CHAPTER 3

ANALYSING AND MEASURING GENDER INEQUALITIES IN SOCIAL INCLUSION IN THE EUROPEAN UNION WITH A CLOSE LOOK AT THE IPA ADRIATIC COUNTRIES

ANNALINA SARRA

SUMMARY: 3.1. Introduction. – 3.2. Indicators of social inclusion: a gender perspective. – 3.3. A social protection performance via Data Envelopment Analysis. – 3.4. Microsimulation modeling. The role of Euromod technique in assessing the impact of social policies on income distribution and inequalities indexes. – 3.5. Conclusions. – Appendix.

3.1. *Introduction*

Over recent decades, the European Union (EU) has been placing increasing importance in eliminating disparities and promoting equality between women and men. Gender equality is deemed a fundamental right and common value of the EU and a compulsory condition for the achievement of the EU objectives on growth, employment, and social cohesion.

The way promoted by the EU to achieve gender equality involves the integration of the gender perspective in every step of a policy process: design, implementation, monitoring and evaluation and is named *Gender Mainstreaming*. According to the Council of Europe, *Gender Mainstreaming* may be described as "*the (re)organization, improvement, development and evaluation of policy processes, so that a gender equality perspective is incorporated in all policies, at all levels and at all stages by the actors normally involved in policy making*". Accordingly, gender mainstreaming is not a goal in itself but a means to achieving equality.

Despite progress made over the past years, inequalities between women and men still exist and affect various aspects of their lives. Thus, gender mainstreaming is concerned with the relationship between women and men in all spheres of society for the benefit of both. The analytic tool for mainstreaming gender into a policy is represented by the gender impact assessment. To this end, it is essential to identify gender gaps and analyses trends in men's and women's situations and assess the impact of the policy on men and women in general and in particular groups. As a first step, the gender impact assessment requires relevant statistics and indicators, disaggregated by sex and able to highlight gender gaps.

In this chapter, we propose a social inclusion comparative gender analysis of the situation and trend over recent years across the European countries. Our assessment relies on a selection of the EU commonly agreed indicators of poverty and social exclusion, with the key objective to gauge the progress made by the European countries towards meeting the Lisbon objective for poverty eradication. Although a large number of indicators are needed to properly measure the multidimensional nature of social inclusion, we restricted our attention on a selection of the EU commonly agreed indicators of poverty and social exclusion, as detailed in the next section.

Afterwards, we propose a Data Envelopment Analysis (DEA) approach to measure the (relative) efficiency performance of the European countries in promoting social inclusion, with the overall goal of comparing levels of social inclusion among States, with a special focus on gender dimension.

Finally, in the ending section, is shown the prospective role of microsimulation modelling in assessing the gender dimension of social inclusion in Europe.

3.2. *Indicators of social inclusion: a gender perspective*

In order to provide the necessary context information, we start by analysing the key features and trends of social inclusion in the EU. As previously pointed out, social exclusion and social inclusion have multiple definitions. In spite of an extensive usage of these terms in the European research, it is well acknowledged the absence of a clear and unambiguous definition of their processes.

In literature (see, among others, Duffy, 1995; Sen, 1998; Berger-Schmitt and Noll, 2000; Tsakloglou and Papadopoulos, 2002; Atkinson *et al.*, 2002), as well as in official documents (European Commission, 2010) and in the political debate on social inclusion, there have been numerous attempts for providing a widespread definition of the phenomenon, pinpointing the dimensions that compose it and building a set of social inclusion indicators. Already in the context of Lisbon European Strategy (2000), it is emerged the necessity to take into account a number of different factors to capture the multidimensionality of social inclusion/exclusion definition. The basic rules in the construction of a set of social inclusion indicators can be found in a significant book published by Atkinson *et al.* (2002). Central to the Atkinson's report is the principle of primary, secondary and tertiary indicators.

