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## Article

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# Sympathy for the Devil? Exploring Flexicurity Win–Win Promises

## Abstract

Flexicurity is the combination of more flexibility for employers and more security for workers. It is a complex and multifaceted phenomenon that lacks a well-developed monitoring framework or a statistically consistent grouping of the indicators. First, this paper proposes a conceptual framework by building upon the Wilthagen and Tros (2004) flexicurity matrix and the Danish Golden Triangle. It constructs flexicurity “drivers” by pooling together variables that are conceptually related to each other and a specific type of flexibility or security. Then, it obtains statistically consistent aggregate measures for each driver and selects three drivers that represent the three corners of the Danish “golden triangle”: external numerical flexibility, employment security, and income security. It conducts an empirical analysis on the evolution of the selected flexicurity drivers over time and across European Union (EU) countries and on the relationship between selected flexicurity drivers and social outcomes from the Social Scoreboard of the European Pillar of Social Rights. It finds evidence of convergence on external numerical flexibility and polarization on employment and income security across the EU. It finds that higher flexibility at the onset of the crisis contributed to a reduction in the unemployment rates after the crisis, while a more generous welfare system contributed to reducing poverty. Employment security, however, appears to be linked to the presence of higher levels of income inequality after the crisis.

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## 1 Introduction

The concept of flexicurity was originally coined in the Netherlands in the mid-1990s. It referred to a policy strategy to modify job protection for workers on standard contracts and to improve job and income security for flexible workers on temporary contracts (Bredgaard, 2010; Wilthagen, 1998). In the early 2000s, the concept was adopted by Danish policymakers and academics to describe an internal labor market characterized by three elements: liberal dismissal protection, relatively generous unemployment benefit system, and active labor market policies (ALMPs)—or the “golden triangle” of flexicurity (Madsen, 1999, 2004).

Flexicurity as a policy strategy assumes that win–win combinations of flexibility for employers and security to workers can be achieved in the labor market. Under such premises, flexicurity came for several years to occupy a prominent position in political and academic debates at European Union (EU) level and is still playing an important role (Bekker, 2018; Bruttel and Sol, 2006; Jørgensen and Klindt, 2018). Unfortunately, many of the win–win beliefs underpinning flexicurity proposals have not been sufficiently substantiated by empirical analyses shedding light on the actual positive or negative outcomes of flexicurity policies (Keune and Serrano, 2014). In addition, there is a wide consensus among social partners in Europe that the recent crisis has paved the way for flexibilization policies in the labor market combined with shrinking security. The balance between flexibility and security, originally achieved in the Danish model, is tilting toward a gradual erosion of the institutions in charge of providing income and employment security (Madsen, 2013). The way in which the concept has evolved in practice has condemned the word flexicurity to distrust and very low popularity levels, especially among trade unions. As a result, flexicurity has become today a word with negative (“evil”) connotations.

Flexicurity is a complex and multifaceted phenomenon. There is not yet a sound and well-developed indicator framework to monitor this concept, which partly explains the scarcity of empirical analyses in the field (Chung, 2012). The European Commission has come forward with its indicator framework (EMCO, 2009), which draws upon four main flexicurity principles: flexible and reliable contractual agreements (FRCA), lifelong learning (LLL), ALMP, and modern social security (MSS). However, according to previous statistical assessments (Nardo and Rossetti, 2013; Domínguez-Torreiro and Casubolo, 2017), the correlation structure among the variables included in each of these four groups is neither sound nor robust. These results do not support the use of composite indicators to summarize the four principles outlined above.

Very often in the existing literature, methodological choices relating to the definition of flexicurity indicator frameworks are subjective or insufficiently explained (Maselli, 2010). These methodological choices include the selection of the variables populating the indicator framework, the interpretation of their positive or negative impact on flexibility and security dimensions, and the calculation of aggregate measures. As regards the latter, one of the drawbacks of using flexicurity aggregates or composite measures is that they might end up hiding and blurring situations of shrinking security at the expense of flexibility, as opposed to synergistic combinations of both.

As a way to overcome the limitations and caveats described above, in this work, we propose to build upon the flexicurity matrix outlined by Wilthagen and Tros (2004) to obtain indicators able to measure the three angles of the Danish Golden Triangle. The flexicurity matrix is

a theoretical construct that explicitly differentiates between flexibility and security categories. In our framework, we assume that the flexicurity variables considered might represent levels of flexibility from the point of view of employers and levels of security from the point of view of workers. In this light, the same variable can be assumed to have a positive impact on flexibility and a negative impact on security. As regards the grouping of variables, those variables that are conceptually and statistically related have been bundled together into flexicurity “drivers”. An aggregated value or composite indicator is calculated for each driver. Three categories are conceptually the same as the three angles of the Golden Triangle: external numerical flexibility, employment security, and income security. We build upon this intersection to unambiguously the concept of flexicurity and quantify it.

The main goal of this study is to define and use composite indicators as a means to reduce the dimensionality of the problem at hand. Using yearly data from 2005 to 2015 at EU countries level, first, we test for the statistical coherence of the flexicurity drivers. Second, we use flexicurity drivers to monitor the evolution of flexibility and security over time and across countries. Finally, given the importance of social issues in the current EU policy agenda (Bekker, 2018), we undertake an econometric analysis of the impact of flexicurity policies on social outcomes in the EU-28. Following Chung (2012), our empirical analysis focuses on the three main building blocks of the Danish “golden triangle” (numerical flexibility, employment security, and income security), and accordingly on the three flexicurity drivers that best represent those three building blocks. In summary, we obtain statistically consistent composite indicators that are measures of the three angles of the Golden Triangle and use them as explanatory variables of the econometric estimation.

Our econometric analysis is based on cross-section linear regression models. These models allow us to study the relationship between the drivers of the Golden Triangle and social outcomes. Social outcomes are defined in terms of variables included in the Social Scoreboard of the European Pillar of Social Rights (European Commission, 2017a): unemployment, early leavers from education, gender employment gap, income inequality, risk of poverty, and young people neither in employment nor in education. Our results corroborate previous findings of studies that highlight the role of passive and ALMPs in safeguarding social well-being (Berglund, 2015). In particular, selected employment security drivers have a significant positive contribution to social outcomes, such as the reduction of the share of population at-risk-of-poverty or social exclusion. Higher initial values in flexibility drivers at the onset of the crisis seem also to contribute to a reduction in the unemployment rates registered after the crisis. Higher-income security drivers contribute to reducing poverty. However, on a more negative note, employment security drivers appear to be linked to the presence of higher levels of income inequality after the crisis.

The remainder of the document is structured as follows. Section 2 discusses and explains how we operationalize the concept of flexicurity into flexibility and security drivers that can conceptually be inserted in the Golden Triangle. Section 3 describes the data, the statistical consistency of flexibility and security drivers, and analyzes how flexicurity has evolved at the country level over the period considered. Section 4 explains the estimation strategy and identifies the main flexicurity impacts on the key social outcomes. Section 5 discusses the results and conclusions.

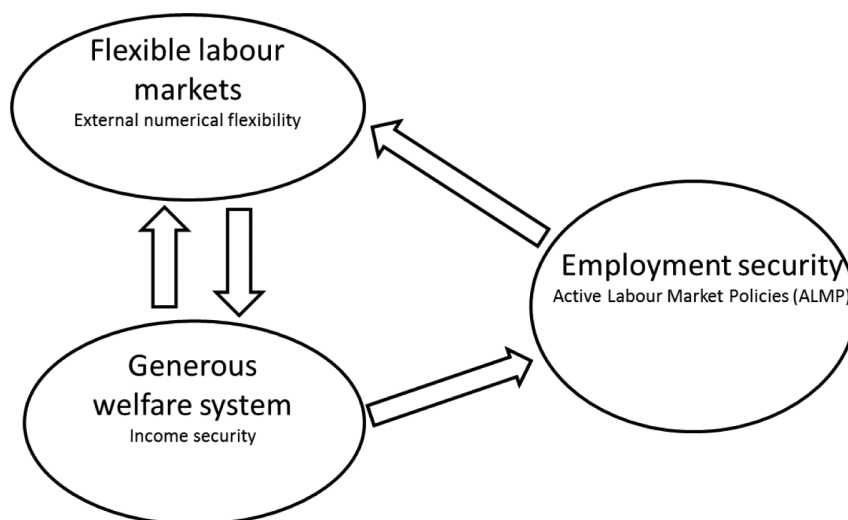
## 2 Conceptualization: the Golden Triangle and the flexicurity matrix

Empirical analyses so far have concluded that the grouping of variables along the categories proposed in the EMCO list to monitor flexicurity is not statistically consistent (Domínguez-Torreiro and Casubolo, 2017; Nardo and Rossetti, 2013). As a starting point, we propose to draw upon the Danish Golden Triangle and the “flexicurity matrix” (Wilthagen and Tros, 2004). The “flexicurity matrix” makes a distinction between four possible types of flexibility, namely external numerical, internal numerical, functional, and wage and four types of security, namely job, employment, income, and work–life balance. The Danish “golden triangle” model (Figure 1) simultaneously strengthens external numerical flexibility, income security, and employment security. The three building blocks in this golden triangle are expected to be reinforced with each other and lead to win–win situations in the labor market for both employers and workers. It simplifies the flexicurity concept and facilitates its statistical characterization, quantification, and insertion in statistical estimations to calculate its impact on social outcomes.

