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The role of tax-benefit systems in shaping economic insecurity in the European Union

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Abstract

We investigate to what extent differences in individuals' characteristics and country-specific variables can explain economic insecurity levels in the European Union. For the measurement of insecurity, we use an individual multidimensional index proposed in Romaguera-de-la-Cruz (2020), which includes objective and subjective dimensions and we use multilevel modelling techniques to consider the micro and macro dimensions of economic insecurity simultaneously. To measure the role of the tax-benefit system in reducing insecurity we focus on how differences in social protection expenditure and personal tax revenues explains insecurity disparities among countries. We also study the specific role of particular social protection policies to identify which of them have a higher impact on the level of economic insecurity by household type, exploring if there are significant differences in their alleviating role for households with and without dependent children. Countries with larger tax-benefit systems provide social insurance to individuals, resulting in a lower level of economic insecurity. Both means- and non-means tested benefits are associated with less insecurity, although the effect is mainly due to health expenditure, old-age pensions, unemployment and social exclusion benefits.

Keywords: economic insecurity, multidimensional index, social transfers, multilevel modelling.

JEL codes: D63, I39

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1. Introduction

In the last decade, economic insecurity has revealed itself as one of the main threats to individual's well-being (Stiglitz, Sen and Fitoussi, 2009). This phenomenon, understood as the uncertainty about future economic hazards and the impossibility to recover from them (D'Ambrosio and Rohde, 2014; Hacker et al., 2014; Osberg, 1998; Osberg and Sharpe, 2005; Rohde and Tang, 2018), has increased as a consequence of the Great Recession. The rise in inequality and poverty in several European countries, as well as more precariousness in the labour market and a reduction in public expenditure –due to the austerity measures adopted to reduce countries' fiscal deficits– have worsened individuals' expectations about their financial situation in the near future. We must highlight that this economic insecurity may have relevant impacts in the short term, through a reduction in consumption and household investment which may have macroeconomic effects, as well as in the medium term, affecting labour market, fertility or political decisions beside causing a deterioration of physical and mental health (Bossert et al., 2020; Smith, Stoddard and Barnes, 2009; Modena et al., 2014; Rohde et al., 2016). Furthermore, present economic insecurity might cause a reduction of future generations' well-being: individuals who believe they will experience an economic distress in a foreseeable future may save and reduce investment in their children's education to cope with this negative expectation.

Economic insecurity is a dynamic phenomenon, which captures the belief of an economic risk's materialization, focusing on possible changes in economic status rather than current financial strain. It is well known that one of the functions of modern welfare states in Europe is social insurance: public policy should provide security by reducing the risk of several hazards or by shifting the risk relocating the costs of an adverse event from one economic agent to another (Western et al., 2012). Many papers have shown that the characteristics of the tax-benefit system in a given country play a crucial role in shaping its income distribution and thus its level of inequality, poverty and intra and intergenerational mobility smoothing the impact of the economic cycle (Gottschalk and Joyce, 1998; Esping-Andersen and Myles, 2011; Van Kerm and Pi Alperin, 2013). Moreover, differences in poverty and material deprivation among countries can be explained by disparities in their welfare systems (Bárcena-Martín et al., 2014; Bárcena-Martín et al., 2018). Nevertheless, there is no previous work studying the relationship between countries' welfare state and their level of economic insecurity.

Our main purpose in this paper is to assess if economic insecurity can be explained by differences in European countries' tax-benefit systems beyond the effect of individual sociodemographic characteristics. To this end, we construct a multidimensional economic insecurity index proposed in Romaguera-de-la-Cruz (2019), which follows Rohde et al.'s (2015) proposal on dimensions. This method considers insecurity as a latent variable with an important psychological component and it is referred to future states; hence, this index incorporates both subjective and objective indicators in which we believe insecurity reveals itself. As subjective dimensions we consider the household's inability to face unexpected expenses, a measure of financial dissatisfaction and changes in the ability to go on a holiday. On the other hand, we include large income drops, unemployment risk and a probability of extreme expenditure distress as objective dimensions. Although we compute this economic insecurity index at an individual level, we adopt a household perspective, due to the possibility of risk pooling and economies of scale and as we believe an individual's well-being can be shaped by the situation of another household member. Once we have computed our insecurity dimensions, we aggregate them by using the counting approach method: we count the number of indicators in which an individual does not lack security weighting these dimensions by the country's population not affected in each one of them (EI_i). These frequency weights enable us to adopt our insecurity index to a given society and they can be considered as objective indicators of subjective feelings of insecurity.

After calculating the individual economic insecurity index for 29 European countries, we explore the effect of countries' social protection generosity on this phenomenon. We focus our analysis on 2015, as we would like to study tax-benefits systems in a period without an economic downturn, when automatic stabilizers may play an important role. To determine which factors may cause economic insecurity, we explore the effect of micro and macro variables on economic insecurity making use of multilevel modelling techniques. Being young, low educated and unemployed has a positive effect on economic insecurity, while owning a house and being in a multigenerational household reduces our insecurity index. At a macro level, those countries with a larger Gross Domestic Product (GDP) with respect to EU-28 average show a lower level of insecurity, whereas unemployment rate increases our index. Regarding the tax-benefit system impact, a higher country's social protection expenditure as a percentage of GDP as well as a larger personal tax revenue have a negative impact on economic insecurity, meaning

that a more generous welfare state helps mitigate uncertainty about future economic losses. Both means and non-means tested benefits as a percentage of GDP reduce economic insecurity as well as cash and in-kind benefits. When looking at the impact of social protection functions separately, we find a significant negative effect of health expenditure, survivors and old age pensions, unemployment benefits and social exclusion benefits.

Furthermore, it is interesting to study if a more generous social protection system mitigates insecurity for some vulnerable groups in the population. In this paper we focus on households with dependent children. The presence of dependent children in the household supposes higher expenditure that can exacerbate economic distress. Likewise, current economic insecurity can have a negative impact on children's development: if their parents expect a future financial hardship, they will reduce investment in children's needs and education leading to a lower well-being in adult life. When analysing cross-country comparisons, we find that higher levels of social protection expenditure have a negative impact for households with children, thus a more generous tax-benefit system is reducing more economic insecurity for those households where at least a child is present beyond the negative impact for all population.

This paper has the following structure: Section 2 presents a review of previous research on the insurance component of progressive taxation as well as the impact of tax-benefit systems on some well-being dimensions. Section 3 describes the data source, our economic insecurity measure and the hierarchical model used for our analysis. Section 4 presents and discusses our main results, while Section 5 gathers our major conclusions and policy recommendations.

2. Background

2.1 Redistribution and insurance in welfare states

One of the essential features of modern welfare states is the redistribution of incomes through taxes and benefits to mitigate disparities between individuals. It has been demonstrated that progressive taxation leads to a more equal distribution by transferring income from richer people to the poorer, as rich individuals have a larger share of tax liabilities than their proportion of factor incomes (Lambert, 2001). Consequently, this

redistributive effect reduces inequality and poverty levels. In this context, many papers have shown empirically that both progressivity and a higher generosity of tax-benefit policies have a crucial role in shaping a country's income distribution and therefore its degree of inequality, poverty and mobility (Atkinson, Rainwater and Smeeding, 1994; Esping-Andersen and Myles, 2011; Jäntti, 1997; Van Kerm and Pi Aperin, 2013).

Nevertheless, another relevant function of the welfare state is to provide security by reducing the risk of diverse hazards or by relocating the costs of an adverse event from one individual to another (Western et al., 2012). There are several reasons that justify the public provision of social insurance: on one hand, government intervention can be explained by a lack of efficiency when there are market failures (as moral hazard or adverse selection) or it is necessary to relocate risk among generations. Moreover, public security can be based on distributional reasons as insurance also compresses the distribution of disposable income (Lindbeck, 2006). The insurance component of tax-benefit systems can also be understood as individual long-run redistribution, as incomes will be smoothed over a person's life cycle by paying more taxes in periods of abundance and receiving benefits when an economic shock takes place (Bartels, 2012, Bartels and Neumann, 2018; Björklund and Palme, 2002; Haan et al., 2018). Atkinson (1991) also points out another justification for social insurance: the absence of full private insurance markets only explains partially why the government supplies security to individuals, which arose as a response to labour force segmentation and the discretization of unemployment and retirement as adverse events.

Literature on optimal taxation has acknowledged this insurance component of progressive taxes and benefits beyond its redistributive effect. Academics start from the idea that income at a certain point in time has a large random component which is exogenous, thus not depending on unobserved characteristics or preferences (Varian, 1980). Individuals will then turn to private insurance markets in order to avoid this uncertainty, however these markets may be incomplete or even might not exist due to moral hazard, adverse selection or asymmetric information. In that case, people will need to save more than desired to raise a buffer stock that helps them in case of an economic downturn, but if individuals do not have enough wealth to purchase private coverage or to self-insure in case these markets are incomplete, government policies can be a relevant instrument to reduce unpredictable income dispersion providing security against individual risk (Buchanan and Tullock, 1962; Eaton and Rosen, 1980; Sinn, 1995; Varian,

1980). In this vein, differences in present incomes arise due to disparities in luck and social insurance implies a redistribution of resources from lucky individuals to those unlucky (Floden, 2001; Sinn, 1995). Although public insurance may be a useful tool by collectivizing risk, we must not forget the trade-off between distortionary effects via reduced incentives and the redistributive and insurance effects of progressive taxation when designing tax and benefit policies. Also, we must be aware that this social insurance provision might lead to a redistribution paradox: insurance may induce individuals to assume more risk, thus increasing inequality in pre-tax incomes and reducing the equalizing effect of modern welfare states.

