27.46	11.80	25.76	10.07	16.7
SE	3.48	11.94	28.00	28.34	0.19	9.3
SI	4.78	16.50	18.80	5.34	5.33	12.63
UK	2.74	7.84	21.20	1.90	10.09	16.47
Mean	4.60	13.80	19.61	16.42	9.18	17.43
St. dev.	2.34	7.55	9.06	13.67	5.75	5.79

Note: GDP growth, Temporary contract share, family and child support policies and training are averages on the period 2003-2007, while longitudinal and cross-section NEET rates are averages on the period 2008-2016. Measurement units: § percentage points; † tenths of percentage point; ‡ hundredths of percentage points.

Source: Authors' calculation on EU-SILC, DG Employment and Social Affaires, Eurostat and IMF data. *: IMF data; §: Eurostat data; †: DG Employment and Social Affaires data

of the estimated coefficients. *I.e.*, a unit change of each country context variable estimated coefficient can be interpreted as an increase in: 1 p.p. of GDP growth, whose average is 4.6; 1 p.p. in the share of temporary contracts, whose average value is 13.8; 0.1 p.p. in the expenditure for family and children over GDP, whose actual average value is 1.96; 0.01 p.p. in the expenditure for training over GDP, whose

actual average value is 0.16. In Table 2 we observe the well-known variability of these structural characteristics across countries.

Table 2 also reports the cross-sectional NEET rate and the *Always NEET* rate, both computed over the 2008-2016 period at the country level. Figure 2 analyses the relationship between these two last measures in depth.

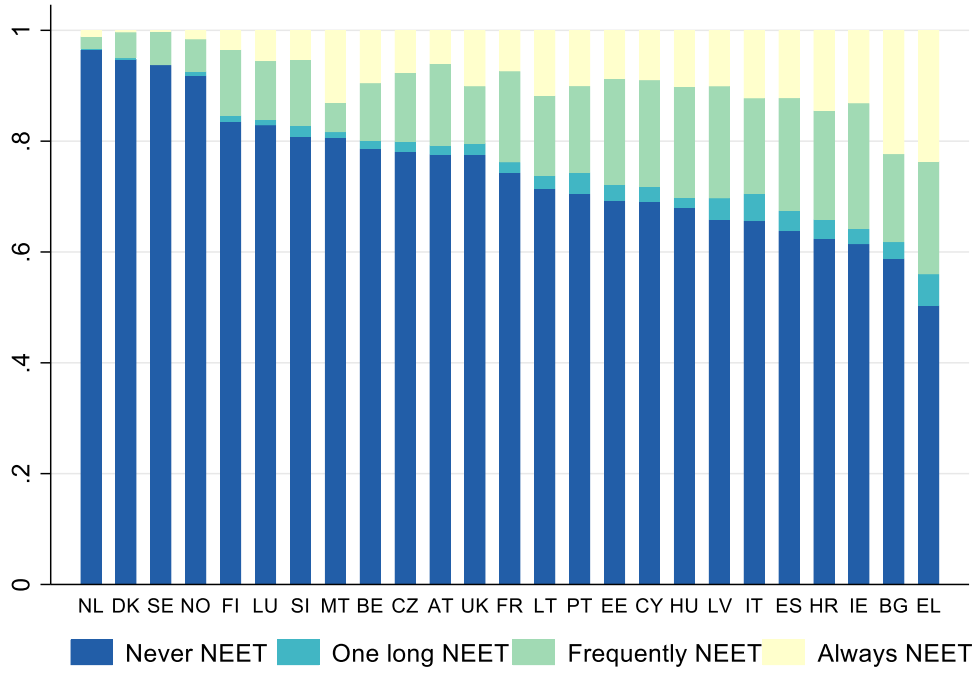
Figure 1 orders countries by increasing share of 'problematic' NEET situations. It displays large variability across a 30% average share of all kinds of long-term NEET, with Greece and the Netherlands in extreme opposite positions, Mediterranean and eastern European countries faring worse than central and northern EU ones.

In most countries, the shares of *Frequently, One-long* and *Always NEET* are similar, with few exceptions in which the *Always NEET* status prevails (Malta, Bulgaria, and Greece). Notice also that a *One-long* episode is quite a rare situation in all countries while the two extreme cases are more common: either churning in and out of employment (*Frequently NEET)* or being quite detached from the labour market (*Always NEET*). The first is a more common event than the second in all countries.

A longitudinal point of view bears many advantages in understanding the NEET phenomenon, also when considered along with the more common cross-sectional value. Figure 2 shows the correspondence between the *Always NEET* rate of our categorisation and the NEET rate calculated in the usual cross-sectional way: low persistence pushes the longitudinal statistic toward 0, while high persistence pushes it toward the cross-sectional value (the red diagonal), meaning that some people are trapped in the NEET condition, while others almost never experience it[6].