Table 1 summarizes the flexibility and security types in the flexicurity matrix. The third column includes our proposal of flexicurity drivers, covering a wide range of possible states, efforts, and outcomes in national labor markets, and establishing a link between the drivers and specific flexicurity categories. In this section, we motivate our selection of drivers from a conceptual point of view. The empirical analysis of the statistical coherence and robustness of the variables included in each driver, and the measures selected to measure the three building blocks of the Golden Triangle are discussed in Section 3.

As shown in Table 1, we consider the following four categories of flexibility:

- i. External–numerical flexibility refers to how easy hiring and firing is for employers. We propose several drivers related to the concept of external numerical flexibility:
  - The driver on EPL and tenure encompasses a broad range of regulatory issues, as well as aspects related to stability in the labor market. On the one hand, less



**Figure 1:** Matrix categories of the Danish golden triangle.

*Note:* Own elaboration, based on Madsen (1999).

**Table 1** Flexibility and security matrix: categories and drivers

| Flexicurity components                | Categories                     | Drivers  |
|---------------------------------------|--------------------------------|--|
| Flexibility                           | External numerical flexibility | Employment protection legislation (EPL) and tenure |
|                                       |                                | Job seekers  |
|                                       |                                | Public expenditure                                 |
|                                       |                                | Traps  |
| Internal numerical flexibility        | Functional flexibility         | Family and labor supply                            |
|                                       |                                | Low-wage supply                                    |
| Security                              | Wage flexibility               | Transitions  |
|                                       |                                | Working time                                       |
|                                       |                                | Human capital—lower education                      |
|                                       |                                | Human capital—higher education, LLL, and ALMP      |
| Job security                          | Employment security            | Competitive pay and labor cost                     |
|                                       |                                | EPL and tenure                                     |
|                                       |                                | Transitions and self-employment                    |
|                                       |                                | Involuntary part-time and temporary jobs           |
| Income security                       | Work-life balance              | Human capital—lower education                      |
|                                       |                                | Human capital—higher education, LLL, and ALMP      |
| Social security support               | Part-time and low wage         | Social security support                            |
|                                       |                                | In-work poverty                                    |
| Childcare, parenthood, and inactivity | Part-time and low wage         | Childcare, parenthood, and inactivity              |
|                                       |                                | Part-time and low wage                             |

stringent EPL increases flexibility. On the other hand, longer job tenures are expected to have a negative impact on flexibility. Longer tenures imply higher severance rights that make a worker less likely to quit a job or to be dismissed.

- The second driver deals with the composition of the pool of job seekers and potential job seekers. External numerical flexibility tends to be higher when the larger availability of unemployed workers in the labor market is searching for a job. Along the same lines, a higher share of involuntary part-time workers who would prefer to work full time also increases flexibility. Involuntary temporary workers who are looking for a permanent job usually play the role of active job seekers. Similarly, self-employed workers, who pay their social security and can be hired for very specific tasks, can be a flexible option for employers.
- Public expenditure in passive labor market policies (PLMPs), such as unemployment benefits, may have a negative influence on search behavior, which might result in lower effective labor supply and lower external flexibility. Moreover, passive policies might end up generating “traps”. Traps are situations in which workers find themselves better off receiving benefits while unemployed or inactive, rather than working for a low wage and paying taxes. This type of public expenditure combined with the presence of traps results in a reduction of flexibility.
- The interplay between labor and family life is also an important driver of external numerical flexibility. In the absence of proper support for childcare, parenthood and inactivity might be strongly correlated, in particular among women. In addition, workers with dependents other than children may also be forced to reduce their labor supply, which impacts negatively on hiring opportunities for employers.

- The concept of low-wage supply can also be linked to the role of PLMPs. When unemployment benefits are low or unavailable, those in unemployment will be forced to actively look for a job and accept almost any offer, even if the salary would be insufficient to allow them to escape from the risk of poverty.
  - As regards transitions and flexibility, any shift from temporary to permanent positions would have a negative impact on external numerical flexibility. A positive impact is expected for transitions to the same or higher qualification levels since there will be a larger supply of better-qualified workers with higher mobility.
- ii. Internal–numerical flexibility is linked to drivers relating to working time flexibility, to the variability in the number and distribution of working hours, and to how easy it is to adjust them to fit the employers' needs.
  - iii. Functional flexibility refers to the capacity to adapt swiftly the internal work organization to changes in demand. The main drivers in this area are those related to human capital. Human capital increases functional flexibility by narrowing the gap between the workers' skills and the skills demanded by firms reducing search frictions and making the market more flexible. Human capital is captured not only by secondary and tertiary educational attainment but also by LLL, continuous vocational training (CVT), and ALMPs.
  - iv. Wage flexibility and related drivers deal with the issue of flexible pay, which in turn is highly dependent on the labor market and competitive conditions.

Similarly, we distinguish between four types of security and related drivers:

- i. Job security revolves around the idea of lifetime employment. We identify up to three drivers connected to this particular type of security:
  - EPL and tenure have the opposite effect and interpretation in terms of job security than in terms of external numerical flexibility. From the worker's perspective, security is enhanced by stronger EPL and longer tenures.
  - Temporary and low-paid jobs might be used as a stepping stone toward more secure working conditions. The analysis of drivers reflecting transitions toward permanent contracts and higher salaries can shed light on this issue. Higher levels of self-employment are also assumed to reflect negatively upon the overall level of job security in the economy.
  - Finally, higher rates of involuntary uptake of part-time and temporary jobs will also be related to higher job insecurity.
- ii. Employment security refers to the probability of staying in employment during the entire career, but not necessarily in the same job with the same employer. Employment and reemployment opportunities are facilitated by the level of human capital acquired by the individual worker. We differentiate between two types of human capital linked to employment security: educational attainment levels and adult learning (LLL and ALMP). The latter is key to mitigate the damaging effect of longer unemployment spells in human capital and skills and increase employment security via increasing reemployment probabilities.
- iii. Income security relies heavily upon social security support, passive policies, and safety nets. On the other hand, income security is negatively affected by driving forces pulling down income security levels, such as the prevalence of in-work poverty.

- iv. Drivers of work–life balance (also called combination security) are related to the ease of combining work with childcare or other activities in private life. Public support for childcare and dependents makes it easier to combine work- and family-related obligations. The lack of public support might result in higher inactivity rates. Lack of public support might also become the main reason for parents to take up part-time jobs or to fall into a low-wage trap.

The problem with the matrix is that flexicurity becomes a too encompassing concept. The Danish Golden Triangle offers a more unambiguous understanding of flexicurity that facilitates statistical specification by focusing on external numerical flexibility, income security, and employment security. A labor market with higher external numerical flexibility is expected to facilitate hiring and subsequently to present higher employment rates and lower unemployment. But since external numerical flexibility also implies a lower level of protection against dismissals, a generous welfare system is needed to guarantee the income security of those made redundant. The sooner those unemployed find a new job, the lower the erosion of their human capital, and the lower the cost of public safety nets. Support for job seekers in the form of ALMP is also contemplated as a key driver of employment security in the golden triangle.

