On the Measurement of Positive Labor Market Mobility

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Abstract
The present article proposes a new labor market index, called the positive labor market mobility index, which focuses on quantifying the amount of “desired” labor market mobility present in the transitions of young individuals, providing a useful way of comparing countries on that matter. Well-established indices in the literature aiming at measuring mobility take into account all movements among states and/or the diagonal elements of the transition probability matrix that denote immobility. On the contrary, the index proposed in this study uses only “favorable” or “desired” movements among labor market states, providing a more relevant to labor mobility assessment index, where the interest lies in quantifying positive transitions, from education or training to employment, for example. The positive mobility index is estimated for individuals in Europe, whose age was 15 to 29 during the years of the financial crisis, from 2008 to 2015. Annually raw micro-data from the European Union Labour Force Survey (EU-LFS) for these 8 years are used for this purpose. Moreover, the values of the proposed labor market mobility index are correlated with an early job insecurity indicator, estimated for the same age group. The results reveal the significant differences among European countries, when “desired” transitions of young individuals are taken into account. Moreover, the analysis performed indicates that the proposed index could be a good predictor for the degree of early job insecurity for young individuals in EU member states.

Keywords
Bartholomew mobility index, Prais–Shorrocks mobility index, upward mobility, labor market mobility, EU-LFS, positive mobility

Introduction
Markov systems are systematically used in the literature to simulate the movements among labor market states and the way they develop with respect to time (Alvarez et al., 2008; Bosch & Maloney, 2007; Flek & Mysikova, 2015; Karamessini, Symeonaki, & Stamatopoulou, 2016; Karamessini, Symeonaki, Stamatopoulou, & Papazachariou, 2016; Symeonaki et al., 2019a, 2019b; Symeonaki & Stamatopoulou, 2015; Ward-Warmedinge et al., 2013). The reason behind this extensive use is that Markov systems provide one of the most efficient and powerful ways of capturing the movements of a population system that consists of individuals stratified into predefined states in relation to a distinct attribute (Bartholomew, 1982; Symeonaki et al., 2000, 2002, 2019a, 2019b; Vassiliou, 1982; Vassiliou & Symeonaki, 1998, 1999).

In the study of population dynamics, a Markov system is defined as a set of individuals, classified in distinct categories in relation to a predefined feature, that move between states following the sequence of transition probability matrices \( \{ P(t) \}_{t=0}^x \). In the present article, the system consists of individuals who are stratified into the following states according to their labor market situation: employment, education or training, unemployment, and inactivity. The study aims to deliver a new labor market mobility index, called the positive labor market mobility index to capture the mobility related to “positive” or “desired” transitions of individuals, providing a meaningful way of comparing countries.

A distinction between “good” moves and “bad” moves was first proposed in Caliendo (2009); movements from unemployment and inactivity to employment were characterized as “good,” whereas movements from employment to unemployment and inactivity were characterized as “bad.” He even argued that it would also be interesting to consider some job-to-job transitions as “bad” and concluded that an increase in “good” transitions was broadly accompanied by reductions in “bad” transitions. Negative and positive partial mobility was introduced in Sengupta and Ghosh (2010), where the case of relatively moving upward or downward was considered. This required the
Introduction of partial mobility, where mobility was estimated with respect to the positioning of a specific subgroup. It was also argued that the only movements that could be considered as an improvement in the positioning are those from a lower state to a higher state, as the system under study was hierarchical. Moreover, as a general rule, school-to-work transitions are considered as successful (Pavlova et al., 2017; Ryan, 2001, among others) and therefore can be perceived as “positive” movements. A first attempt toward the definition of positive labor fluidity was made in Symeonaki, Stamatopoulou, and Karamessini (2017), where the need for establishing a more meaningful labor market mobility index was presented.

Traditionally, the mobility of a population system at time \( t \) is measured with the use of different mobility indices that aim at quantifying the transitions among different states that take place at that specific time (Bartholomew, 1982; Bibby, 1975; Prais, 1955; Shorrocks, 1978). However, it is clear that when measuring labor market transitions, all transitions cannot be treated as having equal importance, something that is assumed in most mobility indices used in the literature. Apparently, all transitions are not of the same importance; it is not the same to remain employed and to remain unemployed, or leave school and enter employment, inactivity, or unemployment. Labor market transitions should be classified into “positive” and “negative” transitions and only “positive” transitions must be considered, when evaluating labor market fluidity. We consider as “positive” any transition that would not result in individuals being considered as NEETs (not in employment, nor in education and training). Thus, a transition is considered as “negative” when individuals move to a state where they find themselves disengaged from both education/training and the labor market. So far, studies that measure mobility among labor market states use standard mobility indices (Karamessini, Symeonaki, & Stamatopoulou, 2016; Symeonaki & Stamatopoulou, 2015).