In general, we observe a direct relationship between cross-sectional shares of NEET and longitudinal persistence, indicating a growing segmentation between NEET and non-NEET in the population of the countries considered, as the share

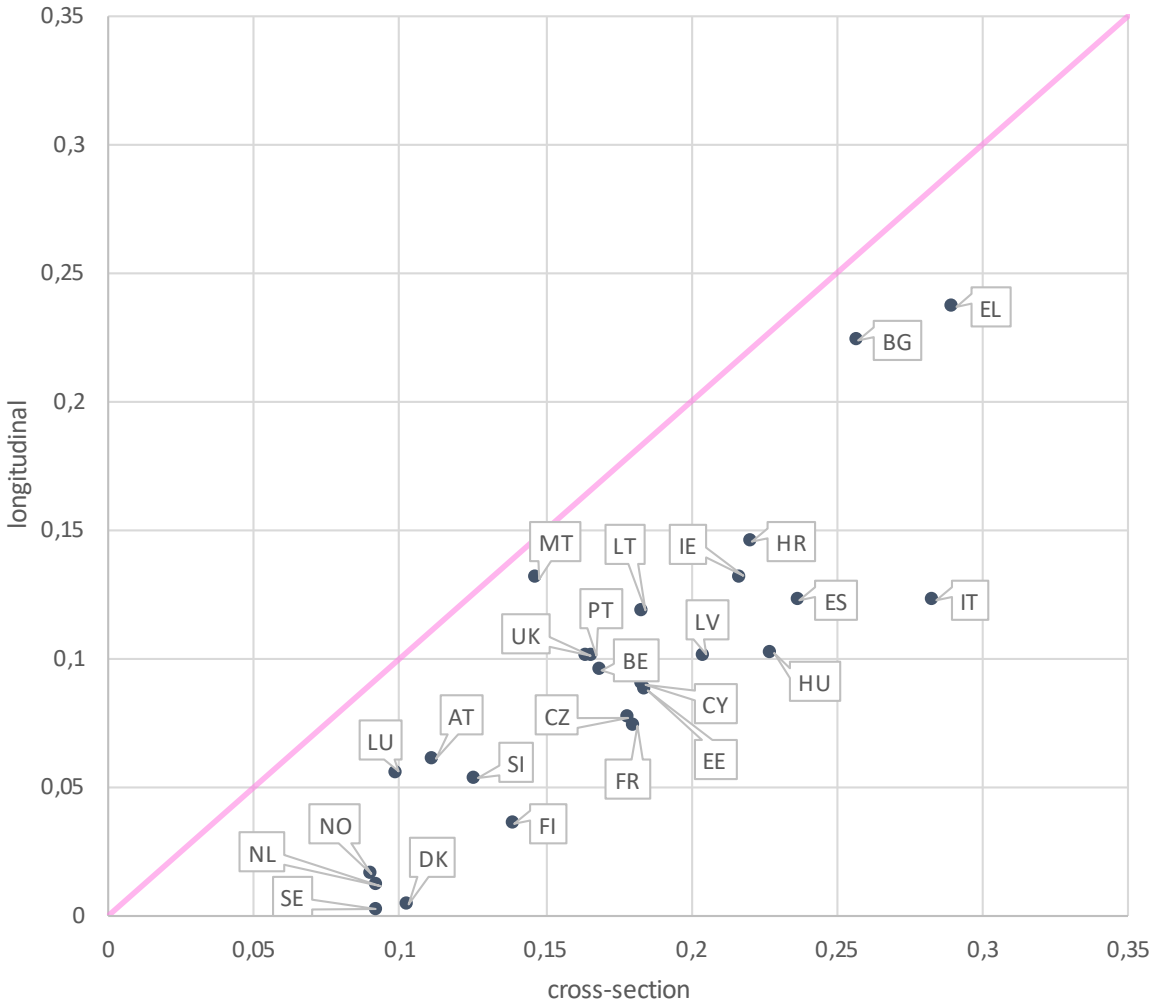
Figure 1. NEET condition by country, pooled 2008-2016 data



Source: Authors' calculation on EU-SILC

6 Referring to Contini *et al.* (2019), Appendix: "If *p* is the NEET prevalence in a specific month, under the assumption of independency over time (*i.e.*, if all individuals were hit by the same risk of being NEET at each time unit) the number of months spent as NEET is a binomial random variable *X* with *n*=48". In this case, the probability of being Always NEET is almost 0. On the opposite extreme, if we assume perfect time dependence "the probability of being long-term NEET, however defined, would be 1 for *p* individuals and 0 for the others" (*ibidem*), *i.e.*, an average value of *p* in the population.

Figure 2. NEET rates in cross-section and longitudinal calculations, averages over the observation period 2008-2016



Source: Authors' calculation on EU-SILC and Eurostat data

grows. The most notable cases are high NEET shares with high persistence – cases of Greece and Bulgaria – that point in the direction of exclusion from the labour market. Low shares with low persistence – Scandinavian and a few small countries – suggest that participation in the labour market is compatible with short periods of inactivity and high churning. All this would not be visible if considering only cross-sectional values.

We now move to the multivariate analysis.

6. Methodology

We consider the mentioned country features by means of a multinomial multilevel model (Hox 2010; Snijders and Bosker 1999; Bryan and Jenkins 2016a and 2016b). Our aim is to obtain the moderating effects of the country-level variables on the probability of being each kind of long-term NEET. Country features are measured over the 2003-2007 period, *i.e.*, as structural characteristics and predetermined with respect to our observation period. At the individual level we control for age, gender, and education to control for the different composition of the sample across countries along dimensions that the literature highlights as relevant in shaping the probability of being NEET for a long period of time: women, low-

educated and older youths face the highest risk of being NEET in the long run[7].

Relying on Snijder and Bosker (1999), we can write our model as follows. τ_{ic}^{k} is the linear predictor for individual i in country c to face outcome k in $K=1,2,3,4$, X_{ic} are the individual-level fixed-effect covariates, while P_c is the vector of the country-level policy of interest; v is the individual-level random error. The second random part of the model is represented by the random intercept β_0^k, which is the result of a fixed country-level intercept δ_0^k and a country-level random error u_0.