The virtual cycle spinning off the golden triangle is supposed to create positive spillovers on society as a whole, which goes beyond the employment and unemployment rates found in the labor market. In particular, it is expected to contribute to more general social outcomes, such as the reduction of poverty and inequality. The triangle is also assumed to foster positive impacts on specific social groups. For instance, reducing the number of young people neither in education nor in employment, or supporting the implementation of initiatives facilitating the combination of work and family life.

### 3 Data on flexicurity variables and drivers

In this section, we describe the data and the aggregation method that we have followed to combine the individual variables into flexicurity drivers. We use the EMCO list of flexicurity and job quality indicators (EMCO, 2009) to populate the different flexibility/security components, types, and drivers. Following the logic outlined in the previous section, we tentatively assign each indicator to the relevant driver and flexibility and security category. The expected sign of the contribution of each variable to flexibility and security is defined as the “direction” of the variable. For example, a higher score on the variable “EPL regular contracts” is expected to impact negatively on external numerical flexibility and to contribute positively to higher job security. We use pairwise correlations, principal component analysis (PCA) and reliability analysis (RA) to assess and validate the statistical coherence and robustness of the set of variables included in each of the drivers, and of the aggregate measures themselves (OECD, 2008). As is the case with every composite indicator, the drivers used in the analysis are aggregations of observable variables to quantify a single but multifaceted phenomenon that cannot be observed directly by researchers and policymakers. A descriptive analysis of the evolution of selected drivers over time is presented at the end of this section.



### 3.1 Combining individual variables into drivers

In our search for more parsimonious specifications, we have followed the approach of grouping individual variables into drivers. Aggregate scales have been calculated for each driver using the arithmetic average (with equal weights) of the underlying normalized variables. Tables 2 and 3 show the final list of variables used in the empirical analysis, broken down by the flexicurity category and driver. The statistical coherence of the drivers is analyzed using pairwise correlations and multivariate analysis (PCA and RA). Following the best practices from the literature (OECD, 2008), we first check the raw variables for the presence of outliers and then normalize them to render their values comparable. The “winsorization” approach has been used for treating outliers. Once the outliers have been treated, the resulting dataset has been normalized using linear min–max normalization, which rescales variables onto the 0–100 range while taking their expected direction into account. The next step involves analyzing the pairwise correlations across variables. Those variables with either too high, too low correlations or significantly negative correlations with the remaining variables in the same driver have been removed from the initial dataset. Removing redundant, “silent” and negatively correlated variables contributes to improving the statistical coherence of the resulting aggregates. From a policymaking perspective, the resulting aggregates (drivers) should facilitate comparisons and benchmark, provided that the aggregation process has been carried out in a way that prevents (or at least minimizes) the loss of information contained in the individual variables. Our approach improves previous attempts, such as Domínguez-Torreiro and Casubolo (2017), to obtain consistent and statistically coherent flexicurity composite indicators and scoreboards.

The grouping of variables into drivers as shown in Tables 2 and 3 is supported not only by pairwise correlations but also by the results of both the PCA and RA. Pairwise correlation analysis, PCA, and RA are presented in detail in Annex. In a nutshell, PCA confirms that the variables within each driver tend to share a single latent statistical dimension (eigenvalues for the first principal component in each driver are higher than unity). Cronbach’s  $\alpha$  values obtained for the drivers are also high, usually lies above the 0.65–0.70 threshold. Both results support the internal coherence and reliability of the drivers’ aggregate scales. In contrast, the available data do not support further aggregation of individual drivers into a single flexibility (security) aggregate scale. Low Cronbach’s  $\alpha$  values for the weighted average of flexibility (security) drivers suggest that they are capturing different underlying flexibility (security) phenomena.

### 3.2 Evolution of flexicurity drivers across countries

Aggregate measures have been calculated for each driver using arithmetic averages of the normalized scores of the individual indicators. The use of a linear aggregation formula with equal weights is recommended when all the indicators are assumed to be equally important, or when no statistical or empirical evidence supports a different scheme (Nardo et al., 2005), as it happens in our study. This approach is usually regarded as the simplest aggregation strategy, and therefore, it can be easily understood and reproduced by other researchers (Land, 2006). Moreover, the “substitutability” assumption inherent to the linear aggregation formula [i.e., the capacity to compensate high (low) values in one of the underlying components with low (high) values in another] seems to be perfectly aligned with the assumptions underpinning the

**Table 2** Indicators by flexibility category and driver

| Category and driver   | Indicators  | Direction |
|---|---|-----------|
| <b>External numerical flexibility</b>                                 |   |           |
| F.1. EPL and tenure (F'1)   | EPL regular contracts (FRCA_01_r)   | -         |
|   | EPL temporary contracts (FRCA_01_t)   | -         |
|   | Job tenure in years—Job duration (FRCA_20)  | -         |
| F.2. Job seekers  | Unemployment rate (ALMP_02)   | +         |
|   | Involuntary working on a temporary job (FRCA_11)  | +         |
|   | Involuntary working part-time (FRCA_12)   | +         |
|   | Diversity and reason for contractual and working arrangements—self-employed (FRCA_14)               | +         |
| F.3. Public expenditure   | Net replacement rate after 6 months (MSS_07)  | -         |
|   | PLMP expenditure on support per person in labor reserve (MSS_02)                                    | -         |
|   | Expenditure on PLMP as % GDP (MSS_03)   | -         |
|   | PLMP participants % of U (MSS_04)   | -         |
| F.4. Traps  | Unemployment trap (MSS_05)  | -         |
|   | Low wage trap (MSS_06)  | -         |
|   | Inactivity trap (WLB_03) <sup>1</sup>   | -         |
| F.5. Family and labor supply  | Employment impact of parenthood (WLB_04)  | -         |
|   | Lack of care for children and other dependents—Main reason for inactivity (WLB_07)                  | -         |
| F.6. Low-wage supply  | In-work at-risk-of-poverty (TSDSC320)   | +         |
|   | At-risk-of-poverty without dependent children no low-work intensity (TESSI122)                      | +         |
|   | A t-risk-of-poverty with dependent children no low-work intensity (ILC_PEES02)                      | +         |
|   | Net replacement rate after 5 years (MSS_08)   | -         |
| F.7 Transitions   | Transition from temporary to permanent—3-year average (FRCA_04)                                     | -         |
|   | Transition in labor status and pay levels—Same or higher qualification level (CLLL_06) <sup>2</sup> | +         |
| <b>Internal numerical flexibility</b>                                 |   |           |
| Working time  | <No EMCO indicator>   |           |
| <b>Functional flexibility</b>   |   |           |
| F.8. Human capital—lower education                                    | Percentage of the population having completed at least secondary education (TPS00065)               | -         |
|   | At least upper secondary educational attainment, age group 20–24 by sex (TPS00186)                  | +         |
| F.9. Human capital—higher education, LLL, and ALMP                    | LLL (age 25–64) (CLLL_01)   | +         |
|   | Public spending on human resources (CLLL_02)  | +         |
|   | Educational attainment—% aged 30–34 with tertiary educational attainment (CLLL_07)                  | +         |
|   | Expenditure on ALMP per person in labor service (ALMP_04)   | +         |
|   | Expenditure on ALMP as % GDP (ALMP_05)  | +         |
| Activation—LMP participants per 100 persons wanting to work (ALMP_06) | +   |           |
| <b>Wage flexibility</b>   |   |           |
| F.10. Competitive pay and labor cost                                  | Transitions by contract—Pay level (FRCA_06)   | -         |

<sup>1</sup> Between brackets variables names used in the Annexes. WLB refer to Work Life Balance, CLLL refers to Lifelong Learning and LTU to Long Term Unemployment, FRCA to Flexible and Reliable Contractual Agreements, ALMP to Active Labor Market Policies, and MSS to Modern Social Security (EMCO 2009). Reaming codes are Eurostat codes.

<sup>2</sup> Between brackets variables names used in the Annexes. WLB refer to Work Life Balance, CLLL refers to Lifelong Learning and LTU to Long Term Unemployment, FRCA to Flexible and Reliable Contractual Agreements, ALMP to Active Labor Market Policies, MSS to Modern Social Security. Reaming codes are Eurostat codes.