At this point, it is worth to mention that Matsumoto and Elder (2010) provide a stricter definition of the transition from education to the labor market when analyzing the results from International Labour Organization’s (ILO) School-to-Work Transition Survey (SWTS). They regard an individual as having completed his or her movement from education to the labor market, if and only if the individual is in fixed-term and satisfactory employment. Thus, a transition to employment is positive, only if the employment is stable and satisfactory. Unfortunately, when one analyses data from the European Union Labour Force Survey (EU-LFS) survey, this distinction between temporary and permanent employment, or part-time and full-time jobs cannot be made due to data limitations. In the EU-LFS, when transitions between labor market states are measured, the state of “employment” corresponds by definition to an individual that “carries out a job or profession, including unpaid work for a family business or holding paid traineeship, including an apprenticeship” (Eurostat, 2019, p. 26), and no distinction is made between type of contracts or hours worked.

Our focus is on youth transitions in Europe (aged from 15 to 29), capturing their evolution over a period of 8 years (2008–2015), a period characterized by the outburst of the financial crisis and its aftermath. However, the proposed index could be estimated for any age span or the general population, without any amendments. Our interest is on this age span, for which school-to-work transitions are particularly important. The successful settlement of young individuals into the labor market is still under discussion in Europe, as younger individuals were the most affected by economic and financial crisis. Thus, the new index will contribute to the discussion on the labor market mobility, by bringing to light the different patterns of young individuals’ flows across the EU and revealing the consequences of the economic crisis. In this context, the indicator aims at supporting social policy makers into effective youth employment policies.

We are also interested in examining whether the proposed positive labor market mobility indicator could be used as a predictor of early job insecurity and more specifically as to whether greater values of the positive labor market mobility index imply less early job insecurity. Early job insecurity refers to job uncertainty for individuals who have not yet moved successfully to the labor market. It is perceived in the present study as an objective phenomenon linked to the thread of unemployment and all significant determinants that potentially could hold individuals back from finding and maintaining their position. More specifically, the early job insecurity indicator introduced in Symeonaki, Karamessini, and Stamatopoulou (2017); Karamessini et al. (2019); and Symeonaki et al. (2018) will be used in the correlation/regression analysis performed.

The article is organized as follows: The “Review of Existing Mobility Indices” section presents the well-established mobility indices used in the literature and their shortcomings in the case where the Markov system is a labor market system. The “Defining the Positive Labor Market Mobility Index” section provides the reader with the information concerning the definition of the proposed positive labor market mobility index, \( \text{Mob}_p \), and the “Data and Limitations” section refers to the database that is used in the analysis and the limitations that emerge. The section “Results and Discussion” delivers the values of \( \text{Mob}_p \) in the studied countries over the years, for individuals aged 15 to 29, based on a well-known multidimensional typology on “youth transition regimes.” In addition, the values of \( \text{Mob}_p \) are correlated with the values of the early job insecurity indicator and the respective results are presented. It is proved that \( \text{Mob}_p \) is a good predictor of early job insecurity especially during the years of the crisis 2010–2015. Finally, the “Conclusions and Future Steps” section discusses the results of the study and presents aspects for future work.
Review of Existing Mobility Indices

Let a Markov population system where individuals are stratified into $k$ exclusive and exhaustive states according to a specific characteristic or in other words let a Markov population system whose state space is equal to $S = \{1, 2, \ldots, k\}$. Let also $p_{ij}(t)$ denote the transition probability of an individual moving from state $i$ to state $j$, at time $t$, that is, $\forall i, j = 1, 2, \ldots, k$, $p_{ij}(t)$ is the conditional probability:

$$p_{ij}(t) = \text{prob}[\text{an individual is at state } j \text{ at time } t | \text{the individual was at state } i \text{ at time } t-1].$$

The probability of remaining at the same state $i$, where $i = 1, 2, \ldots, k$ at time $t$, is perceived in Markov systems as the transition probability $p_{ii}(t)$ equal to

$$p_{ii}(t) = \text{prob}[\text{an individual is at state } i \text{ at time } t | \text{the individual was at state } i \text{ at time } t-1].$$