The overall variance structure is therefore described by $\varepsilon=v+u_0$. The main distributional hypothesis for our variance structure is that

$\begin{pmatrix} v \\ u_0 \end{pmatrix} \sim N\left(\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \Sigma & 0 \\ 0 & \Omega \end{pmatrix}\right)$, $\Sigma=\sigma^2 I$ and Ω a symmetric block matrix with diagonal country-specific variance-covariance blocks and null non-diagonal blocks. The notation highlights that individual-level errors are assumed homoscedastic, *i.e.*, the model does not include a correlation between individual and country-level errors; and that we assume a correlation among individuals in the same country (non-null diagonal blocks in Ω).

Dropping the "ic" subscript to enhance readability, we have, for each individual:

$$\tau^k=\beta_0^k+\beta_1^k X+\beta_2^k P_c+v \qquad \beta_0^k=\delta_0^k+u_0,\ \varepsilon=v+u_0 \qquad (1)$$

The reduced form is therefore, for each k:

$$\tau^k=\delta_0^k+\beta_1^k X+\beta_2^k P_c+\varepsilon \qquad (2)$$

In order to obtain the conditional probability of belonging to the category of interest, we perform the multinomial logistic transformation:

$$P(Y_i=k)=\frac{exp\,\tau_{ic}^{(k)}}{1+\sum_{i=2}^{4} exp\,\tau_{ic}^{(i)}} \qquad (3)$$

Imposing category $i = 1$ as contrast, we obtain the relative risk form, which bears advantages in the ease of interpretation of the estimates:

$$P(Y_i=k)=\frac{exp\left\{\tau_{ic}^{(k)}\right\}}{1+\sum_{i=2}^{4} exp\left\{\tau_{ic}^{(i)}\right\}}=\frac{1}{1+\sum_{i=2}^{4} exp\left\{\tau_{ic}^{(i)}\right\}}=exp\left\{\tau_{ic}^{(k)}\right\} \qquad (4)$$

The main issue we encounter for the correct estimation of standard errors is the small number of groups *(i.e.*, EU countries) in our analysis. The problem is typical of the use of EU-SILC data and lies in the fact that the small number of groups can induce underestimation of regression coefficients, of their standard errors and of the variance-covariance matrix (Bryan and Jenkins 2016a; 2016b). Bryan and Jenkins (2016a, 2016b) identify 30 as the minimum number of groups necessary to obtain reliable estimates of country effects in a multilevel analysis with a multinomial logit link. Virtually the EU-SILC coverage of 31 countries may not pose problems but waves-availability, missing observations and reliability induce us to restrict the sample to 25 countries. To face this issue, we provide bootstrapped results (Appendix 2), along with several tests and robustness checks.

7. Results

In this section, we present the results of the multilevel analysis. The estimation is carried out via a full information maximum likelihood (FIML), provided by the structural equation *gsem* command in Stata[8].

Table 3 reports the relative risk ratio – eq. [4] – for the categories of *One Long*, *Frequent* and *Always* NEET, contrasted to the reference category *Never* NEET, and it includes results for the four macro conditions – included in turns. Unfortunately, the numerosity of the groups does not allow us to include the four context variables together, for lack of degrees of freedom.

The likelihood ratio test between the model with full specification at the individual and country-level covariates – usually called an 'augmented model' in

7 We acknowledge the importance of family background in explaining the different NEET trajectories, as widely presented in the literature. However, our analysis does not include it in the econometric model. Unfortunately, the EU-SILC database does not allow checking for family background for all those who no longer reside with their parents. For example, the case of mothers with care responsibilities would remain as missing data. As the family background is correlated to youths' education, as the literature on intergenerational transmission highlights, we reckoned it better not to select the sample and to rely on the controls available for all individuals in the survey.

8 All the estimates are performed without using population weights. Given the relevance that rare events have in analysis of this phenomenon using survey data, we prefer to avoid their use.

the literature – and a model with full individual level specification and no covariates at the country level – the 'constrained model' – reveals that the country level fixed effects covariates are improving the model by reducing the deviance of the likelihood for all the considered policies (Appendix 4 for detailed results).

In what follows, we focus mainly on the probability of being *Frequent NEET* and *Always NEET*, the two most frequent and most typical situations of churning and detachment. About the fixed part of the model concerning individual characteristics, our estimates confirm what is already known and documented in the literature. As expected, women face a higher probability to be NEET for a long period of time with respect to men. 'Elder' youths face a higher risk of being long-term NEET as well, and more so in the case of *Always NEET.* The increasing risk of long-term NEET status as individuals age indicates a worrying

Table 3. Random Intercept model. Upper section for fixed effects, lower section for random parts. Model with country-level characteristics[α]