**Table 3** Indicators by security category and driver

| Category and driver                                      | Indicators  | Direction |
|--|---|-----------|
| <b>Job security</b>                                      |   |           |
| S.1. EPL and tenure                                      | EPL regular contracts (FRCA_01_r)   | +         |
|  | EPL temporary contracts (FRCA_01_t)   | +         |
|  | Job tenure in years—Job duration (FRCA_20)  | +         |
| S.2. Transitions and self-employment                     | Transition from temporary to permanent—3-year average (FRCA_04)                               | +         |
|  | Transitions by contract—Pay level (FRCA_06)   | +         |
|  | Diversity and reason for contractual and working arrangements—self-employed (FRCA_14)         | -         |
| S.3 Involuntary part-time and temporary jobs             | Diversity and reason for contractual and working arrangements—Involuntary part-time (FRCA_12) | -         |
|  | Diversity and reason for contractual and working arrangements—Involuntary temporary (FRCA_11) | -         |
| <b>Employment security</b>                               |   |           |
| S.4. Human capital—lower education                       | Early leavers from education and training (TSDSC410)  | -         |
|  | Percentage of the population having completed at least secondary education (TPS00065)         | +         |
|  | At least upper secondary educational attainment, age group 20–24 by sex (TPS00186)            | +         |
| S.5. Human capital—higher education, LLL, and ALMP (S´5) | LLL (age 25–64) (CLLL_01)   | +         |
|  | Public spending on human resources (CLLL_02)  | +         |
|  | Educational attainment—% aged 30–34 with tertiary educational attainment (CLLL_07)            | +         |
|  | Expenditure on ALMP as % GDP (ALMP_05)  | +         |
|  | Activation—LMP participants per 100 persons wanting to work (ALMP_06)                         | +         |
|  | Expenditure on ALMP per person in labor service (ALMP_04)                                     | +         |
|  | LTU <sup>1</sup> (% active population) (ALMP_01)  | -         |
| <b>Income security</b>                                   |   |           |
| S.6. Social security support                             | PLMP expenditure on support per person in labor reserve (MSS_02)                              | +         |
|  | Expenditure on PLMP as % GDP (MSS_03)   | +         |
|  | PLMP participants % of U (MSS_04)   | +         |
|  | Net replacement rate after 6 months (MSS_07)  | +         |
|  | Net replacement rate after 5 years (MSS_08)   | +         |
| S.7. In-work poverty                                     | At risk of poverty rate max secondary education (TSDSC420)                                    | -         |
|  | In work at risk of poverty (TSDSC320)   | -         |
|  | At risk of poverty without dependent children no low-work intensity (TESSI122)                | -         |
|  | At risk of poverty with dependent children no low-work intensity (ILC_PEES02)                 | -         |
|  | Inactivity trap (WLB_03)  | +         |
| <b>Work–life balance/combination security</b>            |   |           |
| S.8. Childcare, parenthood, and inactivity               | Childcare (WLB_02)  | +         |
|  | Employment impact of parenthood (WLB_04)  | -         |
|  | Lack of care for children and other dependents—the main reason for inactivity (WLB_07)        | -         |
| S.9. Part-time and low wage                              | Lack of care for children and other dependents—the main reason for part-time (WLB_06)         | -         |
|  | Low wage trap (MSS_06)  | -         |

<sup>1</sup> Between brackets variables names used in the Annexes. WLB refer to Work Life Balance, CLLL refers to Lifelong Learning and LTU to Long Term Unemployment, FRCA to Flexible and Reliable Contractual Agreements, ALMP to Active Labor Market Policies, MSS to Modern Social Security. Remaining codes are Eurostat codes.

flexicurity conceptual framework, that is, the possibility to trade-off higher levels of flexibility for lower levels of security (OECD, 2008).

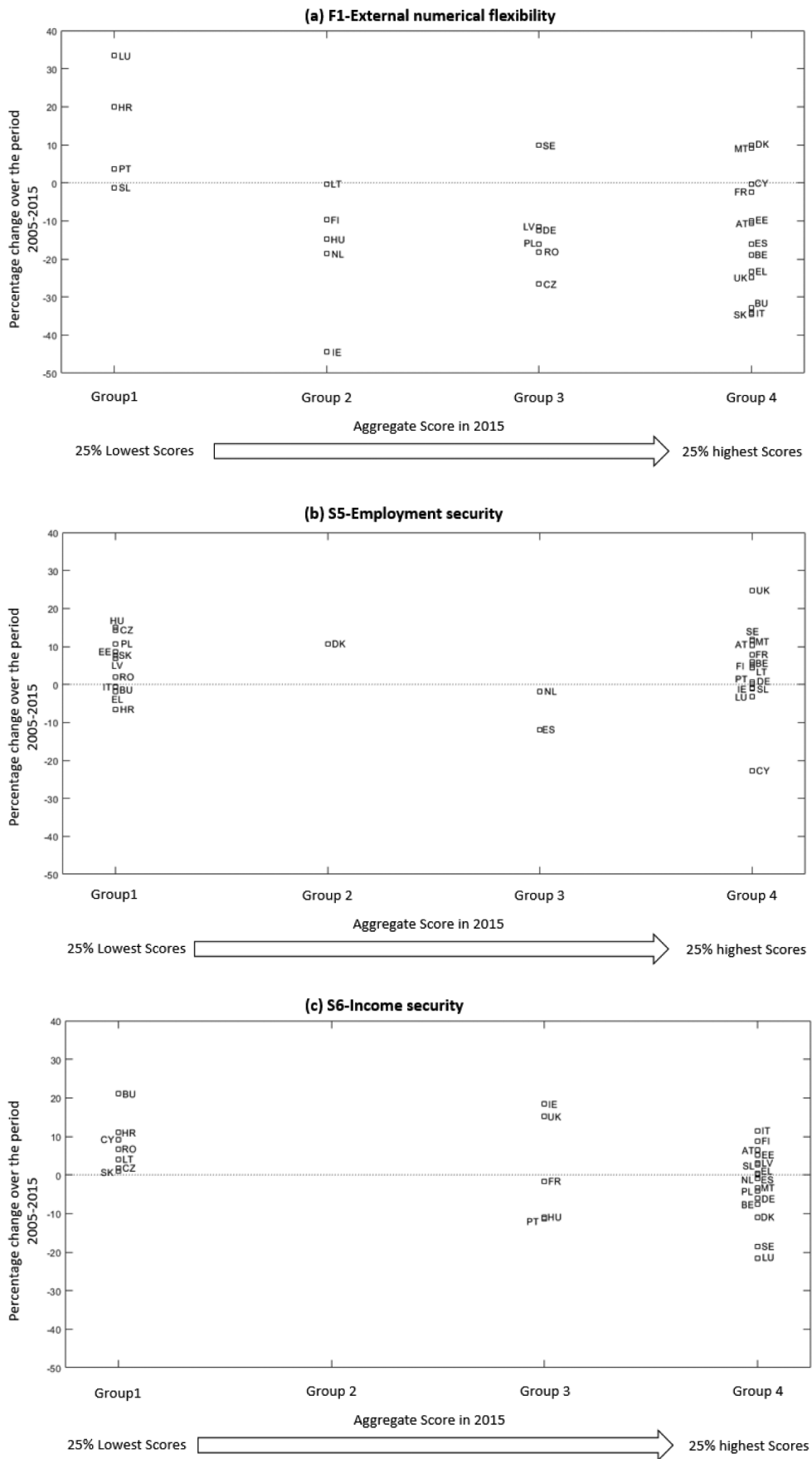
For the sake of parsimony, in our empirical analyses below, we focus on three of these measures, those most related to the building blocks of the golden triangle conceptual framework: external numerical flexibility, income security, and employment security. As a measure of external numerical flexibility, we use the driver F1, defined in Table 2. As measures of employment security and income security, we have selected the drivers S5 and S6 from Table 3.<sup>1</sup> These drivers allow us to summarize complex and heterogeneous phenomena occurring over time and across countries concisely and straightforwardly.<sup>2</sup>

The evolution of these three drivers overtime for the EU-28 countries is presented in Figure 2. Countries are classified into four groups in the horizontal axis, according to the aggregate score for each driver in the year 2015, from the lowest 25% (left-hand side of the horizontal axis) to the top 25% (right-hand side of the horizontal axis). The vertical axis represents the percentage change in the aggregate normalized scores calculated for each driver over the period 2005–2015. For example, Luxembourg belongs to the group of low performers in 2015 in F1. At the same time, it presents a positive evolution over the period 2005–2015, with an increase in the normalized scores for the driver F1, well above 30 points.