The transition probability matrix of the population system is denoted by $P(t)$, where:

$$P(t) = \begin{pmatrix} p_{11}(t) & p_{12}(t) & p_{13}(t) & \cdots & p_{1k}(t) \\ p_{21}(t) & p_{22}(t) & p_{23}(t) & \cdots & p_{2k}(t) \\ \vdots & \vdots & \vdots & \ddots & \vdots \\ p_{k1}(t) & p_{k2}(t) & p_{k3}(t) & \cdots & p_{kk}(t) \end{pmatrix}. \quad (1)$$

In the literature, one can identify limited efforts to develop mobility indices based on transition matrices (Bartholomew, 1982; Bibby, 1975; Prais, 1955; Shorrocks, 1978). Two types of well-know mobility indices of this kind are presented in the present section which could potentially be used to quantify the transitions among labor market states. These are as follows:

1. Relative indices such as the Prais–Shorrocks index (Prais, 1955; Shorrocks, 1978), which correspond to the amount of labor fluidity, and
2. Absolute mobility indices that take into consideration the direction of the transitions, such as upward and downward mobility.

Relative mobility rates take into consideration the transition probabilities of the individuals between states, while absolute mobility indices by definition measure the actual number of members who change their position, reflecting also the direction of the transitions.

One of the first relative mobility indices introduced was the Prais–Bibby mobility index (Bibby, 1975; Prais, 1955) given in Equation 2:

$$\text{Mob}_{PB}(t) = \frac{k - \text{tr}(P(t))}{k}, \quad (2)$$

where $\text{tr}(P(t))$ is estimated by adding up the diagonal elements of the transition matrix $P(t)$, that is, $\text{tr}(P(t)) = \sum_{i=1}^{k} p_{ii}(t)$, $k$ denotes the number of states of the Markov system and $\text{Mob}_{PB} \in [0,1]$. Apparently, the Prais–Bibby mobility index is a straightforward estimate of mobility that is based on the notion of trace and $\text{Mob}_{PB}(t) = 0$ when no individual changes his or her position. On the contrary $\text{Mob}_{PB}(t) = 1$ when everyone moves away from the existing state at time $t - 1$. This measure of course ignores distance “travelled” by the individuals.

In Shorrocks (1978), a similar measure to the Prais–Bibby mobility index was introduced, known now as the Prais–Shorrocks index, and its axiomatic properties were provided. The index is described by Equation 3:

$$\text{Mob}_{PS}(t) = \frac{1}{k-1} \left( k - \text{tr}(P(t)) \right). \quad (3)$$

If $\text{Mob}_{PS}(t) = 1$, perfect mobility is indicated, while $\text{Mob}_{PS}(t) = 0$ implies perfect immobility.

It is clear that both $\text{Mob}_{PB}(t)$ and $\text{Mob}_{PS}(t)$ take only the diagonal elements into account, that is, the probability of staying in the exact same position. However, if the population system is a labor market system, then the probabilities of remaining in employment and education will be considered, but to the same extend the probabilities of remaining in unemployment and inactivity.

The Bartholomew index $\text{Mob}_B(t)$ (Bartholomew, 1982) defined by Equation 4 takes all transitions into consideration, but the index weights transitions by the number of categories traversed, that is, the index expresses mobility in terms of the distance “travelled” by the individuals, expecting greater mobility when individuals move further away from the diagonal. The main limitation of this index is that a simple rearrangement of the states would lead to different values of the index and it would not be comparable across studies (Paul, 2009). Moreover, if one studies a labor market system, the probability of moving from unemployment to employment and from employment to unemployment will be given equal weights and symmetrical transitions will be treated as having the same importance. Apparently, $\min(\text{Mob}_{PB}(t)) = 0$ that corresponds to perfect immobility.

$$\text{Mob}_B(t) = \frac{1}{k} \sum_{i=1}^{k} \sum_{j=1}^{k} p_{ij}(t) |i-j|. \quad (4)$$

A measure to quantify immobility is the immobility ratio which is based on the concept of the Prais–Bibby mobility index:

$$I\text{Mob}(t) = \frac{\text{tr}(P(t))}{k}. \quad (5)$$

This ratio provides the member’s rate of staying in the same position at time $t$.

Finally, Equations 6 and 7, respectively, define the absolute mobility indices of upward and downward mobility that are estimated with the aid of the actual number of individuals moving upward or downward:

$$u(t) = \frac{1}{T(t)} \sum_{j=1}^{k} p_{ji}(t), \quad (6)$$

and

$$d(t) = \frac{1}{T(t)} \sum_{j=1}^{k} p_{ij}(t). \quad (7)$$
where $T(t)$ is the overall number of individuals in the Markov system, and $n_j(t)$ the absolute number of individuals who move from state $i$ to state $j$ at time $t$.