There are several empirical analyses which document the existence of an insurance element in progressive taxation. In this framework, Gruber (1997) studies the smoothing effect of unemployment benefits on consumption, showing that complete private insurance markets for this hazard do not exist, as consumption decreases when individuals lose their jobs. This fall in consumption is mitigated by the generosity of unemployment insurance, especially in the short-term. In addition, there is evidence of an insurance component against divorce risk of some US family policies (Gruber, 2000). On other hand, Grant et al. (2010) find that a more redistributive tax system diminishes consumption variance providing social insurance to households. When studying public transfers, Floden (2001) demonstrates that a more generous transfer system implies a larger insurance effect in a country with higher risk (US) rather than in a low-exposed region (Sweden). Hoynes and Luttmer (2011) decompose the tax-benefit value into a redistributive component which is based on predictable variations in income and an insurance element due to unexpected income fluctuations. In this case, insurance is considered to redistribute incomes from individuals who achieved their expected income to those who suffered an income shock within those with the same previous expectations. There is significant evidence of this insurance value, which increases with income in contrast to the redistributive effect.

Another strand of research analyses social insurance as redistribution among individual income streams over their lifetime (Bartels, 2012; Bartels and Neumann, 2018; Björklund and Palme, 2002; Haan et al., 2018). In this vein, public insurance is not understood as a mechanism to reduce income dispersion at a given period, but a smoothing instrument of resources from different periods within the same person. Therefore, by contributing to public finances through taxes when obtaining higher

incomes, individuals will be entitled to receive public transfers when an economic risk is materialized. If private insurance markets were complete, redistribution will only make sense between individuals with different lifetime incomes and tax-benefit systems must offer coverage against temporary economic distress (Björklund and Palme, 2002). People have a preference for stable income over time rather than unpredictable resources and intra-individual redistribution can be an important determinant of progressive taxation support: individuals will be willing to contribute to annual redistribution from rich to the poor in exchange of income smoothing (Bartels and Neumann, 2018).

In this context, Björklund and Palme (2002) find significant long-run redistribution in Sweden, mainly driven by taxes even though the insurance effect of benefits is non-negligible. Also, income smoothing appears in all lifetime income quartiles, but it is larger for individuals with low levels of resources. Bartels (2012) documents that the German welfare system prefers insurance over annual redistribution as it is more focussed on means-tested benefits oriented to provide security and stabilize income over the life cycle –for instance, retirement pensions, sickness benefits and unemployment insurance. Beveridgean systems redistribute more between individuals in a longer time horizon while Bismarkian welfare states encourage intra-personal redistribution (Bartels and Neumann, 2018).

As far as we know, there is no previous work that analyses directly the impact of tax-benefit policies on economic insecurity. In this paper, we consider insecurity as the exposure to economic risks that implies anxiety from the anticipation of future economic losses and the inability to recover from them. We believe that progressive taxation can help to reduce this anxiety stemming from bad expectations as individuals acknowledge that the welfare system will act as a safety net in case those economic risks are materialized while the objective exposure to economic distress is also mitigated. Therefore, our first and main research hypothesis is:

H1: *More generous tax-benefit policies can help to reduce economic insecurity by acting as a public safety net in case economic risks materialise.*

2.2 Determinants of individual well-being

2.2.1 Individual sociodemographic characteristics

One goal of this paper is to analyse if country differences regarding economic insecurity levels can be explained by differences in the individual characteristics or by differences in institutional factors. Thus far, comparative analysis of economic insecurity is scarce and does not investigate the possible causes of the phenomenon (D'Ambrosio and Rohde, 2014; Nichols and Rehm, 2014; Osberg and Sharpe, 2005, 2014). Even though not in a comparative perspective, Rohde et al. (2015) explored some of the micro determinants of economic insecurity in Australia, concluding that factors causing insecurity are similar to those for other low well-being phenomena: in general, age decreases insecurity dimensions as well as higher levels of educational attainment, the fact of being employed in a full-time job and working in the industrial sector. Moreover, married individuals and those with good health conditions suffer from less insecurity. Household disposable income is associated with lower economic insecurity levels as expected, whereas unemployment status increases the phenomenon. Furthermore, there are large dynamic effects of economic insecurity over time, even if this is more of a transitory issue for individuals without tertiary education or high-income levels.

Within a multidimensional and individual perspective, Romaguera-de-la-Cruz (2019) also investigated the correlation between several sociodemographic characteristics and economic insecurity in three European countries representing different welfare systems: France, Spain and Sweden. She found that economic insecurity decreases as household disposable income grows and a significant group of middle-class individuals suffer from this phenomenon in Spain and to a lesser extent in France while insecurity in Sweden is essentially a low-income circumstance which accumulates to poverty. Individuals between 26 and 35 years of age are the most insecure in all three countries, while reaching tertiary education and being employed with a permanent contract are associated with a lower probability of insecurity. Household composition seems to be also relevant as an additional member contributes negatively to insecurity through an increase in disposable income. Cantó et al. (2019) confirm these results when analysing economic insecurity in 27 European countries, finding that young individuals with low educational attainment and a bad labour market situation –especially, the unemployed– as well as households with at least one dependent child are the most insecure in all regions, while middle-

income individuals are considerably affected by this phenomenon only in Mediterranean and Eastern European countries.

Economic insecurity is a rather distinct phenomenon than material deprivation or poverty –while the latter are referred to the moment they are experienced, insecurity incorporates dynamics as the anticipation of economic risks is not completely related to the income distribution (Ranci et al., 2017; Rohde and Tang, 2018; Osberg, 2018). Nonetheless, previous work analysing the relationship between other well-being phenomena and sociodemographic characteristics may help us to disentangle possible variables that also influence economic insecurity. Thus, in line with the results for economic insecurity, the literature has found a negative relation between age and material deprivation or poverty, since old individuals accumulate lifetime savings and assets (Bárcena-Martín, et al., 2014; 2018). Old people are usually homeowners conversely to the young (Figari, 2012) and tend to have a better position in the labour market with permanent contracts and higher wages (Dewilde, 2008). As expected, households whose head has only a low educational attainment are related with higher levels of material deprivation and poverty (Bárcena-Martín et al., 2017; Brady et al., 2009; Chzhen and Bradshaw, 2012; Figari, 2012; Fusco, et al., 2010; Whelan et al., 2004).

Labour market situation is closely related with economic strain, as the unemployed, inactive individuals and those with a temporary contract have a larger probability of deprivation and poverty (Bárcena-Martín et al., 2017; Dewilde, 2008; Figari, 2012; Whelan et al., 2004). In this context, Fusco et al. (2010) show that work intensity in the household is a major determinant of suffering from poverty and deprivation at the same time and not only the fact of being unemployed. Bad health status has a significant negative impact on deprivation and poverty due to the loss of income associated with medical costs and the impossibility to work (Figari, 2012; Fusco, et al., 2010; Whelan et al., 2004). Furthermore, household composition is a relevant determinant of well-being: people living alone as well as single-parents households display higher financial strain (Boarini and Mira d'Ercole, 2006; Dewilde, 2008; Figari, 2012). The number of children in the household increase the probability of being poor conversely to the number of adult members (Reinstadler and Ray, 2010), while having more than three dependent children and being separated or divorce contribute positively to the risk of poverty and deprivation (Dewilde, 2008; Whelan et al., 2004).

2.2.2 Country-specific characteristics

Regarding macroeconomic determinants, we were not able to find any previous work exploring the correlation between country-specific factors and economic insecurity levels. Nevertheless, it has been demonstrated that the institutional context has a significant impact on material deprivation indices (Figari, 2012). Macroeconomic variables influence individual well-being through a change in personal characteristics: for instance, higher unemployment rates could lead to the loss of employment of an individual and a disposable income decline contributing to a lack of necessary resources whereas a boost in economic activity may have the opposite effect. In this context, the literature has confirmed the negative effect of long-term unemployment on well-being (Bárcena-Martín et al., 2014; Whelan et al., 2003), while the association between low well-being and GDP as a proxy of average welfare in a given society is unclear: Dewilde (2008) does not find a significant effect on multidimensional poverty, whereas larger GDP per capita is associated with lower material deprivation levels (Bárcena-Martín, 2014; Whelan and Maître, 2012) and also reduces the probability of poverty (Reinstadler and Ray, 2010). There is a vast literature documenting the association between social benefits generosity and lower levels of deprivation and poverty (Brady et al., 2009; Bárcena-Martín, 2014; Dewilde, 2008; Nelson, 2012; Whelan et al., 2004), even though we ignore which is the effect on economic insecurity. In view of these considerations, we expect macroeconomic conditions as well as social protection expenditure to show a relevant impact on individual insecurity:

H2: *Country-specific factors have a significant effect on economic insecurity beyond individual sociodemographic characteristics.*

Furthermore, once we have tested if tax-benefit policies are mitigating economic insecurity as formulated in our first research hypothesis, we would like to analyse if this impact is different depending on the type of social protection function. We are especially interested in exploring the impact of means tested vs. non-means tested benefits on insecurity. In this vein, we cannot find agreement in the literature regarding which is the most adequate type of policies to combat low well-being: while Korpi and Palme (1998) note that those regions characterised by larger welfare states based on non-means tested benefits help more to mitigate poverty and inequality, other authors believe that means-tested benefits are more effective to the redistribution of incomes (Kenworthy, 2011).