In this work, we focus on the set of commonly agreed and defined social indicators adopted by the EU countries and by the European Commission. The harmonised indicators adopted by the EU and published by Eurostat are embedded in three levels. *Level 1* indicators provide an overall picture of the phenomenon and include the number of persons who are at risk of poverty, or severely materially deprived or living in households with very low work intensity. Indicators in the *level 2* are linked to the operational objectives of the European Strategy, whereas in the *level 3* there are the explanatory indicators, useful to analyse progress towards the strategy's goals. Among these indicators, we selected those representing the five pillars related to main dimensions of social inclusion/ exclusion as measured by Eurostat (2011a):

1. *people at-risk-of-poverty before social transfers*
2. *persistent at-risk-of poverty rate*
3. *severely materially deprived people (percentage of total population)*
4. *early leavers from education and training (per cent).*
5. *employment rate of the total population.*

Our selection has been also driven by another kind of concern, that is the choice of the most relevant data and the guarantee that they cover a sufficient number of years and countries. This study consider 27 EU member states for which comparable indicators are available[1]. However, together with these member States, we also consider Norway and Iceland. The indicators are take over from 2010 to 2014, which represents the longest period without missing data or data breaks for all the countries. It is worth noting that these indicators can be disaggregated by a number of key variables, according to the data availability.

As known, social exclusion and poverty are exposed by a range of statistical indicators. The objective here is to emphasise the importance of disaggregation by gender and show how the gender differences and inequalities are fundamental features of these phenomena.

Initially, we focus on the relative (income) poverty, defined in relation to the average level of prosperity in a given country and point in time. The first indicator is *people at-risk-of-poverty before social transfers*; it is the share of person with an equivalised disposable income, before social transfers, below the risk-of-poverty threshold, which is set at 60% of the national median equivalises disposable income (after social transfers). Owing to the conventional nature of the retained threshold and the fact that having an income below this threshold is neither a necessary nor a sufficient condition of being in a state of poverty, this indicator is referred to as a measure of poverty risk.

Figure 1, below, shows the percentage of at risk of poverty calculate before social transfer, using indicators disaggregated by gender.

As we can see, women are generally at greater risk of living in a poor household in almost all the European States. Some exceptions in this study are recorded for Denmark, Greece, Poland, Romania and Spain.

The size of gap varies according to the countries. There is a combination of factors which impact differently on men and women, such as the economic crisis and differences in the struc-

[1] The EU countries included in the analysis are: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, United Kingdom.

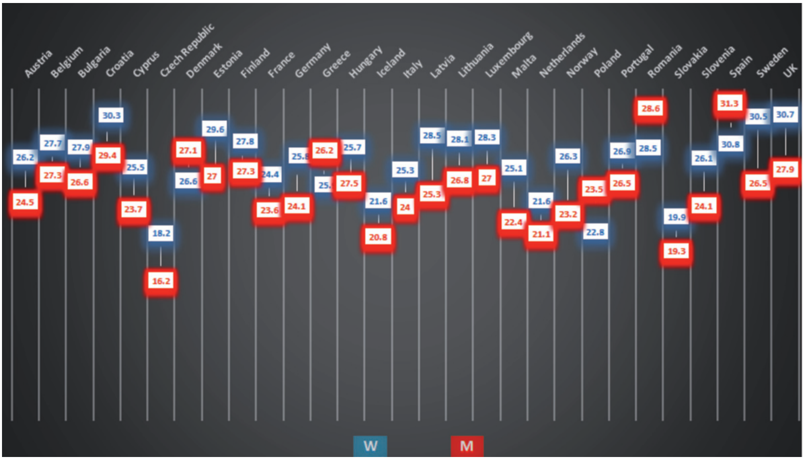

Fig. 1. *At -risk-of poverty rate by gender - Year 2014 (Source: Eurostat)*

ture of labour markets and welfare systems, which are likely to cause these dissimilarities. Belgium, Finland, Netherlands, Portugal and Slovenia were the most egalitarian countries with gender gaps of less than or about 0.5 percentage points.

Looking at the Member States belonging to the IPA-Adriatic countries, the highest divergences for the at-risk-poverty indicator are recorded in Slovenia (gap=2) and in Italy (gap=1.3).

Overall, there are significant differences among Member States during 2010 to 2014 (see Figure 2).