It is clear that the Prais–Shorrocks index, the immobility ratio, and the Prais–Bibby index consider only the diagonal elements of the respective matrices and the Bartholomew mobility index bases its values on the mobility that is observed off the main diagonal of the transition probability matrices, weighting transitions by the “distance” between states. The latter is not purposeful if the system is not hierarchical, that is, if an ordering in states does not exist. The upward and downward mobility indices also assume a hierarchical ordering of the states which is not true in the case of a labor market system. They would be appropriate, for example, in the study of educational intergenerational social mobility (Symeonaki et al., 2016; Symeonaki & Filopoulou, 2017)), where the states correspond to low, medium, and high educational attainment. It is also true that these indices are all highly correlated in empirical applications (Nichols, 2008; Nichols & Rehm, 2014).

Moreover, the existing indicators originate from Markov population systems whose members in general are stratified into exhaustive and exclusive states that are not necessarily comparable (occupational categories, for example) or from hierarchical population systems where movements toward one direction are always positive, for example, educational attainment or income categories.

An example is now provided to highlight some limitations of the existing mobility indices. Let a labor market system, modeled as a Markov system where individuals are stratified into the following categories: employment, education/training, unemployment, and inactivity according to their labor market state. Let also two different transition matrices, $\mathbf{A}$ and $\mathbf{B}$:

$$
\mathbf{A} = \begin{bmatrix}
0 & 0 & 0.5 & 0.5 \\
0 & 0 & 0.5 & 0.5 \\
0 & 0 & 0.5 & 0.5 \\
0 & 0 & 0.5 & 0.5 \\
\end{bmatrix},
$$

and

$$
\mathbf{B} = \begin{bmatrix}
0.5 & 0.5 & 0 & 0 \\
0.5 & 0.5 & 0 & 0 \\
0.5 & 0.5 & 0 & 0 \\
0.5 & 0.5 & 0 & 0 \\
\end{bmatrix}.
$$

For the matrices $\mathbf{A}$ and $\mathbf{B}$, it can easily be estimated using Equations 3 and 4 that

- $tr(\mathbf{A}) = tr(\mathbf{B}) = 1$
- $\text{Mob}_{\text{PS}}(\mathbf{A}) = \text{Mob}_{\text{PS}}(\mathbf{B}) = 3/4$, and
- $\text{Mob}_{\text{B}}(\mathbf{A}) = \text{Mob}_{\text{B}}(\mathbf{B}) = 5/4$.

Both matrices yield the same values for the mobility indices $\text{Mob}_{\text{PS}}$ and $\text{Mob}_{\text{B}}$ but describe completely different movements in the labor market. The first transition matrix describes a labor market system where all individuals move between unemployment and inactivity, while all employed or individuals in education/training move either to unemployment or inactivity. The second labor market system whose transitions are governed by transition matrix $\mathbf{B}$ is the complete opposite. Transitions take place only between employment and education/training and all unemployed or inactive individuals move toward employment and education/training. In the first labor market system, unemployment and inactivity are absorbing states (which means that if the movements in the system are governed by this specific matrix, all individuals in the future would either be unemployed or inactive). In the second system, employment and education/training are the absorbing states. Therefore, it is clear that when the population system is a labor market system, the existing indices cannot be used for comparability purposes as completely different transition matrices produce the same values for the mobility indices. Thus, if one would like, for example, to compare mobility between different countries, these indices are not meaningful, as the same values can result from very different situations in the countries. It is therefore evident that there is a need for a comparable index that measures mobility, but simultaneously captures its quality.

### Defining the Positive Labor Market Mobility Index

The purpose of the index proposed in this section is to shed light to the amount of mobility, considering simultaneously the type of movements of the individuals and provide a meaningful index linked to positive mobility that can be used for comparison among different countries. In essence, we focus on an index of positive mobility that implies greater job opportunities in the system and as a consequence, less job insecurity.