Moreover, even though non-means tested benefits reduce poverty and deprivation more on absolute terms, means tested benefits are a better option on relative terms as they also reduce low well-being but with a lower cost (Figari et al., 2011). In addition, social protection expenditure targeted to children has been proven to effectively reduce child poverty and deprivation (Bárcena-Martín et al., 2017, 2018; Chzhen and Bradshaw, 2012) but we ignore its effects on economic insecurity. In this regard, we will interact social protection expenditure variables with a dummy for households with dependent children to test our third research hypothesis:

H3: *More generous tax-benefit policies mitigate economic insecurity more for those households with at least one dependent children, especially through social benefit functions aimed at children.*

3. Methodology

3.1 Economic insecurity measure

In this paper, we consider economic insecurity as a multidimensional phenomenon: the anxiety that individuals may feel because of expected future economic losses cannot be identified with a unique indicator; on the contrary, is manifested in a variety of variables. Therefore, the Romaguera-de-la-Cruz (2019) insecurity measure seems the most appropriate choice. This index is calculated at the individual level and accounts for the joint distribution of a series of subjective and objective dimensions based on Rohde et al.'s (2015) proposal that combines past events and forecasts about some financial risks.[1] This economic insecurity index proxies subjective insecurity by (a) *household's incapacity to face unexpected expenses*; (b) *household's financial dissatisfaction* –as a measure of discrepancy between disposable income and the lowest annual necessary income, assigning a value zero to satisfied individuals–, and (c) *changes in the ability to go on a holiday* –a binary variable which takes the value one if the household is unable to afford one week away from home provided they were able in the previous year. As objective measures, this index includes (d) *large income drops*, meaning that the

[1] For further information about the definition and computation of subjective and objective insecurity dimensions see Romaguera-de-la-Cruz (2019).

individual must experience a 25% or more fall in household disposable income; (e) *unemployment risk*, which is the probability of both the risk of not finding a job or losing the current one, and a (f) *probability of extreme expenditure distress* –household's probability of experiencing two or three overdue payments which is assigned to each household member.

After computing the aforementioned insecurity dimensions, the Romaguera-de-la-Cruz (2019) measure applies a counting approach (Alkire and Foster, 2011; Bucks, 2011) to construct a composite index of economic insecurity. As we are only interested in individual economic insecurity and its intensity, in this paper we only apply the dimensional thresholds and discard the multidimensional threshold. Thereby, we consider that an individual lacks security in a dimension if he is situated below a specific dimensional threshold: if X_{ij} is the observation of individual i in dimension j with $i = 1, \dots, N$ and $j = 1, \dots, D$ and Z_j is the threshold for dimension j, then individual i is insecure in dimension j if $X_{ij} < Z_j$. We establish the threshold at zero for all dimensions except for the unemployment risk and the probability of extreme expenditure distress for which we set the country's mean.

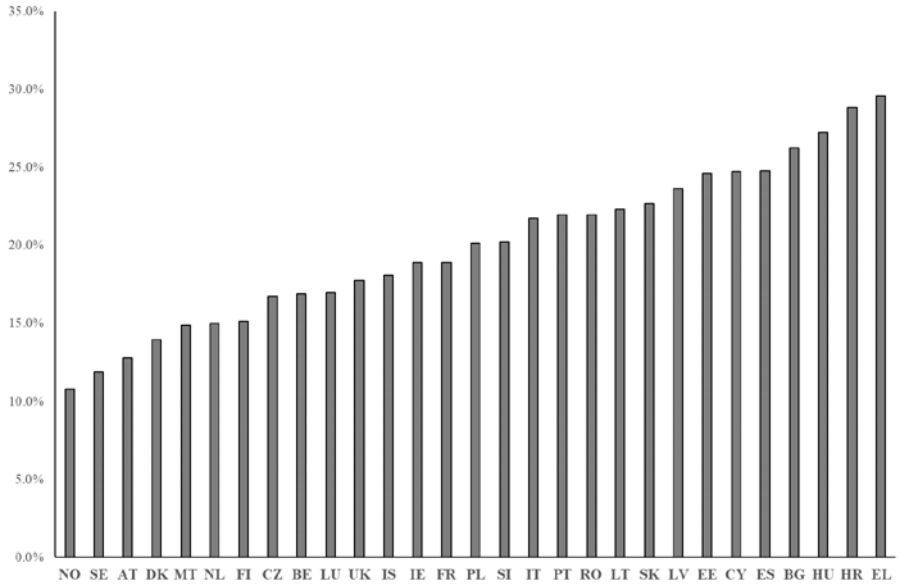
Once dimensional thresholds are applied, Romaguera-de-la-Cruz (2019) defines an individual indicator EI_i that counts the number of weighted dimensions in which an individual lacks security with respect to the total number of dimensions, $EI_i = \sum_{j=1}^{D} w_j I_{ij}$, where I_{ij} is a variable that takes the value one if the individual i lacks security in the dimension j and zero otherwise, where D is the total number of dimensions ($D = 6$). This index therefore enables us to consider the intensity of economic insecurity for each individual in the sample. Dimension j is weighted by w_j, which is the share of the population that does not lack security in that given indicator (inverse frequency weights). In that manner, the index EI_i gives more importance to less frequent indicators in a reference population and adapts to national distributions of dimensions[2].

In this work, we replicate the Romaguera-de-la-Cruz (2019) insecurity index for 29 European countries. As in Figari (2012) and Bárcena-Martín et al. (2014), we normalise EI_i by the sum of weights to allow for countries' comparisons and transform this index

[2] Inverse frequency weights can be identified as objective indicators of subjective feelings of insecurity: people feel worse if they observe that a large part of the population has security when they are among those who are insecure (Desai and Shah, 1988).

into a percentage of insecurity dimensions in which the individual lacks security (if $EI_i = 0$, a person does not lack security in any of the dimensions considered; conversely, if $EI_i = 100$, an individual lacks security in all insecurity indicators). We observe a significant variation in EI_i across countries in 2015 (Figure 5.1), with a minimum of 10.8% of weighted insecurity dimensions in Norway and a maximum of 29.6% in Greece. In general, Eastern and Southern European countries display the largest individual economic insecurity, while the lowest EI_i can be found in Nordic countries. On average, the intensity of individual economic insecurity is around 20%.

FIGURE 5.1. Individual economic insecurity (EI_i) by country.



Source: Author's calculations based on longitudinal EU-SILC data set.

3.2 Data and explanatory variables

We make use of longitudinal data from EU-SILC to replicate the Romaguera-de-la-Cruz (2019) economic insecurity index. This is a standardized survey that provides annual data about income and socioeconomic information at a household and individual level, thus allowing for sound comparisons in the European context. To deal with attrition bias, this longitudinal EU-SILC database is designed as a four-year rotational panel, with exceptions for some countries. For the construction of the individual measure of economic insecurity (EI_i), we use all waves of EU-SILC containing information from 2008 to 2016 and, subsequently, we use the 2015 results to analyse the impact of tax-

benefit systems on insecurity.[3] Institutional and contextual variables are drawn from Eurostat statistics with the exception of personal income revenue which is obtained from the European Commission database.

Our income variable is real household equivalised disposable income, deflated by the Harmonised Consumers Price Index at constant 2015 prices and adjusted for household size and composition by using the OECD modified scale. We trim the data eliminating the 1% tails of this income distribution (Cowell and Victoria-Feser, 2006) and discard those individuals remaining in the survey only for a single wave (as we need dynamic indicators). Our final pool of data includes 265,965 individual observations from 29 different countries. We use the individual as the unit of analysis and all our results are estimated by using sample weights.

In line with the literature, we have chosen different demographic and socioeconomic characteristics to assess the effect of individual variables (level 1) on economic insecurity. We include the individual's gender through the binary variable *male*, five categories regarding his *age group*, the *level of education* achieved, his self-perceived health status (*bad health*) as well as personal labour market situation (*basic activity status*). To account for household composition, we include the *type of household* with six different categories depending on the number of adults and children. As we also want to test the influence of housing on economic insecurity, we include a dummy variable that indicates if the tenure status of the household (*homeowner*). Although our unit of analysis is the individual, we have chosen to include several variables reflecting household's characteristics, namely if all members are below 40 (*young household*) or if the individual is living in a *multigenerational household* defined as those formed at least by one child, one working-age adult and one person above 65. Finally, we also consider the *percentage of unemployed* household members.

[3] We pool all waves from longitudinal EU-SILC dataset from 2008 to 2016 and discard duplicated observations. An individual can only be observed for a maximum of four consecutive waves due to the rotational design of the panel (except for France, Luxembourg and Norway). Our final sample consists of a four-wave panel of individuals corresponding to different interview years.