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	One Long	Frequent	Always	One Long	Frequent	Always	One Long	Frequent	Always	One Long	Frequent	Always
[21-22]	0.638***	1.146***	1.713***	0.513***	1.066	1.716***	0.586***	1.142***	1.768***	0.569***	1.173***	1.901***
	(0.0623)	(0.0520)	(0.116)	(0.0566)	(0.0556)	(0.140)	(0.0557)	(0.0533)	(0.120)	(0.0544)	(0.0525)	(0.124)
[23-24]	0.861	1.290***	2.438***	0.729***	1.250***	2.393***	0.768***	1.289***	2.578***	0.778***	1.333***	2.690***
	(0.0814)	(0.0595)	(0.162)	(0.0770)	(0.0659)	(0.193)	(0.0709)	(0.0612)	(0.170)	(0.0721)	(0.0607)	(0.172)
[25-26]	1.051	1.472***	2.780***	0.865	1.342***	2.833***	0.999	1.457***	2.964***	0.940	1.500***	3.100***
	(0.0977)	(0.0680)	(0.186)	(0.0894)	(0.0706)	(0.225)	(0.0897)	(0.0694)	(0.197)	(0.0856)	(0.0685)	(0.200)
[27-28]	0.819**	1.320***	3.028***	0.686***	1.259***	2.914***	0.760***	1.312***	3.227***	0.743***	1.360***	3.345***
	(0.0790)	(0.0612)	(0.197)	(0.0736)	(0.0662)	(0.228)	(0.0713)	(0.0628)	(0.208)	(0.0704)	(0.0624)	(0.210)
[29]	0.849*	1.266***	2.845***	0.712***	1.117**	2.961***	0.795**	1.252***	3.032***	0.759***	1.288***	3.172***
	(0.0795)	(0.0580)	(0.185)	(0.0736)	(0.0585)	(0.228)	(0.0721)	(0.0592)	(0.196)	(0.0698)	(0.0584)	(0.198)
Female	1.510***	1.554***	2.578***	1.361***	1.432***	2.276***	1.491***	1.554***	2.660***	1.481***	1.552***	2.606***
	(0.0829)	(0.0389)	(0.0850)	(0.0844)	(0.0411)	(0.0879)	(0.0829)	(0.0397)	(0.0898)	(0.0809)	(0.0389)	(0.0859)
Secondary education	0.314***	0.410***	0.169***	0.301***	0.430***	0.207***	0.316***	0.392***	0.171***	0.288***	0.415***	0.174***
	(0.0216)	(0.0138)	(0.00647)	(0.0234)	(0.0167)	(0.00953)	(0.0212)	(0.0137)	(0.00672)	(0.0196)	(0.0139)	(0.00663)
Tertiary education	0.212***	0.222***	0.0384***	0.204***	0.242***	0.0474***	0.217***	0.209***	0.0390***	0.199***	0.223***	0.0396***
	(0.0166)	(0.00845)	(0.00206)	(0.0178)	(0.0105)	(0.00295)	(0.0169)	(0.00821)	(0.00213)	(0.0154)	(0.00849)	(0.00212)
GDP growth §	0.616***	0.814***	0.712***									
	(0.0531)	(0.0367)	(0.0530)									
Share of temporary workers §				0.869***	0.934***	0.881***						
				(0.0245)	(0.0135)	(0.0222)						
Family and child support/GDP †							0.876***	0.943***	0.901***			
							(0.00815)	(0.00666)	(0.00835)			
Training/GDP ‡										0.894***	0.948***	0.907***
										(0.0160)	(0.00881)	(0.0124)
Random part												
Random intercept	2.718	1.691***	2.388***	2.718	1.670***	2.455***	2.718	2.269***	2.902***	2.718	1.688***	2.155***
	(0)	(0.0355)	(0.0796)	(0)	(0.0385)	(0.0923)	(0)	(0.117)	(0.203)	(0)	(0.0373)	(0.0700)
Variance			47.26***			35.41***			2.070***			25.08***
			(53.30)			(42.38)			(0.474)			(23.73)
pseudo R2			.0009			.2460			.0369			.0013
Observations	56,489	56,489	56,489	43,929	43,929	43,929	55,019	55,019	55,019	56,489	56,489	56,489

[α] GDP growth (cols. 1-3), share of temporary workers on total number of employed (cols. 4-6), family and child support policies expenditure, share of GDP (cols. 7-9) and training public expenditure as share of GDP (cols. 10-12). Benchmark 19-20 male low-educated individual. Pooled 2008-2016 data
Notes: seEform in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Pseudo-R2 uses the baseline model as benchmark. Measurement units: § percentage points ; † tenths of percentage point ; ‡ hundredths of percentage points.

Source: Authors' calculation on EU-SILC, DG Employment and Social Affaires, Eurostat and IMF data

bifurcation at a young age between a problematic and a non-problematic pattern toward adulthood. Education maintains a protective role from the most severe cases of persistence in the NEET state; furthermore, tertiary education is more effective than secondary education in reducing the probability of being NEET.

Moving now to comment on the hypotheses spelled out in section 2, we can observe an overall trend for all the contextual and policy variables: *i.e.*, the stronger effect they bear on the *Always NEET* trajectory with respect to the *Frequent NEET* one. This result seems to indicate that *Frequent NEETs* are less sensitive to the policies and country features. Furthermore, the relative probability of experiencing *One long NEET* spell is even more sensitive to the contextual and policy variables; although a tiny group, it displays a larger margin for policy interventions.

Considering the macro variables in detail, we can see that a 1 p.p. higher GDP growth rate experienced by the country in the 2003-2007 period is related to a decrease in the relative probability of belonging to all the long NEET categories. The estimated relative risk is 0.712 in the case of *Always NEET*, 0.814 in the case of *Frequent NEETs* and 0.616 in the case of *One long NEET;* a set of sizable decreases. Our first hypothesis referred to a reduction in the probability of experiencing a long-term NEET spell in countries where GDP growth had been higher, and it is consistent with the empirical results.

A milder effect[9] is observed linked to a 1 p.p. higher share of temporary workers in the country in the 2003-2007 period. The estimated relative risk is 0.881 in the case of *Always NEET*, 0.934 in the case of *Frequent NEETs* and 0.869 in the case of *One long NEET*, indicating that a more flexible labour market is compatible with a lower probability of being NEET[10]. Our second hypothesis was a reduction in the probability of experiencing a long-term NEET spell in countries where more temporary contracts are available, as the estimated relative risks in the case of *Always NEET* and of *One long NEET* spell confirms. We also expected more mixed results in the case of *Frequent NEET* spells, as the probability of churning in and out of the NEET condition for a long time might be higher if the trapping effect prevails, while it could be lower if the stepping stone effect prevails on average across countries; consistently, the estimated relative risk, although significantly lower than 1, is closer to 1 with respect to the other two relative risks estimates in the model.