Now, let a Markov population system where individuals are stratified into four exhaustive and exclusive states:

1. Employment,
2. Education or training,
3. Unemployment, and
4. Inactivity.

The transition probability matrix at time $t$ is given by $S = \{1, 2, 3, 4\}$.

$$
\mathbf{P}(t) = \begin{bmatrix}
p_{11}(t) & p_{12}(t) & p_{13}(t) & p_{14}(t) \\
p_{21}(t) & p_{22}(t) & p_{23}(t) & p_{24}(t) \\
p_{31}(t) & p_{32}(t) & p_{33}(t) & p_{34}(t) \\
p_{41}(t) & p_{42}(t) & p_{43}(t) & p_{44}(t) \\
\end{bmatrix},
$$

Moreover, the transition diagram that depicts the transition probabilities of the system is presented in Figure 1.
The definitions of the positive labor market mobility index and negative labor market mobility index are now provided.

**Definition 1:** Let a labor market system that consists of individuals stratified into the following states:

1. Employment,
2. Education or training,
3. Unemployment, and
4. Inactivity.

The transition probabilities located at the first two columns are considered in the mobility index, as they are the ones that correspond to positive movements (in the sense that they are not negative and do not lead to exclusion from the labor market). In other words, flows into employment and education or training are considered positive, while flows into unemployment and inactivity are perceived as negative. This is an attempt to quantify what is referred to in Caliendo (2009) as “good” and “bad” moves. In accordance to Shorrocks (1978), we now provide the following definitions:

Then, positive labor market mobility index is defined by

\[ Mob_p(t) = \frac{1}{4} \sum_{i=1}^{4} \sum_{j=1}^{2} p_{ij}(t). \]  

(9)

Negative labor market mobility index, denoted by \( Mob_N(t) \), is defined by

\[ Mob_N(t) = 1 - Mob_p(t). \]  

(10)

It is true also that

\[ 0 \leq Mob_p(t) \leq 1 \]  

(11)

Data and Limitations

The methodology presented in the “Defining the Positive Labor Market Mobility Index” section is now applied to the EU-LFS data with the aim of measuring the positive labor market mobility for young individuals aged 15 to 29, for the years 2008–2015. To estimate the proposed index, cross-national raw data for those years are used that relate to all EU countries and the EFTA (European Free Trade Association) countries Norway and Switzerland. It is known that the

![Diagram depicting movements among labor market states.](image)

**Figure 1.** A diagram depicting movements among labor market states.
EU-LFS purpose is to produce comprehensive knowledge on the labor market outcomes and relating issues that will allow for advanced statistical analysis and ensure comparability between countries by using common questionnaires.

In the EU-LFS, individuals are asked to fill in their “current labour market status at the time of the survey” (respective variable is MAINSTAT) and their “labour market status one year before survey” (respective variable is WSTAT1Y). MAINSTAT and WSTAT1Y are estimated to measure the elements of the transition probability matrices. MAINSTAT was brought into the EU-LFS questionnaire as an effort to measure the respondent’s own belief for his or her main labor market state. It is therefore a subjective measurement of the labor market outcome of the respondent which is different from the objective measurement of the labor market state estimated through the variable ILOSTAT. The purpose of this variable is different from the international definitions of employment status (ILOSTAT). MAINSTAT’s role is very important because it makes it possible, for example, to identify students working part-time, who would look at themselves as economically inactive and not as persons in employment. Moreover, due to conceptual differences, the labor market state a year before the survey should be linked with the subjective labor market status (MAINSTAT) and not with the objective one (ILOSTAT). The limitation here is that MAINSTAT and WSTAT1Y are not always included in the survey, as they are not part of the core EU-LFS questionnaire. It is a decision that each country’s National Statistical Authorities should make and the consequence of this limitation is that for some member states, the values of these variables are missing. For this reason, results are not included for Germany, the United Kingdom, and Ireland.

Another limitation lies in the fact that such indices that use the individual’s position at two times could only capture a maximum of one alteration in the position (e.g., from education or training to unemployment). This, bias may be arising from “round-tripping,” that is, the unreported short-term movements between different labor market states that take place within the year. For more details about the effects of “round tripping” on the labor market dynamics, see, for example, Kiefer (1988) and Gora and Lehmann (1995).

Finally, it should be also kept in mind that the retrospective and self-reported data on the labor market history of respondents may lead to a recall bias on their mobility, as it is not certain that the individuals may remember the specific point that their labor market status has changed. For a systematic analysis of the recall effect on measured labor market dynamics, see, for example, Paull (2002). With micro-data from the British Household Panel Survey (BHPS), he concluded among others that the individuals with the most transient behavior are more likely to give inconsistent information.