TABLE 1. Descriptive statistics

	Mean	Standard deviation
Micro-determinants		
Male	0.50	0.50
Age groups		
< 16	0.19	0.39
16 – 30	0.19	0.39
31 – 45	0.24	0.43
46 – 65	0.33	0.47
> 65	0.06	0.23
Level of education		
Primary or less	0.08	0.27
Secondary	0.60	0.49
Tertiary	0.32	0.47
Bad health	0.07	0.25
Basic activity status		
Employed	0.47	0.50
Unemployed	0.04	0.20
Inactive	0.49	0.50
% unemployed in household	6.20	18.95
Multigenerational household	0.01	0.10
Young household	0.19	0.40
Homeowner	0.74	0.44
Type of household		
One adult without children	0.07	0.26
Two adults without children	0.18	0.38
Other household without children	0.23	0.42
One adult with children	0.03	0.17
Two adults with children	0.33	0.47
Other household with children	0.16	0.37
Macro-determinants		
Unemployment rate	9.29	4.91
GDP	100	44.86
Social protection expenditure	22.85	5.47
Personal tax revenue	11.68	5.35
Social protection functions		
Means tested	2.16	2.17
Non-means tested	20.70	4.91
Cash benefits	15.23	3.53
In-kind benefits	7.64	2.82
Health care	6.31	1.70
Disability	1.98	1.01
Old age	9.52	2.56
Survivors	1.22	0.79
Unemployment	1.03	0.73
Family / children	2.01	0.75
Housing	0.27	0.31
Social exclusion	0.49	0.40

Source: Author's calculations based on longitudinal EU-SILC data set.

To assess the impact of the tax-benefit system, we include diverse measures as *social protection* expenditure and *personal tax revenue* as a percentage of GDP, Using expenditure measures as a proxy for welfare state has been criticized by the literature, arguing that a large amount of social protection expenditure may be due to a higher tax-benefit system generosity or to a greater number of recipients, only capturing the size of the budget and ignoring other crucial aspects as entitlement or benefits' size (Korpi and Palme, 1998; Kunißen, 2019). Even though net replacement rates are preferred by a large extent in the literature, cross-national variation in these measures is rather limited for some programs as health care and education spending while variation is spending is quite higher (Jensen, 2011). Taking this consideration in mind and recognising the importance of budget size, we decide to proxy countries' welfare system by their protection expenditure. To disentangle deeply the impact of tax-benefit policies on economic insecurity, we distinguish between *means* vs. *non-means tested* benefits, *cash* vs. *in-kind* protection expenditure and several social protection functions.

We also consider the *unemployment rate* to control for business-cycle and *GDP* per capita as a percentage of EU-28 average to account for average country wealth.[4] We can observe that the standard deviation of contextual factors is non-negligible (Table 1), particularly social protection benefits vary widely across European countries.

3.3 Econometric model

The purpose of this paper is twofold: we want to corroborate if tax-benefit systems have a significant impact on individual economic insecurity and test if country factors can explain differences in insecurity levels beyond individual characteristics. Both goals request dealing with the hierarchical structure of our data as we have individuals (level 1) clustered into countries (level 2). In this context, the most convenient method is multilevel analysis (Goldstein, 2003; Rabe-Hesketh and Skrondal, 2012; Snijders and Bosker, 1999). With this data structure, observations of the error term would not be independent when applying an OLS estimation as observations within countries will be correlated. This violation leads to an underestimation of standard errors, notably at higher levels of aggregation. On other hand, separate country regressions do not allow for the

[4] GDP per capita is expressed in Purchasing Power Parity (PPP).

consideration of country-level explanatory variables and the inclusion of country fixed effects does not allow to estimate the impact of second-level variables since this country factors can be expressed as a linear function of country dummies. Therefore, multilevel regressions are especially useful and enable to estimate separately the variance between individuals within the same country and the variance between countries. Nonetheless, data sets often used in this kind of analyses contain a large sample of individuals in a small number of countries, which can lead to a downward bias on country parameters. Thereby, a minimum of 25 countries is needed for linear multilevel estimations to obtain reliable country results (Bryan and Jenkins, 2016).[5]

In this particular case, we first adopt a random intercept model in which the intercept is allowed to vary randomly across countries ($\beta_{0c} = \beta_0 + u_{0c}$). Our data has a two-level structure where individuals i (first level) are nested into countries c (second level). Let EI_{ic} be the level of economic insecurity for a given individual i in country c. We estimate four specifications to study the effect of individual vs. country-specific factors on the differences across countries regarding economic insecurity. Firstly, we estimate a null model which does not contain any explanatory variable and reveals if there exist any country differences:

$$EI_{ic} = \beta_0 + u_{0c} + e_{0ic} \tag{5.1}$$

where u_{0c} is the random intercept that gathers the difference between the average insecurity in a given country c and the overall mean, while e_{0ic} are the individual-level residuals which are assumed to be independent.[6] Total variance is divided into two components: the variance of economic insecurity between countries (σ^2_{u0}) and that between individuals within countries (σ^2_e). Thus, the correlation of errors between two individuals or *intraclass correlation coefficient* (ICC) is defined as followed:

$$ICC = \frac{\sigma^2_{u0}}{\sigma^2_{u0} + \sigma^2_{e0}} \tag{5.2}$$

In the case of random-intercept models, this intraclass correlation coefficient measures the proportion of total variance due to differences between countries and it is also known as *variance partition coefficient* (VPC). For models with random coefficients beyond a random intercept, the ICC is not equivalent to the proportion of the variance due to the

[5] We satisfy this requirement as there are 29 countries included in our sample.
[6] Both measurement errors, u_{0c} and e_{0ic}, are assumed to follow zero-mean normal distributions.

higher level. If a non-negligible intraclass correlation exists, standard OLS cannot be applied as there is more than one error term (Goldstein, 2003).

Subsequently, we incorporate sociodemographic regressors to analyse if the differences in economic insecurity levels among countries can be explained by individual factors:

$$EI_{ic} = \beta_0 + \beta_1 X_{ic} + u_{0c} + e_{0ic} \tag{5.3}$$

where X_{ic} is the set of explanatory variables at level 1. Additionally, our main goal is to determine if country-specific variables (welfare systems in particular) have a significant impact on differences in insecurity levels among countries:

$$EI_{ic} = \beta_0 + \beta_2 Z_c + u_{0c} + e_{0ic} \tag{5.4}$$

where Z_c contains explanatory variables at the level 2. Finally, we consider both individual and country-level variables jointly:

$$EI_{ic} = \beta_0 + \beta_1 X_{ic} + \beta_2 Z_c + u_{0c} + e_{0ic} \tag{5.5}$$

To test our third hypothesis, we include cross-level interactions between our tax-benefit proxies and a dummy that reflects if the individual lives in a household where at least one dependent child is present. In this case, omitting the random slope corresponding to the lower-level variable could lead to a downward bias in standard errors of the cross-level interaction as well as the first-level estimator, while the main effects for country-specific determinants are not affected (Heisig and Schaeffer, 2019). We could only apply a random intercept model if the variance for the random slope was statistically not significant. As we do not satisfy this condition, we estimate cross-level interactions with a random coefficient model of our interest variable –households with children.[7] Thus, we now relax the assumption that the slope is the same for all countries and include heteroskedasticity in the error term (Snijders and Bosker, 1999):

$$EI_{ic} = \beta_0 + \beta_1 X_{ic} + \beta_2 Z_c + u_{0c} + u_{1c} x_{ic} + e_{0ic} \tag{5.6}$$

[7] Estimates for micro determinants of the random intercept variables are not likely to be affected by the omission of a random slope for households with children, as they would remain statistically significant even if the standard error increased by 50 per cent (Heisig and Schaeffer, 2019).

4. Results

4.1 Social protection and economic insecurity in the EU

Results of multilevel estimations with random intercept are displayed in Table 2. According to the ICC of the null model (Model 1), 6.2% of the variation in economic insecurity is due to disparities between countries. However, when adding first-level variables, this percentage of the variation of insecurity due to country-specific factors increases to 6.7% suggesting that there exists a certain compositional effect and that individual characteristics are not homogeneously distributed across countries.

Subsequently, we first estimate the impact of individual sociodemographic characteristics on EI_i without contextual factors (Model 2), adding later institutional variables that control for countries' economic cycle (unemployment rate) and average wealth (GDP as a percentage of EU-28) as well as two proxies for the welfare state: social protection expenditure (Model 3) and personal tax revenue (Model 4). Our results are in line with previous evidence and very similar for all three specifications. We can observe that younger individuals (those between 16 and 30) experience a higher economic insecurity than those at later stages in life. Being an individual above 65 reduces the percentage of insecurity dimensions more than 6.9 percentage points, probably due to a lower need of income as well as the access to life-time savings and public or private pensions. Educational attainment shows a negative and significant effect, meaning that individuals with a level of education above primary school have a lower economic insecurity. It is worth noting the huge impact of tertiary education, which decreases economic insecurity around 14 percentage points. On the other hand, bad self-assessed health has a positive and significant impact on insecurity, performing mainly through two channels: insecurity increases due to the limitations of income production (for instance, due to a sick leave at work) as well as due to the raise in medical expenses. As expected, being unemployed clearly increases economic insecurity (around 9.3 percentage points regarding inactive individuals) as opposed to being employed, as labour income is the major source of income in the European context. Also, homeownership displays a large negative impact on economic insecurity (-11.9 percentage points) as individuals avoid the uncertainty that fluctuating rental expenses may produce.