A comparable effect emerges for a 0.1 p.p. higher expenditure for policies that support family and childcare in the country in the 2003-2007 period. The estimated relative risk is 0.901 in the case of *Always NEET*, 0.943 in the case of *Frequent NEETs* and 0.876 in the case of *One long NEET* spell. The third hypothesis about a reduction in the probability of experiencing a long-term NEET spell in countries where spending on family and children policies is higher is again consistent with the estimates.

Finally, a 0.01 higher expenditure for training[11] in the country in the 2003-2007 period is linked to a relative risk of 0.907 in the case of *Always NEET*, 0.948 in the case of *Frequent NEETs* and 0.894 in the case of *One long NEET* spell. Hence our fourth and last hypothesis of a reduction in the probability of experiencing a long-term NEET spell in countries where spending in ALMP policies is higher is confirmed by the empirical results.

Overall, results are consistent with expectations, in a multi-country context and as a result of an econometric technique that considers variability both at the individual and at the country level.

A few robustness checks are in order. We run a robustness check applying a bootstrap technique, as suggested by Hox (2010) and Bryan and Jenkins (2016a, 2016b) to address the issue of a small number of countries in our sample. We impose a bootstrap stratified at the country level to preserve the cluster structure of the data-generating process and we implement it with full-size re-sampling and 50 repetitions. Again, results are robust to such manipulations (see Appendix 2).

The between-country level variance shows sizable

9 We acknowledge that comparing the magnitude of the effects of each Pc is a slippery exercise, as their average is different and every attempt at normalization, including ours, is arbitrary. Moreover, we are not interpreting our results in a strictly causal sense, but as links between country features in the pre-crisis years and youth economic performance afterwards.

10 The improvement in the explained variance compared to the baseline model, highlighted by the pseudo-R2, suggests that this contextual variable plays an economically significant role in explaining the phenomenon. The contribution of other contextual variables is much more limited but the lack of degrees of freedom does not allow us to evaluate simultaneously more than one and to understand interplays and relative relevance for the studied phenomena. See Appendix 3 for a discussion of the meaning of pseudo-R2 in this context.

11 The measurement unit is chosen according to the average dimension of each characteristic in the period of observation.

differences across models. Rare events may contribute to generating such outcomes. Indeed, some countries – Denmark, Ireland, Malta, The Netherlands, Norway, and Sweden – display few cases of some outcomes. We run the baseline specification on the subsample excluding these countries, and we obtain point estimates of the same magnitude and the same statistical significance but with a greatly reduced variance compared to the full-sample model. See Appendix 5 for the estimated results of the group-level jack-knife procedure.

Conclusions

Over the last twenty years and especially in the years of the financial crisis, youth transitions to adulthood and work have been going through complex changes. The NEET (Not in Employment Education or Training) concept has been widely diffused to represent the condition of difficulty of the younger generations both in the public and academic discourse. Though in the former it has become largely popular, in the latter it has been debated for its conceptual and analytical efficacy, as we discuss in the initial sections of the present work.

We contribute to the current literature by applying a longitudinal approach based on the persistence of the NEET status. This approach has three main values. First, it allows us to distinguish among the various groups that constitute the category. Secondly analysing the duration of the permanence in the condition makes it possible to single out two groups of long-term NEETs, *i.e.,* those churning between employment and non-employment, and those persistently detached from activity. Third, more generally, the longitudinal approach allows for an accurate picture of the severity of the NEET phenomenon in each country.

One of the most interesting results emerging both in the literature and in our work is that from both cross-sectional and longitudinal analyses it is always women and the less educated who face the greatest disadvantage. Thus, the composition of NEETs is more frequently made up of less educated, women who are also more often long-term NEETs. In contrast, men and those with higher educational qualifications are, according to the longitudinal perspective, NEETs for shorter periods of time.

Regarding the role of country level policies and features of the labour market, our results showed that the NEET phenomenon seems to be mitigated by generous conciliation and training policies, by the presence of temporary contracts and, mostly, by a substantial GDP growth. Demand side policies are of high importance also given the large amount of involuntary unemployed among the NEETs, both men and women. We find that aggregate GDP growth can be a driver for reducing the probability of a young person being a NEET if, *ceteris paribus*, s/he has a more resilient condition, *i.e.*, experienced a long spell or a high number of spells in employment, education, or training in the period of observation. On the contrary, family support policies are relatively more effective on less resilient individuals. These findings are consistent with the argument for which there is a hierarchy of policies to support people to exit from the NEET condition: lower-level activation policies, such as family-support ones, that increase the participants to the labour market or to education at the extensive margin and market-based policies that increase the intensive margin and work best for more resilient NEET individuals. Conversely, lacking activation policies makes market and incentive-based policies not effective for the most fragile sub-population.

To sum up, our result can contribute to a better understanding of who NEETs are and to a better monitoring of policy offers, making it possible to check whether they are well tailored to the NEET population and effective. Consistently with the Eurofound (2016) recommendations, it is necessary to reduce the NEET rate to ensure that all young people receive a good-quality offer of employment, continued education, an apprenticeship, or a traineeship within a few months of becoming unemployed or leaving formal education. Adopting a longitudinal perspective, it clearly emerges that some young people – more frequently men – are at risk of being trapped in paths where periods of employment and unemployment alternate. Other young people – often women with low educational qualifications – are more likely to be completely disconnected from the labour market. Specific measures can be offered according to the persistence in the NEET status, in order to offer the support most suited to their needs to each young person – whether work, education or training.

Appendix

1. Country-level policies and characteristics

The variables used for the country-level analysis are retrieved from multiple sources.

The *Cross-section measure of NEETs [edat_lfse_20]*, for the age interval [20-34] and the time interval 2008-2016, is produced through the national Labour Force Surveys and provided by Eurostat.