In the EU-LFS survey (Eurostat, 2019, p. 26), the categories among which the respondent can choose the respective questions are the following:

1. Carries out a job or profession, including unpaid work for a family business or holding, including an apprenticeship or paid traineeship, and so on;
2. Unemployed;
3. Pupil, student, further training, unpaid work experience;
4. In retirement or early retirement or has given up business;
5. Permanently disabled;
6. In compulsory military service;
7. Fulfilling domestic tasks; and
8. Other inactive person.

We cluster these categories to produce the labor market states:

1. Employment (1)
2. Education or training (3),
3. Unemployment (2), and
4. Inactivity (4–8).

**Results and Discussion**

Based our analysis on Walther’s (2006) and Pohl and Walther’s (2007) typology of “youth transition regimes,” we distinguish four clusters across European countries. Due to limited data for both the United Kingdom and Ireland (MAINSTAT and WSTAT1Y are not included in their questionnaire), results for the liberal regime are not presented in the analysis of this section. In particular, the universalistic regime in Nordic countries (Denmark, Finland, Sweden) is characterized by advanced welfare systems, inclusive education, and centrally standardized and flexible training system. The post-compulsory routes into typical and vocational education lead to high entrance to tertiary education. The employment rates are high both for men and women, while the transitions of entering the labor market are smooth and stable (Lorentzen et al., 2019).

On the contrary, continental countries in the employment-centered regime are defined by selective and standardized education and training. The transitions of the young people into employment are considered smooth and successful, especially in countries with developed apprenticeship systems such as Germany and Austria, where the employment rates of graduates are among the highest in Europe (Eurofound, 2014; Hadjivassiliou et al., 2016; Scherer, 2001).

A southern European/sub-protective transition regime is also defined, with rudimentary welfare structures and strong family networks. The standardized education systems are not selective, while the vocational training is considered weak in general. The countries in this regime are also characterized by rigid labor markets, high rates of youth unemployment, and precarious employment. Going from school to a stable employment is considered to be very slow, especially in the
case of Italy, where more than 40% of young people delay substantially their graduation from tertiary education (Pastore, 2017). Finally, there is much turnover between employment, unemployment, and inactivity, while the temporary contracts reach high levels and trap young people into insecure careers, especially in the case of Spain (Iannelli & Soro-Bonmat, 2001; Rodriguez-Modroo, 2019).

Finally, the post-socialist countries of Central and Eastern Europe defined by Fenger (2007) as “developing” regarding their welfare state are characterized by comprehensive school systems, with high rates of post-compulsory general education and weak linkages between education system and labor market (Hadjivassiliou et al., 2016). The quality and the speed of the transitions within the labor market are different between the countries. In particular, the school-to-work transition appears quite short in Baltic countries (Estonia, Latvia, Lithuania) and a very high rate of young people hold permanent, full-time contracts, while the picture is the opposite, concerning the Eastern European countries (Eurofound, 2014).

The estimates of the positive labor market mobility index for the years 2008–2015 are now provided. The respective results refer to EU countries, Norway, and Switzerland for the years for which the necessary variables (MAINSTAT and WSTAT1Y) have been included in the countries’ national questionnaires. Table 1 exhibits the values of the proposed index for the European countries under study, per year.

It is clear that in 2008, the positive labor market mobility index varied between 0.565 (Italy) and 0.738 (Sweden), while in 2015, the index took values between 0.530 (Romania) and 0.761 (Luxembourg), implying that the financial crisis has broadened the differences between countries. It is also worth observing that the values of the positive mobility index decreased for all countries in 2009. We note here that the values of $\text{MobP}(2009)$ are based on the conditional transition probabilities comparing the allocation to the states in 2008 with that in 2009:

$$p_{ij}(2009) = \text{prob}\{\text{an individual moves to state } j \text{ in 2009} | \text{the individual was at state } i \text{ in 2008}\},$$

which proves the significant effects of the crisis’s breakout on education, training, and employability of young Europeans. Apparently, in 2009, the values of $\text{MobP}$ exhibited the shortest range between countries.

Figures A1 to A8 in the appendix depict the values of the positive labor market mobility index per year, where one can observe the ranking of the countries for each year separately.