TABLE 2. Random intercept multilevel linear model for EI_i. Micro determinants

	1	2	3	4
Male		-0.896***	-0.896***	-0.896***
		(0.120)	(0.120)	(0.120)
Age group				
< 16		-0.297	-0.293	-0.292
		(0.404)	(0.404)	(0.404)
16 - 30		3.559***	3.561***	3.561***
		(0.343)	(0.343)	(0.343)
46 - 65		-1.749***	-1.747***	-1.747***
		(0.215)	(0.215)	(0.215)
> 65		-6.886***	-6.886***	-6.885***
		(0.669)	(0.669)	(0.669)
Level of education				
Secondary		-5.077***	-5.075***	-5.077***
		(0.677)	(0.678)	(0.678)
Tertiary		-13.941***	-13.936***	-13.937***
		(0.861)	(0.862)	(0.862)
Bad health		5.903***	5.905***	5.904***
		(0.415)	(0.415)	(0.415)
Basic activity status				
Employed		-2.109***	-2.108***	-2.108***
		(0.433)	(0.433)	(0.433)
Unemployed		9.293***	9.294***	9.295***
		(0.690)	(0.691)	(0.690)
% unemployed in the household		0.175***	0.175***	0.175***
		(0.010)	(0.010)	(0.010)
Multigenerational household		-3.082***	-3.087***	-3.087***
		(1.155)	(1.155)	(1.155)
Young household (all members < 40)		1.671***	1.672***	1.672***
		(0.320)	(0.321)	(0.321)
Homeownership		-11.877***	-11.878***	-11.876***
		(0.702)	(0.702)	(0.702)
Type of household				
One adult without children		-8.176***	-8.176***	-8.178***
		(0.623)	(0.625)	(0.625)
Two adults without children		-11.959***	-11.966***	-11.966***
		(0.515)	(0.518)	(0.517)
Other household without children		-11.440***	-11.452***	-11.450***
		(0.573)	(0.576)	(0.575)
Two adults with children		-9.145***	-9.151***	-9.151***
		(0.539)	(0.540)	(0.540)
Other household with children		-5.969***	-5.980***	-5.978***
		(0.626)	(0.628)	(0.627)
Constant	20.285***	46.585***	57.118***	51.971***
	(0.953)	(1.147)	(2.934)	(2.650)
Macro determinants	No	No	Yes	Yes
Var (intercept)	25.30	20.99	6.54	8.44
Var (residual)	382.32	290.71	290.71	290.71
ICC	0.062	0.067	0.022	0.028
Observations	265965	214975	214975	214975
Country groups	29	29	29	29
Log likelihood	-754327.57	-606138.35	-606121.60	-606125.27

Source: Author's calculations based on longitudinal EU-SILC data set.

Regarding household's characteristics, age composition of the household is significant to shape economic insecurity: if different generations are living together (at least one child, one working-age adult and one adult above 65), insecurity is reduced approximately 3 percentage points, whereas being present in a young household (all members below 40) has a positive impact on the phenomenon. All types of households show a negative and significant effect on insecurity with respect to single-adult households with one dependent children. Nevertheless, this impact is higher for households where no children is present, except for those formed by only one person due to the absence of economies of scale and risk-sharing. The percentage of unemployed members in the household with respect to working-age members increases economic insecurity.

TABLE 3. Random intercept multilevel linear model for EI_i. Macro determinants

	3	**4**	**5**	**6**
Unemployment rate	0.285***	0.204**	0.533***	0.457***
	(0.099)	(0.100)	(0.097)	(0.091)
GDP	-0.042***	-0.040**	-0.036**	-0.030
	(0.012)	(0.016)	(0.018)	(0.020)
Social protection expenditure	-0.398***		-0.349***	
	(0.075)		(0.091)	
Personal tax revenue		-0.290***		-0.310***
		(0.112)		(0.120)
Constant	57.118***	51.971***	26.487***	22.330***
	(2.934)	(2.650)	(2.567)	(2.324)
Micro determinants	Yes	Yes	No	No
Var (intercept)	6.54	8.44	6.40	7.10
Var (residual)	290.71	290.71	382.32	382.32
ICC	0.022	0.028	0.016	0.018
Observations	214975	214975	265965	265965
Country groups	29	29	29	29
Log likelihood	-606121.60	-606125.27	-754307.79	-754309.29

Source: Author's calculations based on longitudinal EU-SILC data set.

When adding country-specific variables (Table 3), the percentage of insecurity variation due to differences across countries falls to 2.8% to 1.6% depending on the specification, showing the relevance of institutional factors in explaining economic insecurity. Unemployment rate has a positive and significant impact on insecurity (Models 5 and 6), although this effect is reduced when individual characteristics are considered jointly with contextual variables (Models 3 and 4). We also find that countries with a higher GDP per capita are associated with lower percentage of insecurity dimensions. Regarding welfare state, we conclude that countries with more generous social protection systems and larger personal tax revenue have lower economic insecurity

levels. Results suggest that tax-benefit systems in Europe are effective with respect to social insurance of economic risks. In other words, the welfare state is providing security to individuals, who would have a higher uncertainty about recovering from future financial distress if no public safety net existed.

To achieve a deeper understanding of the relationship between tax-benefit systems and economic insecurity, we estimate the impact on this phenomenon of several social protection functions as a percentage of country's GDP. We first consider the influence of means and non-means tested benefits as well as cash and in-kind benefits and then we estimate the effect for eight disaggregated functions (Table 4). We find that countries with a higher percentage of means tested benefits with respect to GDP have lower individual economic insecurity (around -0.44 percentage points; Model 7). The impact of non-means tested benefits generosity is also negative and significant (Model 8). Moreover, both cash and in-kind benefits significantly reduce individual economic insecurity (Models 9 and 10). Regarding social protection functions, we find that health care, old age benefits, unemployment benefits and those aimed to mitigate social exclusion reduce insecurity, whereas there is no significant impact of disability, survivors' benefits, housing and family/children benefits. In this sense, social protection functions which are targeted to certain risks where economic insecurity may reveal itself are more effective in decreasing the negative effects of this phenomenon, rather than benefits for certain vulnerable groups. Thus, public expenditure in health improves the uncertainty that sickness may bring to individuals, as income drops will be lower the more effective is the public health care system in recovering people from illness. The negative impact on insecurity of old age and unemployment benefits is probably due to the replacement by public institutions of labour income in the case of retirement or the loss of employment. Again, possible income falls and economic distresses these events may cause are smoothed by the knowledge that the welfare system will make financial strain more tolerable. We know that poor individuals are those showing a larger economic insecurity, though in several European countries it is also present in middle-income groups (Cantó et al., 2019; Romaguera-de-la-Cruz, 2019). Thus, the generosity of social exclusion benefits increases security for those situated in the lower part of the income distribution, who suffer from different negative well-being phenomena at the same time. On the other hand, policies specifically targeted to vulnerable groups of the population rather than on economic hazards do not display a significant impact on insecurity: the

situation of disabled people or families with children will depend on many other household factors. In addition, the small size of housing benefits is probably not enough to palliate the larger insecurity suffered from tenants versus homeowners. These results are in line with the idea that what matters for a good welfare system is to provide universal social insurance policies which allow people to obtain security against risks rather to redistribute incomes from richer individuals to the poorer (Kenworthy, 2011).

4.2 Social protection and households with children

It is also of interest to analyse if diverse welfare systems are protecting vulnerable households differently against economic insecurity. For that purpose, we include interactions of our tax-benefit variables as well as social protection functions with a dummy that indicates whether the household has at least a dependent child or not. In general, households with children present higher levels of economic insecurity due to the increase in expenditure associated with minors. Also, previous evidence has confirmed that suffering from financial difficulties during childhood can affect development of children, who might have lower well-being in the future. If parents believe they are going to suffer from an economic distress in the near future and they are not going to be able to recover from it, they will save and cut down some current expenses that may affect children in later stages of their lives –for instance, a reduction in education investment in the present due to parents' insecurity will involve a lower educational attainment of children and thus more difficulties to get higher wages.

Table 5 displays the impact of cross-level interactions between welfare variables and living in a household where dependent children are present. Countries with larger social protection generosity protect more households with children beyond total effect. Nevertheless, the overall impact of personal tax revenue becomes non-significant while but the cross-level interaction with households with children show a negative effect on insecurity, meaning that the lowering impact of personal tax on insecurity performs mainly through households with children. We also find the same pattern for means tested and social exclusion benefits. On other hand, country differences in insecurity can also be explained by non-means tested generosity, which decrease insecurity even more for our group of interest, as well as cash and in-kind benefits.