The real GDP growth rate yearly time series is obtained from the IMF *Real GDP growth, annual percent change [NGDP_RPCH]* – from which we derive the average GDP growth rate over the 2003-2007 period. The GDP growth rate is a proxy of the dynamic of aggregate demand.

The same averaging procedure is applied to the share of temporary workers – variable *Temporary employees as percentage of the total number of employees, by sex, age and country of birth (%) [lfsa_etpgacob])* – and to the expenditure for family and children policies expressed as a share of GDP – variable *Expenditure: main results [spr_exp_sum]* – both drawn from the Eurostat database.

The last variable considered is public expenditure in training, share of GDP [*LMP_EXPSUMM$TPS00077*] that is available through the DG employment, social affairs and inclusion data warehouse.

Table 2 in the main text summarises the availability and magnitude of information by country.

2. Stratified Bootstrap

Table A1. Random intercept – stratified bootstrap at country level

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
VARIABLES	One Long	Frequent	Always	One Long	Frequent	Always	One Long	Frequent	Always	One Long	Frequent	Always
[21-22]	0.638***	1.146***	1.713***	0.513***	1.066	1.716***	0.586***	1.142***	1.768***	0.569***	1.173***	1.901***
	(0.0537)	(0.0556)	(0.130)	(0.0567)	(0.0533)	(0.123)	(0.0472)	(0.0522)	(0.141)	(0.0478)	(0.0491)	(0.117)
[23-24]	0.861*	1.290***	2.438***	0.729***	1.250***	2.393***	0.768***	1.289***	2.578***	0.778***	1.333***	2.690***
	(0.0685)	(0.0588)	(0.171)	(0.0725)	(0.0607)	(0.151)	(0.0694)	(0.0583)	(0.189)	(0.0607)	(0.0550)	(0.157)
[25-26]	1.051	1.472***	2.780***	0.865	1.342***	2.833***	0.999	1.457***	2.964***	0.940	1.500***	3.100***
	(0.0863)	(0.0682)	(0.230)	(0.0879)	(0.0538)	(0.196)	(0.0746)	(0.0736)	(0.220)	(0.0807)	(0.0758)	(0.167)
[27-28]	0.819**	1.320***	3.028***	0.686***	1.259***	2.914***	0.760***	1.312***	3.227***	0.743***	1.360***	3.345***
	(0.0763)	(0.0639)	(0.204)	(0.0755)	(0.0731)	(0.207)	(0.0642)	(0.0633)	(0.250)	(0.0713)	(0.0600)	(0.200)
[29]	0.849**	1.266***	2.845***	0.712***	1.117**	2.961***	0.795***	1.252***	3.032***	0.759***	1.288***	3.172***
	(0.0705)	(0.0509)	(0.207)	(0.0872)	(0.0594)	(0.224)	(0.0696)	(0.0603)	(0.221)	(0.0608)	(0.0452)	(0.189)
Female	1.510***	1.554***	2.578***	1.361***	1.432***	2.276***	1.491***	1.554***	2.660***	1.481***	1.552***	2.606***
	(0.0783)	(0.0333)	(0.0914)	(0.0764)	(0.0401)	(0.0933)	(0.0738)	(0.0400)	(0.102)	(0.0693)	(0.0353)	(0.0840)
Secondary education	0.314***	0.410***	0.169***	0.301***	0.430***	0.207***	0.316***	0.392***	0.171***	0.288***	0.415***	0.174***
	(0.0234)	(0.0133)	(0.00544)	(0.0215)	(0.0173)	(0.00856)	(0.0181)	(0.0136)	(0.00642)	(0.0147)	(0.0145)	(0.00615)
Tertiary education	0.212***	0.222***	0.0384***	0.204***	0.242***	0.0474***	0.217***	0.209***	0.0390***	0.199***	0.223***	0.0396***
	(0.0175)	(0.00904)	(0.00173)	(0.0166)	(0.00993)	(0.00268)	(0.0137)	(0.00867)	(0.00214)	(0.0144)	(0.00821)	(0.00235)
GDP growth §	0.616***	0.814***	0.712***									
	(0.0125)	(0.00721)	(0.0106)									
Share of temporary workers §				0.869***	0.934***	0.881***						
				(0.00591)	(0.00295)	(0.00366)						
Family and child support/ GDP †							0.876***	0.943***	0.901***			
							(0.00365)	(0.00187)	(0.00306)			
Training/ GDP ‡										0.894***	0.948***	0.907***
										(0.00337)	(0.00123)	(0.00255)
Random part												
Random intercept	2.718	1.691***	2.388***	2.718	1.670***	2.455***	2.718	2.269***	2.902***	2.718	1.688***	2.155***
	(0)	(0.0342)	(0.0800)	(0)	(0.0369)	(0.0868)	(0)	(0.0867)	(0.205)	(0)	(0.0402)	(0.0670)
Variance			47.26***			35.41***			2.070***			25.08***
			(12.69)			(10.71)			(0.189)			(6.452)
pseudo R2												
Observations	56,489	56,489	56,489	43,929	43,929	43,929	55,019	55,019	55,019	56,489	56,489	56,489

Notes: seEform in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Pseudo-R2 uses the baseline model as benchmark.
Measurement units: § percentage points ; † tenths of percentage point ; ‡ hundredths of percentage points.