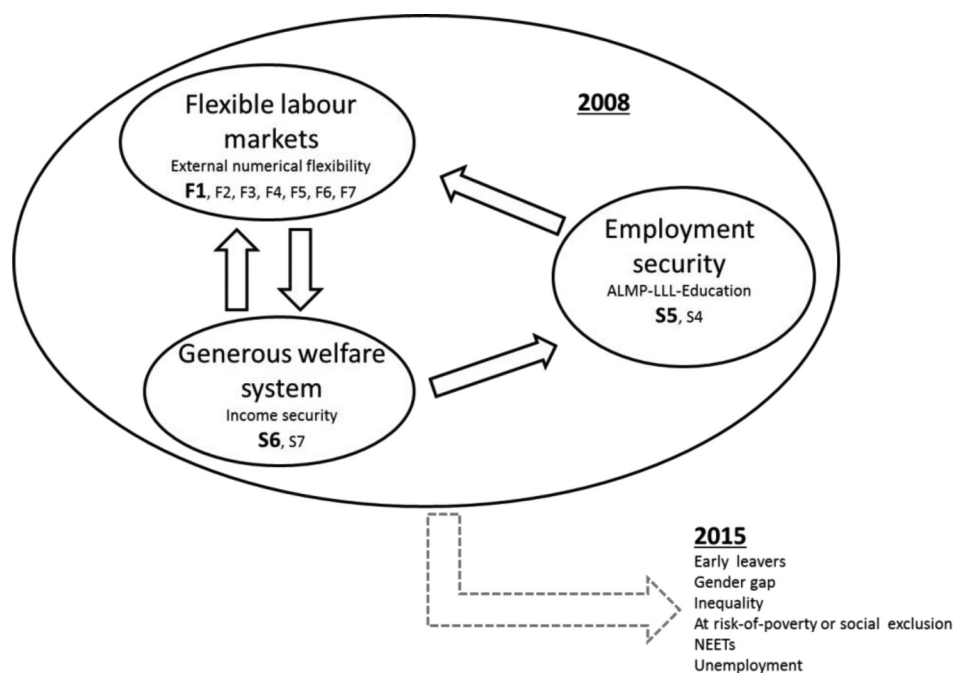
The most salient feature found in Figure 2 is the highly heterogeneous behavior across countries and drivers. Starting with F1, on the one hand, the countries presenting the lowest scores in 2015 are those that have increased their values the most over the period 2005–2015. On the other hand, most countries showing the highest scores in 2015 reduced their score over the period. This fact is indicative of an overall convergence in terms of our driver of external numerical flexibility. Remarkably, Slovenia is the only country presenting a low performance in 2015 coupled with a negative evolution since 2005. Conversely, Malta and Denmark are not only in the group of best performers in 2015 but also they have improved their scores when compared to 2005. In terms of S5, certain polarization is observed as countries tend to concentrate on the groups with the lowest and highest scores. Bulgaria, Italy, Greece, and Croatia belong to the group with the lowest scores of S5 in 2015 and show a negative evolution of their scores compared to 2005. In the group of top performers, Cyprus stands out due to its sheer drop in the employment security driver over the period considered. When looking at the results corresponding to S6, countries are also polarized in the groups with the lowest and highest scores. All the countries in the top group of lowest scores in 2015 have also experienced an increase over the period considered. The evolution of the countries in the top group of the highest scores for S6 is mixed. We find countries that have improved the score with respect to 2005 (e.g., Italy, Finland, and Austria), while others have worsened since then (e.g., Denmark,

1 The analysis is constrained to these three drivers to avoid the problem of “indicator shopping” (Anderson and Maibom, 2018). Moreover, in the econometric analyses performed in the next section, it is necessary to keep a reduced number of explanatory variables to ensure reliable estimates (i.e., to guarantee sufficient degrees of freedom).

2 Despite their statistical consistency and coherence, some drivers can be criticized because they include both empirical measures (such as job tenure and LTU) and institutional measures (such as EPL). This is the case of F1 and S5. To evaluate the sensitivity of our results to this concern, we have calculated alternative measures of F1 and S5. F1' is the result of calculating F1 without including job tenure. S5' is the result of calculating S5 without LTU. There is no S6' because S6 is composed only by institutional measures. This way we obtain purely institutional measures of the Danish Triangle corners. From a labor market perspective, this sensitivity test allows exploration of the importance of institutional determinants of social outcomes once the labor market path dependencies have been removed. Our results allow us to conclude that our findings are not sensitive to the construction of the drivers. For the sake of brevity, we do not display in our manuscript the results with the measures S5' and F1', but they are available under request.



**Figure 2:** EU-28 performance over 2005–2015 in the golden triangle drivers.



**Figure 3:** Golden Triangle underlying the linear regression models.

Source: Own elaboration.

Sweden, and Luxembourg). It is worth noting than in the case of Austria and Finland, these two countries show a similar pattern of behavior in both S5 and S6: top performers in 2015, and a positive evolution for both drivers when compared to their initial scores in 2005.

## 4 Econometric analyses: social outcomes and flexicurity drivers

### 4.1 Estimation strategy and econometric specification

In this section, we explore the relationship between flexicurity drivers and social performance. We check the hypothesis of whether the golden triangle drivers measured at the onset of the crisis in 2008 had a significant impact on the social performance of the EU-28 countries in the year 2015 (latest available data at the time of this study) (Figure 3). We base our results on cross-sectional linear regression models estimated by ordinary least squares (OLS). This econometric approach is suitable for the analysis of policies that have substantial impacts on the long term but only quite small effects in the short run. This is precisely the case of flexicurity-related policies, such as ALMP (European Commission, 2017b). In addition, the complexity of economic processes and the importance of economic structures and path dependence make cross-sectional models very useful to mitigate possible problems of endogeneity.<sup>3</sup>

Based on the conceptual framework described above, we specify the following linear regression model for the econometric analysis:

<sup>3</sup> Endogeneity is a challenging issue to cope with in applied econometrics (Dall'erba and Le Gallo, 2008). The problem is partly mitigated when, as it is our case, the explanatory variables are measured at the beginning of the sample period (Fukuda, 2012; Crespo-Cuaresma et al., 2014). Moreover, it is widely recognized that the use of cross-sectional linear models with lag values of the explanatory variables as instruments of their current values is a valid strategy to alleviate the problem of endogeneity and double causality when there is not a long list of likely instruments to choose from (Peiró-Palomino and Tortosa-Austina, 2015).

**Table 4** Explained variables included in the econometric analysis

| Social outcomes (dependent variables) |   |   |  |
|---------------------------------------|---|---|--|
| Variable                              | Concept   | Definition  | Source   |
| Y <sub>1</sub>                        | Early leavers from education and training                     | Percentage of the population between 18 and 24-year-old with at most secondary education who were not in further education or training during the last 4 weeks preceding the survey in 2015 | Social Scoreboard for the European Pillar of Social Rights ( <a href="https://composite-indicators.jrc.ec.europa.eu/social-score-board/">https://composite-indicators.jrc.ec.europa.eu/social-score-board/</a> ) |
| Y <sub>2</sub>                        | Gender gap  | Difference between the employment rates of men and women of working age in 2015   |  |
| Y <sub>3</sub>                        | Income inequality   | The ratio of total income received by the 20% of the population with the highest income over the income received by the 20% of the population with the lowest levels of income in 2015      |  |
| Y <sub>4</sub>                        | At risk of poverty or social exclusion (AROPE)                | Percentage of the population who is either at risk of poverty or social exclusion (severely deprived or living in a household with low work intensity in 2015                               |  |
| Y <sub>5</sub>                        | Young people not in education, employment, or training (NEET) | Percentage of young people aged between 15- and 24-year-old who are neither working nor studying or doing a training job in 2015  |  |
| Y <sub>6</sub>                        | Unemployment rate   | Unemployed people as a percentage of the labor force in 2015  |  |