TABLE 4. Random intercept multilevel linear model for EI_i. Social protection functions

	7	8	9	10	11	12	13	14	15	16	17	18
Unemployment rate	0.240**	0.279**	0.385***	0.159	0.185**	0.224**	0.319**	0.350***	0.394***	0.213**	0.210**	0.213*
	(0.098)	(0.109)	(0.117)	(0.097)	(0.093)	(0.107)	(0.127)	(0.122)	(0.094)	(0.106)	(0.105)	(0.109)
GDP	-0.053***	-0.048***	-0.045***	-0.047***	-0.048***	-0.055**	-0.059***	-0.055**	-0.037**	-0.055**	-0.055**	-0.051***
	(0.019)	(0.017)	(0.016)	(0.014)	(0.013)	(0.023)	(0.015)	(0.024)	(0.017)	(0.025)	(0.022)	(0.018)
Social protection functions												
Means tested	-0.435*											
	(0.226)											
Non-means tested		-0.381***										
		(0.107)										
Cash benefits			-0.609***									
			(0.137)									
In-kind benefits				-0.638***								
				(0.163)								
Health care					-1.007***							
					(0.293)							
Disability						-0.439						
						(0.670)						
Old age							-0.824***					
							(0.195)					
Survivors								-1.272				
								(0.838)				
Unemployment									-2.329***			
									(0.639)			
Family / children										-0.477		
										(1.048)		
Housing											-1.825	
											(1.620)	
Social exclusion												-3.095**
												(1.220)
Constant	50.530***	56.482***	56.613***	54.562***	55.885***	50.784***	57.251***	50.196***	49.027***	50.979***	50.548***	51.191***
	(2.841)	(3.251)	(3.065)	(2.757)	(2.926)	(3.112)	(3.336)	(3.327)	(2.579)	(3.447)	(3.103)	(2.999)
Micro determinants	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Var (intercept)	9.53	7.50	6.73	8.10	8.11	10.30	6.48	9.84	7.85	10.38	10.16	9.19
Var (residual)	290.71	290.71	290.71	290.71	290.71	290.71	290.71	290.71	290.71	290.71	290.71	290.71
ICC	0.032	0.025	0.023	0.027	0.027	0.034	0.022	0.033	0.026	0.034	0.034	0.031
Observations	29	29	29	29	29	29	29	29	29	29	29	29
Country groups	214975	214975	214975	214975	214975	214975	214975	214975	214975	214975	214975	214975
Log likelihood	-606127.03	-606123.53	-606121.99	-606124.67	-606124.72	-606128.11	-606121.4	-606127.45	-606124.22	-606128.22	-606127.92	-606126.48

Source: Author's calculations based on longitudinal EU-SILC data set.

TABLE 5. Random coefficient multilevel linear model for EI_i. Interactions with household with children

	1	2	3	4	5	6	7
Household with children	7.751***	5.416***	3.886***	7.224***	6.495***	6.356***	7.447***
	(1.501)	(0.862)	(0.565)	(1.511)	(1.677)	(1.044)	(1.673)
Social protection expenditure	-0.309***						
	(0.069)						
HH with children*social protection	-0.192***						
	(0.066)						
Personal tax revenue		-0.220**					
		(0.098)					
HH with children*personal tax		-0.176***					
		(0.065)					
Social protection functions							
Means tested			-0.344*				
			(0.183)				
HH with children*means tested			-0.244				
			(0.152)				
Non-means tested				-0.294***			
				(0.096)			
HH with children*non-means tested				-0.187***			
				(0.073)			
Cash benefits					-0.495***		
					(0.130)		
HH with children*cash benefits					-0.205*		
					(0.106)		
In-kind benefits						-0.456***	
						(0.126)	
HH with children*in-kind benefits						-0.398***	
						(0.144)	
Health care							-0.739***
							(0.267)
HH with children*health care							-0.658**
							(0.279)
Constant	44.407***	40.384***	39.316***	43.881***	44.244***	42.190***	43.239***
	(2.760)	(2.343)	(2.318)	(2.948)	(2.763)	(2.638)	(2.874)
Var (coefficient)	4.21	4.25	5.00	4.50	4.74	4.14	4.09
Var (intercept)	5.45	6.73	7.33	6.08	5.38	6.67	6.63
Var (residual)	293.26	293.26	293.26	293.26	293.26	293.26	293.26
ICC	0.018	0.022	0.024	0.020	0.018	0.022	0.022
Log likelihood	-606779.7	-606782.58	-606785.96	-606782	-606781.08	-606782.09	-606781.93

TABLE 5. Random coefficient multilevel linear model for EI_i. Interactions with household with children (continued)

	8	9	10	11	12	13	14
Household with children	5.160***	5.402***	2.803***	4.386***	4.688***	3.661***	5.187***
	(0.938)	(1.432)	(0.884)	(0.729)	(1.424)	(0.529)	(0.527)
Social protection functions							
Disability	0.020						
	(0.531)						
HH with children*disability	-0.913*						
	(0.467)						
Old age		-0.668***					
		(0.178)					
HH with children*old age		-0.215					
		(0.143)					
Survivors			-1.505*				
			(0.803)				
HH with children*survivors			0.442				
			(0.485)				
Unemployment				-1.896***			
				(0.508)			
HH with children*unemployment				-0.899**			
				(0.429)			
Family / children					-0.571		
					(0.849)		
HH with children*family/ children					-0.683		
					(0.678)		
Housing						-1.957	
						(1.409)	
HH with children*housing						-1.204	
						(1.236)	
Social exclusion							-1.157
							(1.109)
HH with children*social exclusion							-3.696***
							(0.909)
Constant	39.022***	44.767***	39.090***	38.068***	40.002***	39.441***	39.452***
	(2.681)	(2.935)	(2.556)	(2.128)	(2.933)	(2.539)	(2.603)
Var (coefficient)	4.57	4.93	5.30	4.73	5.12	5.19	3.25
Var (intercept)	7.99	5.26	7.09	6.14	7.83	7.59	7.78
Var (residual)	293.26	293.26	293.26	293.26	293.26	293.26	293.26
ICC	0.027	0.018	0.024	0.021	0.026	0.025	0.026
Log likelihood	-606785.72	-606781.27	-606785.97	-606782.81	-606786.99	-606786.82	-606781.15

Source: Author's calculations based on longitudinal EU-SILC data set.

TABLE 6. Random coefficient multilevel linear model for EI_i. Interactions with single parents

	1	2	3	4	5	6	7
Single parent	7.693***	7.845***	8.392***	8.866***	8.753***	7.478***	7.376***
	(1.879)	(1.245)	(0.732)	(2.479)	(2.807)	(1.613)	(2.272)
Social protection expenditure	-0.409***						
	(0.075)						
Single parent*social protection	0.059						
	(0.074)						
Personal tax revenue		-0.303***					
		(0.114)					
Single parent*personal tax		0.101					
		(0.092)					
Social protection functions							
Means tested			-0.468**				
			(0.220)				
Single parent*means tested			0.290				
			(0.262)				
Non-means tested				-0.388***			
				(0.104)			
Single parent*non-means tested				0.009			
				(0.107)			
Cash benefits					-0.629***		
					(0.134)		
Single parent*cash benefits					0.019		
					(0.170)		
In-kind benefits						-0.651***	
						(0.160)	
Single parent*in-kind benefits						0.206	
						(0.202)	
Health care							-1.037***
							(0.295)
Single parent*health care							0.266
							(0.368)
Constant	48.594***	43.343***	41.845***	47.872***	48.108***	45.939***	47.343***
	(3.086)	(2.814)	(2.904)	(3.302)	(3.105)	(2.999)	(3.177)
Variance in coefficient	9.18	8.88	8.76	9.24	9.29	8.80	8.96
Variance in intercept	6.42	8.33	9.48	7.48	6.57	8.09	8.05
Variance residual	294.25	294.25	294.25	294.25	294.25	294.25	294.25
ICC	0.021	0.028	0.031	0.025	0.022	0.027	0.027
Log likelihood	-607003.93	-607007.43	-607009.17	-607006.23	-607004.37	-607007.02	-607007.12

TABLE 6. Random coefficient multilevel linear model for EI_i. Interactions with single parents (continued)

	8	9	10	11	12	13	14
Single parent	7.935***	8.125**	9.146***	9.634***	8.927***	8.736***	8.996***
	(1.321)	(3.233)	(1.109)	(1.074)	(1.940)	(0.794)	(1.132)
Social protection functions							
Disability	-0.458						
	(0.647)						
Single parent*disability	0.556						
	(0.666)						
Old age		-0.842***					
		(0.187)					
Single parent*old age		0.097					
		(0.316)					
Survivors			-1.378				
			(0.843)				
Single parent*survivors			-0.081				
			(0.777)				
Unemployment				-2.357***			
				(0.638)			
Single parent*unemployment				-0.492			
				(0.565)			
Family / children					-0.511		
					(1.049)		
Single parent*family/ children					0.063		
					(0.868)		
Housing						-1.994	
						(1.592)	
Single parent*housing						1.121	
						(1.755)	
Social exclusion							-3.075**
							(1.267)
Single parent*social exclusion							0.112
							(1.509)
Constant	42.099***	48.695***	41.489***	40.297***	42.326***	41.872***	42.472***
	(3.279)	(3.323)	(3.376)	(2.686)	(3.494)	(3.193)	(3.111)
Variance in coefficient	8.78	9.24	9.26	9.02	9.23	9.01	9.23
Variance in intercept	10.37	6.40	9.81	7.86	10.45	10.18	9.29
Variance residual	294.25	294.25	294.25	294.25	294.25	294.25	294.25
ICC	0.034	0.021	0.032	0.026	0.034	0.033	0.031
Log likelihood	-607010.57	-607003.87	-607010.14	-607006.77	-607011.04	-607010.52	-607009.36

Source: Author's calculations based on longitudinal EU-SILC data set.

Regarding social protection functions, health care and unemployment benefits show an additional negative impact for this type of household, whereas interactions with old age and survivor benefits do not present a differential effect. Conversely, we do not find any differential effect for Single parent households as opposed to other household types (Table 6), which suggests that public policy is performing poorly when protecting this group in terms of economic insecurity.