Source: Authors' calculation on EU-SILC, DG Employment and Social Affaires, Eurostat and IMF data

3. Pseudo-R2

In regressions with categorical dependent variables, pseudo-R2 measures are used to evaluate the goodness of fit. We reported pseudo-R2 calculated with the measure by MacFadden (1974). Being ll_{full} the Log-likelihood in the full model with regressors and ll_{null} the log-likelihood in the benchmark model without regressors,

$$pseudoR^2 = 1 - \frac{ll_{full}}{ll_{null}}$$

In the case of the ordinary least squares, the interpretation of R^2 as a measure of goodness of fit is straightforward, as it represents the share of explained variance over the total variance. In the case of log-likelihood pseudo R^2 the measure describes the improvement of the model likelihood compared to the null model, used as a benchmark. We present the measure using the baseline specification as a benchmark so that the measure focuses on the contribution of the country-level predictors to the explained variance.

Tables A2 and A3 in par. 3 of the Appendix provide additional detail on the improvements of deviance given different benchmark models. In any case, the interpretation of pseudo R^2 must proceed with care. As is the case in any regression analysis, the introduction of new predictors always improves the amount of explained variance[12].

4. Likelihood Ratio Test

The Likelihood Ratio Test (LRT) is built to compare the deviances of two nested models and test whether once a baseline model (Constrained Model, CM) is augmented by means of additional covariates (Augmented Model, AM) the deviance of the latter statistically differs from the deviance of the former, *i.e.*, the difference between the deviances is statistically different from 0 – which constitutes the alternative hypothesis of the test, H1. Being L_{CM} and L_{AM} the likelihoods for the constrained and augmented models respectively, the test statistics is:

$-2ln(L_{CM}\text{-}L_{AM})\sim\chi\text{^}2\ (df_{CM}\text{-}df_{AM})$

In our case, being X a vector of sociodemographic characteristics (gender dummy, biannual age classes dummies, highest educational attainment dummy) and τ^k the linear predictor for each trajectory, we compare the reduced-form multilevel multinomial logit Constrained Model:

$\tau^k=\delta_0^k+\beta_1^k X+u$

with the reduced-form multilevel multinomial logit Augmented Model, that features the single additional covariate at the country level – in turns GDP growth, Temporary contract share, Family and child support policies/GDP, Training/GDP:

$\tau^k=\delta_0^k+\beta_1^k X+\beta_2^k P_c+\varepsilon$

Since we add a single variable, $df_{CM}\text{-}df_{AM}=1$.

The results of the LRT (Table A2) show that for all four country-level covariates the null

Table A2. Likelihood Ratio Test between the Constrained models (CM) – with gender dummy, biannual age classes dummies, educational attainment dummies – and the Augmented Model (AM), for the country level covariates (GDP growth, Temporary contract share, Family and child support policies/GDP, Training/GDP)

Likelihood-ratio test	LR chi2(1)	=	75.66
(Assumption: CMgdp nested in AMgdp)	Prob > chi2	=	0.0000
Likelihood-ratio test	LR chi2(1)	=	21.42
(Assumption: CMtempshare nested in AMtempshare)	Prob > chi2	=	0.0001
Likelihood-ratio test	LR chi2(1)	=	184.20
(Assumption: CMfamilychild nested in AMfamilychild)	Prob > chi2	=	0.0000
Likelihood-ratio test	LR chi2(1)	=	112.22
(Assumption: CMtraining nested in AMtraining)	Prob > chi2	=	0.0000

Source: Authors' calculation on EU-SILC, DG Employment and Social Affaires, Eurostat and IMF data

12 For a comparison of existing measures of goodness of fit in categorical dependent variable models, also discussing the role of small samples, see Hemmert *et al.* (2018) while LaHuis *et al.* (2014) discuss measures of explained variance in multilevel models.

Table A3. LRT between the Constrained models (CM) – with gender dummy, biannual age classes dummies, educational attainment dummies and country-level covariates (GDP growth, Temporary contract share, Family and child support policies/GDP, Training/GDP) – and the Augmented Model (AM), with additional random intercept

Likelihood-ratio test	LR chi2(1) = 4744.74
(Assumption: CMgdp nested in AMgdp)	Prob > chi2 = 0.0000
Likelihood-ratio test	LR chi2(1) = 3880.97
(Assumption: CMtempshare nested in AMtempshare)	Prob > chi2 = 0.0000
Likelihood-ratio test	LR chi2(1) = 2659.35
(Assumption: CMfamilychild nested in AMfamilychild)	Prob > chi2 = 0.0000
Likelihood-ratio test	LR chi2(1) = 4168.91
(Assumption: CMtraining nested in AMtraining)	Prob > chi2 = 0.0000

Source: Authors' calculation on EU-SILC, DG Employment and Social Affaires, Eurostat and IMF data

hypothesis is rejected, implying that the addition of such covariates significantly decreases the deviance of the model and improves the model approximation.

Analogously, we run an LRT on the comparison between a constrained model with a full specification – featuring socio-demographic characteristics and the policies, introduced in turns – without random intercept and the same model augmented with the random intercept. Results are reported in Table A3, and support the alternative hypothesis that the introduction of the random intercept improves the model approximation for all the specifications.

5. Between-country variance: the role of rare events

We study the role that single countries and sub-groups of countries can play in affecting the between-country variance and estimates in our model.

As we can see in Table A4, in all countries the majority of individuals belong to the *Never NEET* group (from 50.8% in Greece to 96.5% in the Netherlands), followed by *Frequent NEET* (from 2.2% to 22.7%), *Always NEET* (from 0.2% to 23.7%) and *One Long NEET* (from 0 to 5.6%).

Notice that Denmark, The Netherlands, Norway and Sweden display a number of scarcely populated groups, *i.e.*, which represent less than 1% of the total. Rare events can be problematic in the estimation of discrete choice models (King and Zeng 2001). Therefore, here we estimate again the random-intercept model including individual-level covariates but excluding country-level ones for simplicity, on the sub-sample of countries that have at least 1% of their observation in all the categories.