**Table 5** Independent variables included in the econometric analysis

| Flexicurity measures and controls (explanatory variables) |          |                 |   |   |  |                 |
|---|----------|-----------------|---|---|--|-----------------|
| Matrix  | Variable | Concept         | Definition  | Source  |  |                 |
| Flexicurity   | X        | Flexibility     | F1  | External numerical flexibility in the labor market                            | The aggregated value of the driver “ <i>EPL and tenure</i> ” in 2008       | Own elaboration |
|   |          |                 | Security  | S5  | Employment security  |                 |
|   | S6       | Income security |   | The aggregated value of the driver “ <i>Social security support</i> ” in 2008 |  |                 |
| Control   | C        | L               | Lagged dependent variable   | Value of the dependent variable in 2008                                       | Social Scoreboard for the European Pillar of Social Rights                 |                 |
|   |          |                 | ln(GDP)   | GDP per capita  | Natural <i>logarithm</i> of <i>GDP per capita in 2008</i>                  | Eurostat        |
|   |          |                 | vGDP  | Economic growth   | The annual average growth rate of GDP per capita over the period 2008–2015 |                 |
| Outliers  | D        | Country dummies | Dummy for each country detected as outlier according to the DFFIT <sup>1</sup> analysis | Own elaboration   |  |                 |

<sup>1</sup> The definition of DFFITS is “Difference in Fits”. Therefore, the footnote 5 on page 15 (line 42) should start in the following way: “The detection of outliers is based on the Difference in Fits (DFFITS) analysis”.

$$Y_{2015} = X_{2008} \beta + C_{2008} \gamma + D\delta + \varepsilon_{2015} \quad (1)$$

where Y, the set of dependent variables, refers to social outcomes for EU-28 countries listed in 2015 and defined in Table 4. Therefore, we formulate and estimate six regressions models for

evaluating the effect of the flexicurity drivers on each one of the social outcomes represented in  $Y$ .<sup>4</sup>

Table 5 provides information about the independent variables grouped in the matrices  $X$ ,  $C$ , and  $D$ . The three flexicurity drivers (F1, S5, and S6) selected to represent the three vertices of the golden triangle (flexible labor markets, employment security, and income security, respectively) are included in  $X$ .  $C$  contains a set of control variables that contribute to obtaining more reliable and robust estimates of the relationship of flexicurity drivers and socioeconomic outcomes. As control variables, we include the lagged value of the dependent variable ( $L$ ) to account for historical factors that are omitted in our model (Wooldridge, 2012). The logarithm of GDP per capita ( $\ln\_GDP$ ) controls for differences in wealth across countries. The annual average growth rate of GDP per capita controls for heterogeneity in the economic situation for each country ( $vGDP$ ). The variables in  $X$  and  $C$  are evaluated in the year 2008—except for  $vGDP$  which, by definition, is calculated as the annual average growth rate in the period 2008–2015. We also use country dummies to control for the outliers identified in the estimation process.<sup>5</sup> These dummies, included in matrix  $D$ , reduce the possible bias caused by omitted country-specific variables. Finally, and according to the postulates of the classical regression model,  $\varepsilon$  is the disturbance term which is assumed to be an independent and identically distributed (*i.i.d.*) random variable.

The validity of our modeling specification and the robustness of our estimates rely upon the fulfillment of the underlying assumptions of the classical linear regression model (Wooldridge, 2012). We use several diagnostic measures to validate our estimated models. First, we employ goodness of fit measure (the adjusted  $R^2$ ) to summarize the discrepancies between the observed values and the estimated values. Second, we apply the Breusch–Godfrey Lagrange Multiplier (LM) test and the Ljung–Box (L-B) test to detect any significant serial correlation in the estimated residuals. Third, we use the Breusch–Pagan–Godfrey (B-G-P) test and the White test to check the hypothesis of homoscedasticity. We run the Jarque–Bera test to validate the null hypothesis of normality in the distribution of the residuals. Finally, we employ the Ramsey’s RESET Test to check our model specification, that is, whether the linear functional form is correct and relevant variables are not omitted in the model.

## 4.2 Econometric results

The upper part of Table 6 shows the estimated coefficients for the independent variables in the models, which correspond to the six social outcomes selected for this study. The first finding to be underlined is the positive and statistically significant effect of the lagged value of each social outcome at the onset of the crisis ( $L$ ) on its corresponding value in 2015. This result indicates the presence of path dependence or a persistent effect on the evolution of social outcomes: the past value of each social outcome has a significant impact on its future value.

4 Before estimating our econometric models, missing values have been imputed for the social outcome variables, as well as for the normalized variables underlying the flexicurity drivers. The “Amelia II” software package (Honaker et al., 2011) has been used to impute the missing values in our data set. More precisely, missing data have been filled in taking advantage of the cross-section time-series functionality of the software.

5 The detection of outliers is based on the DFFFIT analysis. First, we estimated the Eq. (1) without country dummies, and computed the DFFITS to detect influential observations in the regression. Then, outliers are defined as those observations for which the value of the DFFITS is greater than  $2(P/N)^{1/2}$ , where  $P$  is the number of parameters to be estimated and  $N$  the number of observations.



**Table 6** Results of the OLS regression over the period 2008–2015

|   |             |                     |                   | Social outcomes     |              |              |              |              |               |
|---|-------------|---------------------|-------------------|---------------------|--------------|--------------|--------------|--------------|---------------|
| Variables                               |             |                     |                   | $Y_{1,2015}$        | $Y_{2,2015}$ | $Y_{3,2015}$ | $Y_{4,2015}$ | $Y_{5,2015}$ | $Y_{6,2015}$  |
| Constant                                |             |                     |                   | 11.479              | -6.677       | 2.192        | -22.675      | 7.589        | 18.015        |
| Flexicurity                             | Flexibility | External numerical  | $F_{1,2008}$      | 0.004               | 0.039        | -0.006       | -0.035*      | -0.023       | -0.061*       |
|   | Security    | Employment security | $S_{5,2008}$      | -0.048              | -0.009       | 0.023*       | 0.067        | 0.001        | 0.0773        |
|   |             | Income security     | $S_{6,2008}$      | 0.055**             | -0.018       | -0.013       | -0.063*      | -0.014       | -0.046        |
| Control variables                       |             |                     | $L_{2008}$        | 0.553***            | 0.843***     | 1.159***     | 1.021***     | 1.056***     | 0.695***      |
|   |             |                     | $\ln\_GDP_{2008}$ | -0.946              | 0.323        | -0.279       | 2.435        | -0.403       | -1.035        |
|   |             |                     | $vGDP_{08-15}$    | 6.200**             | 5.613        | -0.348       | -7.904       | -4.549**     | -15.781***    |
|   |             |                     |                   | Diagnostic checking |              |              |              |              |               |
| Adjusted $R^2$                          |             |                     |                   | 0.91                | 0.88         | 0.86         | 0.87         | 0.83         | 0.83          |
| Heterocedasticity                       |             | B-P-G test          |                   | 0.65 (0.74)         | 0.99 (0.47)  | 1.329 (0.29) | 0.537 (0.84) | 0.546 (0.79) | 1.399 (0.26)  |
|   |             | White test          |                   | 0.753 (0.66)        | 0.62 (0.75)  | 1.330 (0.29) | 0.449 (0.90) | 0.595 (0.75) | 0.939 (0.52)  |
| Autocorrelation                         |             | LM test             |                   | 0.008 (0.93)        | 0.41 (0.53)  | 0.007 (0.94) | 0.013 (0.91) | 0.653 (0.43) | 0.005 (0.94)  |
|   |             | L-B test            |                   | 0.012 (0.91)        | 0.51 (0.48)  | 0.008 (0.93) | 0.018 (0.89) | 0.630 (0.43) | 0.008 (0.93)  |
| Normality (Jarque–Bera test)            |             |                     |                   | 0.581 (0.75)        | 0.43 (0.81)  | 0.830 (0.66) | 4.437 (0.11) | 0.802 (0.67) | 1.680 (0.43)  |
| Model specification (Ramsey Reset Test) |             |                     |                   | 0.113 (0.91)        | 0.42 (0.68)  | 0.914 (0.37) | 0.217 (0.83) | 1.110 (0.28) | 1.940* (0.07) |

\*, \*\*, \*\*\*Statistically significant at the 10, 5, and 1% levels, respectively.

The economic growth over the period 2008–2015, measured by the GDP per capita growth rate ( $vGDP$ ), has a negative and significant impact on the 2015 values of the percentage of NEETs ( $Y_5$ ) and level of unemployment ( $Y_6$ ). Conversely, the impact of  $vGDP$  on early leavers from education and training ( $Y_1$ ) is significantly positive. The sign and significance of the estimated coefficients are in line with the usual economic assumptions. For instance, economic growth is expected to increase the demand for labor in the job market and to create new job opportunities. This will lead to a reduction in unemployment rates. At the same time, economic growth and job opportunities may pave the way for NEETs by raising the opportunity cost of education. As a result, the younger cohorts have less of an incentive to continue studying, thus increasing the rate of early leavers.