4.3 Robustness tests

To make sure our previous results are not a product of the chosen data sample, we conduct a series of robustness tests. First, we discard individuals below 16 and above 65 years of age and we run our random intercept estimations on a subsample of working age individuals. Our principal conclusions do not change, that is individual characteristics show the expected sign and macroeconomic variables have a significant impact on economic insecurity (see Table A1 and A2). In general, our main results also hold when analysing economic insecurity in a period with negative economic growth by using the 2013 wave of EU-SILC –income variables are referred to 2012. Nonetheless, it is true that the effect of means-tested benefits on insecurity becomes non-significant (Tables A3, A4 and A5).

Furthermore, we estimate several multilevel logit models with a dependent variable that takes the value one if the individual is considered as insecure from a multidimensional perspective when applying an intermediate threshold –at least three out of six dimensions– and zero otherwise (Tables A6 and A7). The effects of microeconomic determinants on insecurity are quite robust to the response variable chosen. In this case, GDP per capita does not show any relevant impact on the probability of being insecure while country's unemployment rate does increase insecurity. However, we can also confirm our first research hypothesis: a more generous social protection system and larger personal tax revenue contribute to reduce the probability of insecurity in the European context

5. Concluding remarks

In this paper, we have analysed to which extent differences in economic insecurity among European countries are due to individuals' characteristics as well as country-specific factors. In particular, we checked if welfare systems are providing social insurance to some economic hazards, namely if a more generous tax-benefit system leads to a lower level of insecurity. The percentage of insecurity dimensions is significantly smaller in those countries with lower unemployment rates, higher gross domestic product and more generous tax-benefit systems, especially social protection expenditure targeted to economic risks that are related with insecurity.

Firstly, we replicate the insecurity measure developed in Romaguera-de-la-Cruz (2019) for 29 European countries, following Rohde et al.'s (2015) proposal on dimensions. As we believe insecurity is a complex phenomenon which reveals itself in a variety of indicators, we compute a multidimensional index at the individual level thus analysing the joint distribution of a series of dimensions. Economic insecurity is related with individuals' expectations of their future economic situation and the impossibility to cope with future financial hardship. Consequently, our economic insecurity measure has included both subjective and objective dimensions, combining past experiences with probabilities of future events. For aggregating our insecurity dimensions, we have chosen the use of the counting approach method: we have defined a threshold in each dimension to determine if a person lacks security in a given indicator and counted the dimensions in which the individual is insecure, weighting each one of them by the proportion of the population not affected by the specific phenomenon. This approach enables us to account for national distributions of insecurity dimensions, introducing a relative perspective into the index.

Secondly, we have conducted a series of multilevel regressions in order to disentangle the effect of individual variables as well as institutional factors on our individual economic insecurity index. When analysing the effect of individuals' sociodemographic factors on our measure of economic insecurity, we found that young individuals (between 16 and 30 years old), with an educational attainment below secondary education and unemployed are those with the highest percentage of insecurity dimensions. Also, declaring a bad health status increases insecurity due to possible economic losses related with sickness and medical costs associated. Especially relevant is the negative impact of

homeownership, which stresses the necessity of wider housing policies that help individuals to mitigate the uncertainty and negative expectations associated with renting. On other hand, lone-parent households as well as those with dependent children show a larger economic insecurity. In addition, those households with all members below 40 are associated with a higher insecurity, conversely to multigenerational households which benefit from life-time savings of their oldest members. As expected, the percentage of unemployed individuals in the household increases the insecurity index.

Even though individual characteristics account for most of economic insecurity, we find that the impact of country-specific factors is non-negligible, thus confirming our second research hypothesis. Countries with larger unemployment rates and smaller GDP per capita display lower levels of individual economic insecurity. Furthermore, differences in economic insecurity levels across countries can be explained by a more generous welfare system, with a negative impact of social protection expenditure and personal tax revenue on our insecurity measure. This result corroborates our first hypothesis: countries with larger tax-benefit systems are providing social insurance to individuals, meaning that their level of anxiety with respect to future economic distress is lower than that without any kind of social protection. This reduction of insecurity may act through an improvement in people's expectations –having an impact on subjective insecurity dimensions– as well as smoothing the effects of income drops, unemployment risk or future consumption distress. When looking into the impact of specific social protection functions, we found that both means- and non-means tested benefits reduce economic insecurity as well as cash and in-kind benefits. Nonetheless, this effect is mainly due to health expenditure, old-age pensions, unemployment benefits and social exclusion allowances. Housing benefits do not show a significant impact on insecurity, reinforcing the result for homeownership at the individual level. It seems that the most effective policies to reduce insecurity are those targeted at specific economic risks and not at particular subgroups of the population.

Moreover, we have analysed if more generous welfare systems help more households with at least one dependent child in mitigating economic insecurity. We observed that social protection expenditure has an additional negative impact for households with dependent children beyond its overall effect on the country's population, while the welfare system is failing in providing insurance to lone-parent households. Nevertheless, our third research hypothesis is partially confirmed: only some tax-benefit policies

mitigate economic insecurity more for those households with children but not those especially targeted to this group as family benefits, which do not provide insurance neither for households with children nor for other population subgroups probably due to its small budget size.

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Appendix

TABLE A1. Random intercept multilevel linear model for EI_i. Micro determinants. Working age individuals

	1	2	3	4
Male		-1.154***	-1.154***	-1.154***
		(0.159)	(0.159)	(0.159)
Age group				
16 - 30		3.857***	3.861***	3.860***
		(0.341)	(0.342)	(0.341)
46 - 65		-1.780***	-1.776***	-1.776***
		(0.213)	(0.213)	(0.213)
Level of education				
Secondary		-6.220***	-6.215***	-6.218***
		(0.770)	(0.772)	(0.772)
Tertiary		-14.494***	-14.488***	-14.490***
		(0.929)	(0.930)	(0.930)
Bad health		7.056***	7.058***	7.056***
		(0.449)	(0.449)	(0.449)
Basic activity status				
Employed		-2.092***	-2.089***	-2.088***
		(0.429)	(0.430)	(0.429)
Unemployed		9.340***	9.342***	9.342***
		(0.688)	(0.689)	(0.689)
% unemployed in the household		0.175***	0.174***	0.174***
		(0.009)	(0.009)	(0.009)
Multigenerational household		-6.665***	-6.664***	-6.664***
		(1.746)	(1.746)	(1.746)
Young household		1.120***	1.123***	1.122***
		(0.381)	(0.381)	(0.381)
Homeownership		-11.580***	-11.581***	-11.579***
		(0.648)	(0.648)	(0.647)
Type of household				
One adult without children		-8.206***	-8.209***	-8.212***
		(0.585)	(0.588)	(0.587)
Two adults without children		-12.017***	-12.030***	-12.031***
		(0.489)	(0.492)	(0.492)
Other household without children		-11.585***	-11.605***	-11.604***
		(0.586)	(0.589)	(0.587)
Two adults with children		-8.791***	-8.803***	-8.804***
		(0.539)	(0.541)	(0.540)
Other household with children		-6.317***	-6.336***	-6.334***
		(0.645)	(0.647)	(0.646)
Constant	20.399***	47.500***	57.056***	52.368***
	(0.915)	(1.193)	(2.883)	(2.565)
Macro determinants	No	No	Yes	Yes
Variance in intercept	23.27314	18.95898	6.11	7.72
Total variance	386.5429	290.6734	290.67	290.67
ICC	0.0567892	0.0612306	0.021	0.026
Observations	192851	158725	158725	158725
Country groups	29	29	29	29
Log likelihood	-546795.93	-449235.32	-449219.15	-449222.53

Source: Author's calculations based on longitudinal EU-SILC data set.

TABLE A2. Random intercept multilevel linear model for EI_i. Macro determinants. Working age individuals.

	3	4	5	6
Unemployment rate	0.279***	0.206**	0.560***	0.494***
	(0.096)	(0.096)	(0.095)	(0.090)
GDP	-0.041***	-0.038***	-0.033**	-0.027
	(0.011)	(0.014)	(0.015)	(0.017)
Social protection expenditure	-0.361***		-0.297***	
	(0.070)		(0.079)	
Personal tax revenue		-0.258**		-0.273**
		(0.110)		(0.112)
Constant	57.056***	52.368***	24.808***	21.325***
	(2.883)	(2.565)	(2.442)	(2.177)
Micro determinants	Yes	Yes	No	No
Variance in intercept	6.11	7.72	5.45	5.83
Variance residual	290.67	290.67	386.54	386.54
ICC	0.021	0.026	0.014	0.015
Observations	158725	158725	192851	192851
Country groups	29	29	29	29
Log likelihood	-449219.15	-449222.53	-546775.13	-546776.14

Source: Author's calculations based on longitudinal EU-SILC data set.