Table A5 reports the resulting estimates, compared to the base (full sample) estimates. We obtain results that are in line in the two subsamples, concerning magnitude, relative magnitude among outcomes in the same specification and statistical significance. Variance is the largely affected part of the estimates, with a drop from 4,039 in the full-sample estimates to 157.2 in the reduced-sample ones. Therefore, it seems that rare events are not affecting our model but the between-country variance. The result extends to the full model including P_c (estimates available upon request).

Table A4. Count of individuals by type of NEET group and country

	Never NEET		One Long NEET		Frequent NEET		Always NEET		Total
country	Absolute	Relative	Absolute	Relative	Absolute	Relative	Absolute	Relative	Absolute
AT	1,194	77.6%	25	1.6%	226	14.7%	93	6.0%	1,538
BE	1,269	78.6%	25	1.5%	166	10.3%	154	9.5%	1,614
BG	1,560	58.8%	78	2.9%	421	15.9%	592	22.3%	2,651
CY	1,526	69.0%	62	2.8%	424	19.2%	199	9.0%	2,211
CZ	2,243	78.0%	55	1.9%	355	12.4%	221	7.7%	2,874
DK	530	94.8%	1	0.2%	26	4.7%	2	0.4%	559
EE	1,538	69.3%	64	2.9%	424	19.1%	194	8.7%	2,220
EL	1,069	50.4%	119	5.6%	432	20.4%	502	23.7%	2,122
ES	2,388	63.8%	137	3.7%	761	20.3%	458	12.2%	3,744
FI	2,170	83.6%	29	1.1%	307	11.8%	91	3.5%	2,597
FR	5,249	74.3%	134	1.9%	1,160	16.4%	522	7.4%	7,065
HR	920	62.4%	51	3.5%	289	19.6%	214	14.5%	1,474
HU	2,172	68.0%	57	1.8%	641	20.1%	325	10.2%	3,195
IE	336	61.4%	15	2.7%	124	22.7%	72	13.2%	547
IT	2,958	65.6%	222	4.9%	777	17.2%	553	12.3%	4,510
LT	950	71.4%	31	2.3%	192	14.4%	157	11.8%	1,330
LU	1,480	82.9%	18	1.0%	189	10.6%	99	5.5%	1,786
LV	1,160	65.8%	68	3.9%	356	20.2%	178	10.1%	1,762
MT	1,339	80.6%	17	1.0%	88	5.3%	217	13.1%	1,661
NL	1,893	96.5%	3	0.2%	44	2.2%	22	1.1%	1,962
NO	1,364	91.9%	11	0.7%	86	5.8%	24	1.6%	1,485
PT	1,407	70.5%	77	3.9%	311	15.6%	201	10.1%	1,996
SE	970	93.7%	0	0.0%	63	6.1%	2	0.2%	1,035
SI	3,108	80.9%	77	2.0%	454	11.8%	205	5.3%	3,844
UK	1,199	77.6%	32	2.1%	159	10.3%	156	10.1%	1,546
Total	**41,992**	**73.2%**	**1,408**	**2.5%**	**8,475**	**14.8%**	**5,453**	**9.5%**	**57,328**

Source: Authors' calculation on EU-SILC data

Table A5. Random intercept with individual level covariates only: full-sample model (cols. 1-3) in comparison with partial sample model, excluding Denmark, Ireland, The Netherlands, Sweden (cols. 4-6)

	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline model			Excluding DK, NL, NO, SE		
VARIABLES	One Long	Frequent	Always	One Long	Frequent	Always
[21-22]	0.562***	1.181***	1.844***	0.569***	1.168***	1.832***
	(0.0536)	(0.0523)	(0.122)	(0.0551)	(0.0530)	(0.123)
[23-24]	0.763***	1.328***	2.618***	0.772***	1.312***	2.613***
	(0.0704)	(0.0601)	(0.170)	(0.0725)	(0.0610)	(0.172)
[25-26]	0.928	1.516***	2.989***	0.937	1.490***	2.931***
	(0.0842)	(0.0685)	(0.195)	(0.0864)	(0.0691)	(0.195)
[27-28]	0.728***	1.358***	3.247***	0.739***	1.343***	3.230***
	(0.0688)	(0.0618)	(0.206)	(0.0709)	(0.0629)	(0.208)
[29]	0.750***	1.303***	3.058***	0.764***	1.298***	3.030***
	(0.0686)	(0.0585)	(0.194)	(0.0709)	(0.0597)	(0.195)
Female	1.480***	1.558***	2.588***	1.473***	1.552***	2.593***
	(0.0807)	(0.0390)	(0.0854)	(0.0810)	(0.0395)	(0.0862)
Secondary education	0.286***	0.419***	0.172***	0.289***	0.417***	0.171***
	(0.0193)	(0.0138)	(0.00657)	(0.0198)	(0.0140)	(0.00660)
Tertiary education	0.198***	0.226***	0.0391***	0.201***	0.228***	0.0395***
	(0.0153)	(0.00852)	(0.00210)	(0.0156)	(0.00877)	(0.00213)
Random part						
C1[country]	2718	1.652***	2.302***	2718	1.631***	2.265***
	0	(0.0323)	(0.0717)	0	(0.0338)	(0.0736)
var(C1[country])			4,039***			157.2***
			(9.786)			(253.3)
pseudo-R2			0			.0284
Observations	56,489	56,489	56,489	51,523	51,523	51,523

Notes: seEform in parentheses; *** p<0.01, ** p<0.05, * p<0.1. Pseudo-R2 uses the baseline model as benchmark.
Source: Authors' calculation on EU-SILC data

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