Table 1. Positive Labor Market Mobility Index, $\text{MobP}$, for European Countries, 2008–2015, EU-LFS.

| Country | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---------|------|------|------|------|------|------|------|------|
| AT      | 0.667| 0.652| 0.668| 0.675| 0.672| 0.654| 0.664| 0.670|
| BE      | 0.619| 0.597| 0.611| 0.618| 0.618| 0.601| 0.604| 0.604|
| BU      | 0.571| 0.541| 0.527| 0.531| 0.529| 0.539| 0.537| 0.537|
| CH      | —    | —    | —    | —    | —    | —    | —    | —    |
| CY      | 0.697| 0.683| 0.645| 0.622| 0.595| 0.588| —    | 0.598|
| CZ      | 0.625| 0.616| 0.600| 0.609| 0.599| 0.632| 0.654| —    |
| DK      | —    | —    | —    | —    | —    | —    | 0.703| 0.730|
| EE      | 0.649| 0.575| 0.596| 0.638| 0.624| —    | 0.644| 0.672|
| ES      | 0.627| 0.560| 0.569| 0.566| 0.541| 0.510| 0.518| 0.506|
| FI      | 0.735| 0.697| 0.700| 0.708| 0.711| 0.679| 0.704| 0.653|
| FR      | 0.631| 0.612| 0.623| 0.627| 0.614| 0.607| 0.616| 0.596|
| GR      | 0.592| 0.575| 0.554| 0.515| 0.496| 0.508| 0.550| 0.531|
| HR      | 0.621| 0.564| 0.521| 0.542| 0.545| 0.499| 0.523| 0.536|
| HU      | 0.591| 0.568| 0.577| 0.574| 0.564| 0.571| 0.635| 0.623|
| IT      | 0.565| 0.542| 0.548| 0.551| 0.538| 0.523| 0.559| 0.546|
| LT      | 0.649| 0.575| 0.536| 0.603| 0.610| 0.618| 0.644| 0.628|
| LU      | 0.648| 0.686| 0.744| 0.730| 0.713| —    | 0.720| 0.761|
| LV      | 0.626| 0.546| 0.566| 0.591| 0.598| —    | 0.622| 0.655|
| NL      | —    | —    | —    | —    | —    | —    | 0.641| —    |
| PO      | 0.586| 0.584| 0.578| 0.589| 0.570| 0.570| 0.588| 0.586|
| PT      | —    | —    | —    | 0.564| 0.551| 0.560| 0.574| 0.588|
| RO      | 0.631| 0.579| 0.534| 0.531| 0.527| 0.523| 0.526| 0.530|
| SE      | 0.738| 0.693| 0.695| 0.703| 0.688| 0.720| 0.726| 0.758|
| SI      | 0.610| 0.560| 0.570| 0.565| 0.564| 0.526| 0.580| 0.566|
| SK      | 0.592| 0.549| 0.546| 0.561| 0.557| 0.667| 0.550| 0.585|

Note. EU-LFS: European Union Labour Force Survey.
Sweden, Switzerland, Finland, and Luxembourg exhibit the greatest values of positive labor market mobility over those years, while Croatia, Greece, Spain, and Romania the lowest.

An illustrative picture of the evolution of the proposed index over the years is provided in Figure 2.

Each line corresponds to a specific country and different subplots are presented according to the different transition regimes that are mentioned above. It appears that Denmark, Finland, and Sweden are exhibiting higher levels of “positive” mobility of their young citizens, compared with the other regimes, with the index values oscillating between 0.7 and 0.8. The mobility patterns seem to be relatively stable in time, as the values of Mob_p are not affected or affected very little by the economic crisis.

On the contrary, the positive mobility index takes values between 0.6 and 0.7, across countries belonging to the employment-centered regime, with Luxembourg and Switzerland indicating more positive movements within their labor markets. Actually, the values of Mob_p seem even to increase for these countries while for the remaining countries (Austria, Belgium, France, and the Netherlands), small fluctuations are apparent throughout the years.

Concerning now the southern European countries, the positive labor market mobility index takes low values in general, especially in Greece and Italy throughout the years. The extreme austerity measures forced as a consequence of the economic crisis worsened the situation even more in Southern Europe, as the index seems to be affected negatively. In Spain, for example, the index was equal to 0.627 in 2008 and 0.506 in 2015, while in Cyprus, the index dropped from 0.697 in the beginning of the crisis to 0.598 in 2015.

Finally, national differences are notable also in the last subplot. In some post-socialist countries, the proposed index is also influenced over the years (e.g., in Romania Mob_p(2008) = 0.631 while Mob_p(2015) = 0.530). However, in other post-socialist countries regarded as “successful,” the index was not affected (Mob_p(2008) = 0.649, Mob_p(2015) = 0.672 in Estonia and Mob_p(2008) = 0.649, Mob_p(2015) = 0.628 in Lithuania, among others).