Another relevant result is the non-significance of the coefficients associated with wealth in the economy, as measured by the logarithm of GDP per capita ( $\ln\_GDP$ ). Differences in wealth across countries in 2008 do not seem to have a statistically significant impact on the social outcomes observed in 2015.

Regarding the flexicurity drivers included in our model, countries with higher external numerical flexibility in their labor markets in 2008 as measured by  $F1$  tend to have lower levels of unemployment ( $Y_6$ ) and people at risk of poverty or social exclusion ( $Y_4$ ) in 2015. Our results suggest that flexibility might facilitate hiring by employers and subsequently contribute to a reduction in unemployment rates and poverty. However, higher flexibility does not have a significant impact on inequality levels, early leavers, NEETs, or gender gap.

The employment security driver (S5) is found to have a significantly positive impact on the levels of income inequality ( $Y_3$ ). Eligibility criteria and participation in LLL programs or ALMP may contribute to explain this result. Depending on their design, these programs may benefit workers at the higher end of the wage distribution rather than low-paid, low-educated workers, and the unemployed. Microeconomic evaluation of the impact of these policies could contribute to shed some light on this issue, but it is beyond the scope of this study.

Finally, our proxy for income security (S6) has a negative and significant impact on the percentage of people at risk of poverty or social exclusion ( $Y_4$ ). At the same time, it exerts a significant and positive impact on the levels of early leavers ( $Y_1$ ). These two opposite impacts reflect the pros and cons of passive policies. On the one hand, safety nets and higher-income security lead to a reduction in poverty. On another hand, the presence of safety nets minimizes the opportunity cost of dropping out from school and entering the labor force.

The lower part of Table 6 presents the results of the diagnostic checking of our models. The goodness of fit and the diagnosis of the residuals support the adequacy of our model specifications and the reliability of our estimates. The adjusted  $R^2$  is high for all the estimated models, ranging from a value of 0.83 in the models corresponding NEETs ( $Y_5$ ) and unemployment ( $Y_6$ ), to 0.91 in the case of early leavers ( $Y_1$ ). The high goodness of fit indicates that the estimated models can explain most of the variability observed in the dependent variables. The diagnostic checking does not detect any problem of serial correlation or heteroscedasticity in the residuals of the model, which implies that the OLS estimates in the regression models are efficient. Moreover, the Jarque–Bera test does not reject the null hypothesis that the residuals are normally distributed for any of the regressions. Ramsey’s RESET test does not reveal any problem of neglected nonlinearities at a 5% level of significance for any of the specifications.

## 5 Conclusions and discussion

From the Danish “golden triangle” perspective, flexicurity is the combination of liberal dismissal protection, relatively generous unemployment benefit system, and ALMPs. Flexicurity has been fostered as a policy strategy at the EU level due to its potential to result in win–win situations: more flexibility for employers and more security to workers. However, flexicurity proposals have not been sufficiently substantiated by empirical analyses. Several reasons are explaining this situation. First, flexicurity is a complex and multifaceted phenomenon without a sound and well-developed monitoring framework. Second, many flexicurity-related indicators have a positive impact on flexibility while negative ones on security. Finally, the conceptual grouping of the indicators included in the EMCO list lacks statistical soundness and robustness. Against this backdrop, we put forward a proposal of a more conceptually and statistically consistent indicator framework and conduct an empirical analysis of the links between flexicurity policies and economic outcomes.

Our indicator framework builds upon the Wilthagen and Tros (2004) flexicurity matrix that explicitly differentiates between four types of flexibility and four types of security. Flexibility and security indicators are contemplated from the point of view of employers and workers, respectively. Furthermore, we construct flexicurity “drivers” by pooling together variables that are conceptually related to each other and a specific type of flexibility or security. Finally, we obtain statistically consistent aggregate measures for each driver. Three flexicurity drivers

have been chosen to represent the flexibility and security types that constitute the three main building blocks of the Danish “golden triangle”: external numerical flexibility, employment security, and income security. To represent external numerical flexibility, we use the driver F1, which includes EPL and tenure. For employment security, we use the driver F5, which includes human capital acquired from educational attainment levels, adult learning (LLL and ALMP), and the negative impact of LTU on human capital. For income security, we use the driver S6, which includes passive policies and net replacement rates.

Using yearly data from 2005 to 2015, we monitor the evolution of these three drivers over time and across EU countries. The observed patterns of behavior are highly heterogeneous across countries and drivers. There is a convergence in terms of external numerical flexibility (F1), since the countries with the lower scores in 2015 are those increasing their values the most over the period 2005–2015, while the opposite is true for most of the countries with the highest scores in 2015. As regards employment security (S5), country scores tend to be polarized, that is, clustered around either the lowest or the highest scores. Finally, EU countries also appear to be polarized to a certain extent with regards to income security (S6). However, the evolution of the top-performing countries in 2015 is somewhat mixed. Among the top performers, some have improved their S6 score with respect to 2005 (e.g., Italy, Finland, and Austria), while others have worsened (e.g., Denmark, Sweden, and Luxembourg).

Our econometric analysis delves into the relationship between selected flexicurity drivers and selected social outcomes included in the Social Scoreboard of the European Pillar of Social Rights. The initial conditions in each country are measured by the levels of flexicurity drivers F1, S5, and S6 in 2008. Social scoreboard variables gauge country performance in terms of social outcomes after the crisis. Empirical evidence from the econometric analysis shows that selected flexibility and security drivers have a significant positive contribution to social outcomes, such as the reduction of the share of population at-risk-of-poverty or social exclusion. Higher initial values in flexibility drivers at the onset of the crisis contributed to a reduction in the unemployment rates after the crisis. As expected, a more generous welfare system reduced poverty. However, on a more negative note and contrary to expectations, employment security drivers appear to be linked to the presence of higher levels of income inequality after the crisis. Altogether, the results above support only partially the win–win beliefs of flexicurity proponents. However, they also call for further research on design and access to ALMPs, education, and training.

#### **Declarations**

##### **Availability of data and material**

Data are available under request at [pablo.depedraza@ec.europa.es](mailto:pablo.depedraza@ec.europa.es) and [pablodepedraza@usal.es](mailto:pablodepedraza@usal.es). The empirical analysis had been performed using Excel, Stata, and Matlab.

##### **Competing interest**

The authors declare that they have no competing interests. The scientific output expressed does not imply a policy position of the European Commission. Neither the European Commission nor any person acting on behalf of the Commission is responsible for the use, which might be made of this publication.

##### **Authors' contributions**

The three authors have equally contributed to the paper and participated in every step from the initial developments of the idea to calculations and final writing. PP has coordinated the work and led conceptual

grouping of indicators and writing. MA-D has led econometric analyses. MD-T has led indexes calculation and their statistical coherence.

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**Annex A3** Flexibility drivers—PCA and Cronbach's  $\alpha$  results

Group 1# FRCA\_01\_r FRCA\_01\_t FRCA\_20

|                       | PC1   | PC2   | PC3   |
|-----------------------|-------|-------|-------|
| SS loadings           | 1.673 | 0.757 | 0.570 |
| Proportion Var        | 0.558 | 0.252 | 0.190 |
| Cumulative Var        | 0.558 | 0.810 | 1.000 |
| Proportion explained  | 0.558 | 0.252 | 0.190 |
| Cumulative proportion | 0.558 | 0.810 | 1.000 |

Cronbach's  $\alpha$ : 0.61

Group 2# ALMP\_02 FRCA\_11 FRCA\_12 FRCA\_14

|                       | PC1   | PC2   | PC3   | PC4   |
|-----------------------|-------|-------|-------|-------|
| SS loadings           | 2.479 | 0.693 | 0.497 | 0.331 |
| Proportion Var        | 0.620 | 0.173 | 0.124 | 0.083 |
| Cumulative Var        | 0.620 | 0.793 | 0.917 | 1.000 |
| Proportion explained  | 0.620 | 0.173 | 0.124 | 0.083 |
| Cumulative proportion | 0.620 | 0.793 | 0.917 | 1.000 |