TABLE A3. Random intercept multilevel linear model for EI_i. Micro determinants. 2013

	1	2	3	4
Male		-1.031***	-1.030***	-1.030***
		(0.129)	(0.129)	(0.129)
Age group				
< 16		-0.421	-0.416	-0.416
		(0.534)	(0.535)	(0.534)
16 - 30		3.606***	3.607***	3.607***
		(0.379)	(0.379)	(0.379)
46 - 65		-1.840***	-1.838***	-1.839***
		(0.312)	(0.312)	(0.312)
> 65		-7.844***	-7.845***	-7.844***
		(0.676)	(0.676)	(0.676)
Level of education				
Secondary		-4.757***	-4.756***	-4.757***
		(0.427)	(0.428)	(0.428)
Tertiary		-13.893***	-13.889***	-13.890***
		(0.603)	(0.603)	(0.604)
Bad health		6.193***	6.195***	6.194***
		(0.529)	(0.530)	(0.530)
Basic activity status				
Employed		-2.169***	-2.168***	-2.168***
		(0.551)	(0.551)	(0.551)
Unemployed		8.815***	8.816***	8.816***
		(0.765)	(0.766)	(0.765)
% unemployed in the household		0.172***	0.172***	0.172***
		(0.009)	(0.009)	(0.009)
Multigenerational household		-3.751***	-3.759***	-3.756***
		(0.905)	(0.904)	(0.904)
Young household		2.783***	2.783***	2.783***
		(0.284)	(0.284)	(0.284)
Homeownership		-11.980***	-11.981***	-11.978***
		(0.807)	(0.807)	(0.807)
Type of household				
One adult without children		-7.082***	-7.081***	-7.084***
		(0.638)	(0.638)	(0.639)
Two adults without children		-10.687***	-10.699***	-10.698***
		(0.694)	(0.695)	(0.695)
Other household without children		-10.010***	-10.027***	-10.024***
		(0.799)	(0.800)	(0.799)
Two adults with children		-7.754***	-7.762***	-7.763***
		(0.727)	(0.728)	(0.728)
Other household with children		-4.470***	-4.485***	-4.482***
		(0.841)	(0.842)	(0.841)
Constant	21.803***	46.341***	58.395***	52.133***
	(0.962)	(1.015)	(2.548)	(2.105)
Macro determinants	No	No	Yes	Yes
Variance in intercept	25.77	21.17	4.30	6.93
Total variance	401.25	308.35	308.35	308.35
ICC	0.060	0.064	0.014	0.022
Observations	261753	209494	209494	209494
Country groups	29	29	29	29
Log likelihood	-750892.88	-598293.68	-598271.42	-598278.03

Source: Author's calculations based on longitudinal EU-SILC data set.

TABLE A4. Random intercept multilevel linear model for EI_i. Macro determinants. 2013

	3	4	5	6
Unemployment rate	0.248***	0.197**	0.510***	0.460***
	(0.085)	(0.093)	(0.088)	(0.090)
GDP	-0.048***	-0.045***	-0.039***	-0.031*
	(0.006)	(0.012)	(0.012)	(0.016)
Social protection expenditure	-0.430***		-0.376***	
	(0.068)		(0.087)	
Personal tax revenue		-0.286***		-0.322***
		(0.093)		(0.114)
Constant	58.395***	52.133***	28.915***	23.785***
	(2.548)	(2.105)	(2.313)	(2.011)
Micro determinants	Yes	Yes	No	No
Variance in intercept	4.30	6.93	5.13	6.34
Variance residual	308.35	308.35	401.25	401.25
ICC	0.014	0.022	0.013	0.016
Observations	209494	209494	261753	261753
Country groups	29	29	29	29
Log likelihood	-598271.42	-598278.03	-750869.73	-750872.77

Source: Author's calculations based on longitudinal EU-SILC data set.

TABLE A5. Random intercept multilevel linear model for EI_i. Social protection functions. Year 2013

	7	8	9	10	11	12	13	14	15	16	17	18
Unemployment rate	0.232**	0.235**	0.314***	0.169*	0.201**	0.211**	0.251**	0.303***	0.386***	0.165	0.210**	0.181
	(0.102)	(0.100)	(0.098)	(0.088)	(0.089)	(0.102)	(0.115)	(0.093)	(0.112)	(0.115)	(0.101)	(0.114)
GDP	-0.061***	-0.054***	-0.052***	-0.052***	-0.056***	-0.062***	-0.067***	-0.062***	-0.047***	-0.055***	-0.063***	-0.062***
	(0.015)	(0.010)	(0.010)	(0.007)	(0.010)	(0.017)	(0.011)	(0.018)	(0.012)	(0.017)	(0.017)	(0.015)
Social protection functions												
Means tested	-0.314											
	(0.214)											
Non-means tested		-0.434***										
		(0.100)										
Cash benefits			-0.643***									
			(0.145)									
In-kind benefits				-0.641***								
				(0.160)								
Health care					-0.818***							
					(0.269)							
Disability						-0.428						
						(0.650)						
Old age							-0.799***					
							(0.211)					
Survivors								-1.266*				
								(0.733)				
Unemployment									-1.829***			
									(0.488)			
Family / children										-1.340*		
										(0.770)		
Housing											-1.200	
											(1.823)	
Social exclusion												-2.078
												(1.525)
Constant	50.864***	58.254***	58.128***	54.756***	55.094***	51.319***	58.018***	51.032***	49.309***	52.878***	50.928***	51.827***
	(2.385)	(3.015)	(2.800)	(2.363)	(2.544)	(2.629)	(3.060)	(2.693)	(2.309)	(3.020)	(2.529)	(2.722)
Micro determinants	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Variance in intercept	7.94	5.06	4.73	6.04	6.74	8.33	4.83	7.70	6.65	7.83	8.31	8.02
Variance residual	308.35	308.35	308.35	308.35	308.35	308.35	308.35	308.35	308.35	308.35	308.35	308.35
ICC	0.025	0.016	0.015	0.019	0.021	0.026	0.015	0.024	0.021	0.025	0.026	0.025
Observations	209494	209494	209494	209494	209494	209494	209494	209494	209494	209494	209494	209494
Country groups	29	29	29	29	29	29	29	29	29	29	29	29
Log likelihood	-598279.9	-598273.5	-598272.4	-598276.2	-598277.7	-598280.5	-598272.6	-598279.4	-598277.4	-598279.6	-598280.5	-598279.9

TABLE A6. Random intercept multilevel logit model. Micro determinants.

	1	2	3	4
Male		-0.062***	-0.070***	-0.070***
		(0.020)	(0.021)	(0.021)
Age group				
< 16		-0.007	0.001	0.001
		(0.045)	(0.049)	(0.049)
16 - 30		0.291***	0.304***	0.304***
		(0.049)	(0.053)	(0.053)
46 - 65		-0.179***	-0.178***	-0.178***
		(0.044)	(0.049)	(0.049)
> 65		-1.032***	-1.039***	-1.039***
		(0.116)	(0.133)	(0.133)
Level of education				
Secondary		-0.468***	-0.472***	-0.472***
		(0.082)	(0.086)	(0.086)
Tertiary		-1.405***	-1.427***	-1.427***
		(0.109)	(0.112)	(0.112)
Bad health		0.472***	0.482***	0.482***
		(0.048)	(0.054)	(0.054)
Basic activity status				
Employed		-0.245***	-0.231***	-0.231***
		(0.058)	(0.063)	(0.063)
Unemployed		0.924***	0.939***	0.939***
		(0.091)	(0.105)	(0.105)
% unemployed in the household		0.015***	0.015***	0.015***
		(0.001)	(0.001)	(0.001)
Multigenerational household		-0.496***	-0.460***	-0.460***
		(0.088)	(0.100)	(0.100)
Young household		0.278***	0.282***	0.282***
		(0.067)	(0.071)	(0.071)
Homeownership		-0.903***	-0.947***	-0.947***
		(0.074)	(0.064)	(0.064)
Type of household				
One adult without children		-0.332**	-0.324**	-0.324**
		(0.132)	(0.135)	(0.135)
Two adults without children		-0.933***	-0.929***	-0.930***
		(0.104)	(0.108)	(0.108)
Other household without children		-0.887***	-0.878***	-0.878***
		(0.130)	(0.137)	(0.137)
Two adults with children		-0.579***	-0.549***	-0.549***
		(0.104)	(0.103)	(0.103)
Other household with children		-0.220*	-0.194*	-0.193*
		(0.116)	(0.117)	(0.117)
Constant	-2.517***	-0.777***	0.170	0.217
	(0.124)	(0.194)	(0.437)	(0.435)
Macro determinants	No	No	Yes	Yes
Observations	263976	219562	208977	208977
Country groups	29	29	29	29
Log likelihood	-83363.831	-64564.154	-59560.74	-59561.40

Source: Author's calculations based on longitudinal EU-SILC data set.

TABLE A7. Random intercept multilevel logit model. Macro determinants

	3	4	5	6
Unemployment rate	0.054***	0.043***	0.075***	0.066***
	(0.014)	(0.013)	(0.013)	(0.011)
GDP	-0.005	-0.004	-0.003	-0.002
	(0.003)	(0.003)	(0.003)	(0.003)
Social protection expenditure	-0.048***		-0.036**	
	(0.018)		(0.017)	
Personal tax revenue		-0.046***		-0.040**
		(0.016)		(0.016)
Constant	0.217	-0.341	-2.179***	-2.561***
	(0.435)	(0.393)	(0.382)	(0.328)
Micro determinants	Yes	Yes	No	No
Observations	208977	208977	252700	252700
Country groups	29	29	29	29
Log likelihood	-59560.74	-59561.40	-77471.34	-77470.76

Source: Author's calculations based on longitudinal EU-SILC data set.