The values of the proposed index are now correlated with the values of the multidimensional early job insecurity indicator proposed in Symeonaki, Karamessini, and Stamatopoulou (2017); Symeonaki et al. (2018); and Karamessini et al. (2019) that provides evidence of the amount of early job insecurity in European states for the same age group, 15 to 29. This specific early job insecurity indicator considers a set of specific measures that capture various elements of early job insecurity with the aid of EU-LFS for EU member states and the EFTA countries Norway and Switzerland. These measures are aggregated...
into a composite indicator of early job insecurity to understand and juxtapose the amount of early job insecurity among countries. This holistic early job insecurity indicator accounts for the whole range of the phenomenon under study, focusing on indicators linked to the labor market outcomes domain, the job quality domain, the school-to-work transitions domain, and the job security domain.

Figure 3. Scatterplots of positive labor mobility index and early job insecurity, 2008–2015.

Figure 3 presents the scatterplots of $Mob_p$ to early job insecurity indicator for all studied years. It can be seen that the positive labor market mobility index and the early job insecurity indicator are highly correlated especially after 2010. More specifically, the Pearson’s $r$ exhibits its greatest values at the heart of the crisis, in the years 2011 and 2012. In general, the estimation of early job insecurity requires that 17
different indicators are measured and then composed into a single measure, a process which is quite demanding. The present analysis concludes that early job insecurity could be predicted from the values of positive labor market mobility in the country, an estimation that definitely requires less effort.

Conclusions and Future Steps

In this study, we have introduced a new index of positive labor market mobility that reveals information concerning the amount of “desired” mobility present in the labor market system. The proposed index is estimated for individuals whose age varied from 15 to 29 during the years 2008–2015 in Europe with the aid of micro-data derived from the EU-LFS for the respective years. Positive labor market mobility is measured using the transition probabilities between labor market states for EU member states, for which the required data were available. Countries are ranked according to these measurements with Luxembourg, Sweden, Finland, and Switzerland having the highest degrees of positive labor market mobility for those years and Greece, Croatia, Romania, and Spain the lowest.

It is crucial to note here that the values of positive labor market mobility decreased for all studied countries at the outbreak of the economic crisis in 2009. After 2010, some countries, mainly characterized by advanced welfare regimes, managed to move past those consequences, while in others, the values of the index kept decreasing.

Moreover, positive labor market mobility is proved to be highly correlated with early job insecurity especially after 2010. Thus, there is no ambiguity in how the crisis has formulated positive labor market mobility and by extension early job insecurity in European countries and that maybe allows for some nuance in the way policies should be implemented. Stressing the discrepancies among European countries can lead to a wiser design of Youth Guarantee programs, adjusted to the national and social specificities of each country. Moreover, it can give feedback for a more balanced division of funding or focused and beneficial actions, via the Youth Employment Initiative. As a consequence, the European Employment Strategy, the National Reform Programs, and the Stability/Convergence Programs could be briefed in the direction of more inclusive and fair approaches.

An aspect of future work of this research could include a consideration of varying weighting schemas for the elements of the transition probability matrix included, bearing in mind that even positive movements are not equally important. Going from unemployment back to education or going from unemployment to employment is somehow of different quality. This could be achieved either by

- Examining, validating, and evaluating different weighting schemas through correlation analysis, or by
- Developing a machine learning system for measuring the weights using theory, heuristic experts’ knowledge, and empirical rules.

Appendix

Figure A1. Positive labor mobility index by country, EU-LFS, 2008.
Note. EU-LFS = European Union Labour Force Survey.

Figure A2. Positive labor mobility index by country, EU-LFS, 2009.
Note. EU-LFS = European Union Labour Force Survey.
Figure A3. Positive labor mobility index by country, EU-LFS, 2010.
Note. EU-LFS = European Union Labour Force Survey.

Figure A4. Positive labor mobility index by country, EU-LFS, 2011.
Note. EU-LFS = European Union Labour Force Survey.

Figure A5. Positive labor mobility index by country, EU-LFS, 2012.
Note. EU-LFS = European Union Labour Force Survey.

Figure A6. Positive labor mobility index by country, EU-LFS, 2013.
Note. EU-LFS = European Union Labour Force Survey.

Figure A7. Positive labor mobility index by country, EU-LFS, 2014.
Note. EU-LFS = European Union Labour Force Survey.

Figure A8. Positive labor mobility index by country, EU-LFS, 2015.
Note. EU-LFS = European Union Labour Force Survey.

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