Cronbach's  $\alpha$ : 0.80

Group 3# MSS\_07 MSS\_02 MSS\_03 MSS\_04

|                       | PC1   | PC2   | PC3   | PC4   |
|-----------------------|-------|-------|-------|-------|
| SS loadings           | 3.010 | 0.531 | 0.341 | 0.118 |
| Proportion Var        | 0.752 | 0.133 | 0.085 | 0.030 |
| Cumulative Var        | 0.752 | 0.885 | 0.970 | 1.000 |
| Proportion explained  | 0.752 | 0.133 | 0.085 | 0.030 |
| Cumulative proportion | 0.752 | 0.885 | 0.970 | 1.000 |

Cronbach's  $\alpha$ : 0.89

Group 4# MSS\_05 MSS\_06 WLB\_03

|                       | PC1   | PC2   | PC3   |
|-----------------------|-------|-------|-------|
| SS loadings           | 1.989 | 0.577 | 0.434 |
| Proportion Var        | 0.663 | 0.192 | 0.145 |
| Cumulative Var        | 0.663 | 0.855 | 1.000 |
| Proportion explained  | 0.663 | 0.192 | 0.145 |
| Cumulative proportion | 0.663 | 0.855 | 1.000 |

(Continued)



Cronbach's  $\alpha$ : 0.70

Group 6# JQ\_1 JQ\_3 JQ\_5 MSS\_08

|                       | PC1   | PC2   | PC3   | PC4   |
|-----------------------|-------|-------|-------|-------|
| SS loadings           | 2.713 | 0.755 | 0.373 | 0.160 |
| Proportion Var        | 0.678 | 0.189 | 0.093 | 0.040 |
| Cumulative Var        | 0.678 | 0.867 | 0.960 | 1.000 |
| Proportion explained  | 0.678 | 0.189 | 0.093 | 0.040 |
| Cumulative proportion | 0.678 | 0.867 | 0.960 | 1.000 |

Cronbach's  $\alpha$ : 0.83

Group 9# CLLL\_01 CLLL\_02 CLLL\_07 ALMP\_04 ALMP\_05 ALMP\_06

|                       | PC1   | PC2   | PC3   | PC4   | PC5   | PC6   |
|-----------------------|-------|-------|-------|-------|-------|-------|
| SS loadings           | 3.359 | 1.200 | 0.674 | 0.383 | 0.240 | 0.144 |
| Proportion Var        | 0.560 | 0.200 | 0.112 | 0.064 | 0.040 | 0.024 |
| Cumulative Var        | 0.560 | 0.760 | 0.872 | 0.936 | 0.976 | 1.000 |
| Proportion explained  | 0.560 | 0.200 | 0.112 | 0.064 | 0.040 | 0.024 |
| Cumulative proportion | 0.560 | 0.760 | 0.872 | 0.936 | 0.976 | 1.000 |

Cronbach's  $\alpha$ : 0.83

**Annex A4** Security drivers—PCA and Cronbach's  $\alpha$  results

| Group 1# FRCA_01_r FRCA_01_t FRCA_20                             |       |       |       |       |       |       |       |
|--|-------|-------|-------|-------|-------|-------|-------|
|  | PC1   | PC2   | PC3   |       |       |       |       |
| SS loadings  | 1.673 | 0.757 | 0.570 |       |       |       |       |
| Proportion Var   | 0.558 | 0.252 | 0.190 |       |       |       |       |
| Cumulative Var   | 0.558 | 0.810 | 1.000 |       |       |       |       |
| Proportion explained   | 0.558 | 0.252 | 0.190 |       |       |       |       |
| Cumulative proportion  | 0.558 | 0.810 | 1.000 |       |       |       |       |
| Cronbach's $\alpha$ : 0.61                                       |       |       |       |       |       |       |       |
| Group 2# FRCA_04 FRCA_06 FRCA_14                                 |       |       |       |       |       |       |       |
|  | PC1   | PC2   | PC3   |       |       |       |       |
| SS loadings  | 1.641 | 0.746 | 0.613 |       |       |       |       |
| Proportion Var   | 0.547 | 0.249 | 0.204 |       |       |       |       |
| Cumulative Var   | 0.547 | 0.796 | 1.000 |       |       |       |       |
| Proportion explained   | 0.547 | 0.249 | 0.204 |       |       |       |       |
| Cumulative proportion  | 0.547 | 0.796 | 1.000 |       |       |       |       |
| Cronbach's $\alpha$ : 0.58                                       |       |       |       |       |       |       |       |
| Group 4# JQ_10 JQ_11 JQ_12                                       |       |       |       |       |       |       |       |
|  | PC1   | PC2   | PC3   |       |       |       |       |
| SS loadings  | 2.595 | 0.285 | 0.120 |       |       |       |       |
| Proportion Var   | 0.865 | 0.095 | 0.040 |       |       |       |       |
| Cumulative Var   | 0.865 | 0.960 | 1.000 |       |       |       |       |
| Proportion explained   | 0.865 | 0.095 | 0.040 |       |       |       |       |
| Cumulative proportion  | 0.865 | 0.960 | 1.000 |       |       |       |       |
| Cronbach's $\alpha$ : 0.92                                       |       |       |       |       |       |       |       |
| Group 5# CLLL_01 CLLL_02 CLLL_07 ALMP_05 ALMP_06 ALMP_04 ALMP_01 |       |       |       |       |       |       |       |
|  | PC1   | PC2   | PC3   | PC4   | PC5   | PC6   | PC7   |
| SS loadings  | 3.575 | 1.206 | 0.918 | 0.590 | 0.378 | 0.191 | 0.141 |
| Proportion Var   | 0.511 | 0.172 | 0.131 | 0.084 | 0.054 | 0.027 | 0.020 |
| Cumulative Var   | 0.511 | 0.683 | 0.814 | 0.899 | 0.953 | 0.980 | 1.000 |
| Proportion explained   | 0.511 | 0.172 | 0.131 | 0.084 | 0.054 | 0.027 | 0.020 |
| Cumulative proportion  | 0.511 | 0.683 | 0.814 | 0.899 | 0.953 | 0.980 | 1.000 |
| Cronbach's $\alpha$ : 0.83                                       |       |       |       |       |       |       |       |

(Continued)

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Group 6# MSS\_02 MSS\_03 MSS\_04 MSS\_07 MSS\_08

|                       | PC1   | PC2   | PC3   | PC4   | PC5   |
|-----------------------|-------|-------|-------|-------|-------|
| SS loadings           | 3.366 | 0.780 | 0.480 | 0.291 | 0.084 |
| Proportion Var        | 0.673 | 0.156 | 0.096 | 0.058 | 0.017 |
| Cumulative Var        | 0.673 | 0.829 | 0.925 | 0.983 | 1.000 |
| Proportion explained  | 0.673 | 0.156 | 0.096 | 0.058 | 0.017 |
| Cumulative proportion | 0.673 | 0.829 | 0.925 | 0.983 | 1.000 |

Cronbach's  $\alpha$ : 0.87

Group 7# JQ\_6 JQ\_1 JQ\_3 JQ\_5 WLB\_03

|                       | PC1   | PC2   | PC3   | PC4   | PC5   |
|-----------------------|-------|-------|-------|-------|-------|
| SS loadings           | 3.214 | 0.746 | 0.575 | 0.326 | 0.139 |
| Proportion Var        | 0.643 | 0.149 | 0.115 | 0.065 | 0.028 |
| Cumulative Var        | 0.643 | 0.792 | 0.907 | 0.972 | 1.000 |
| Proportion explained  | 0.643 | 0.149 | 0.115 | 0.065 | 0.028 |
| Cumulative proportion | 0.643 | 0.792 | 0.907 | 0.972 | 1.000 |

Cronbach's  $\alpha$ : 0.85

Group 8# WLB\_02 WLB\_04 WLB\_07

|                       | PC1   | PC2   | PC3   |
|-----------------------|-------|-------|-------|
| SS loadings           | 2.064 | 0.666 | 0.270 |
| Proportion Var        | 0.688 | 0.222 | 0.090 |
| Cumulative Var        | 0.688 | 0.910 | 1.000 |
| Proportion explained  | 0.688 | 0.222 | 0.090 |
| Cumulative proportion | 0.688 | 0.910 | 1.000 |

Cronbach's  $\alpha$ : 0.76

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