We also consider the indicator devised to measure *persistent poverty* and pick up people whose income is consistently below 60% of the median in the country concerned, distinguishing, in

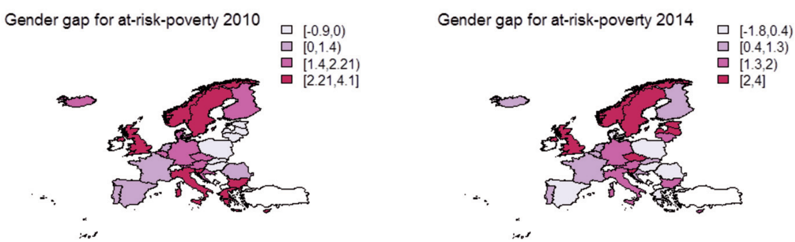

Fig. 2. *Gender gap for the at-risk-poverty rate: left panel (Year 2010) right panel (Year 2014)*

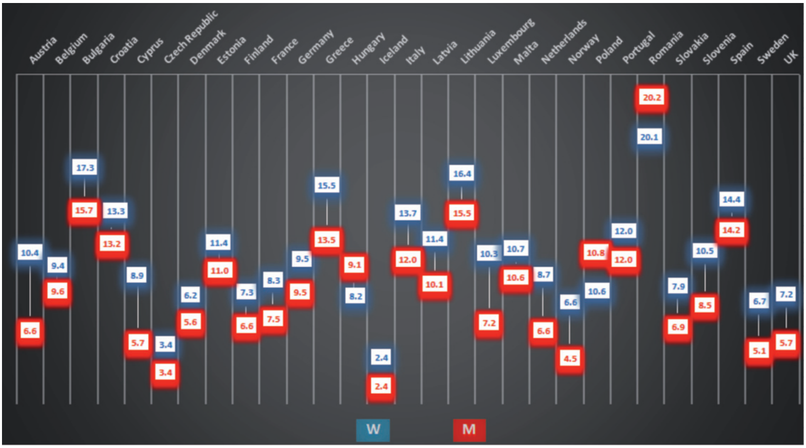

Fig. 3. *Persistent at -risk-poverty rate by gender - Year 2014 (Source: Eurostat)*

this way, these citizens from people whose income below the poverty threshold is merely transitory.

The opportunity to measure the persistent poverty for the majority of the EU Member States is provided by the longitudinal data from Statistics on *Income* and *Living Conditions* (*EU-SILC*) database.

Data disaggregated by gender (see Figure 3) show that Austria and Cyprus, together with Luxembourg, display the largest gaps in terms of persistent at-risk-poverty rate in 2014. In some countries, namely Belgium, Hungary, Poland and Romania, the gap is higher for men than for women. Pronounced disparities between women and men characterise almost all the IPA Adriatic countries included in the analysis. This is particularly the case of Italy, Slovenia and Greece, with gender gaps around 2 percentage points.

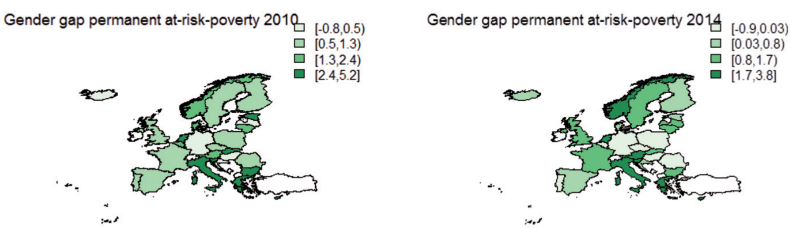

Fig. 4. *Gender gap for the permanent at-risk-poverty rate: left panel (Year 2010) right panel (Year 2014)*

Changes in the incidence of persistence risk across the EU States over 2010-2014 can be captured by looking at Figure 4.

To complement the picture of social exclusion another important indicator is represented by the *material deprivation rate*. Material deprivation rates gauge the proportion of people whose living conditions are severely affected by a lack of resources. The severe material deprivation rate represents the proportion of people living in households that cannot afford at least four of the following nine items:

– mortgage or rent payments, utility bills, hire purchase instalments or other loan payments;
– one week's holiday away from home;
– a meal with meat, chicken, fish or vegetarian equivalent every second day;
– unexpected financial expenses;
– a telephone (including mobile telephone);
– a colour TV;
– a washing machine;
– a car; and
– heating to keep the home sufficiently warm

For this indicator a breakdown by gender reveals that in 2014 severe material deprivation is worse among women, in almost all the Member States for which data are available (see Figure 5). The results suggest that the major differences in women and men's rates are recorded for Lithuania and Czech Republic, in which the gap is around 3 percentage points.

There are also marked national variations in the deprivation rate, ranging from 48.3 in Bulgaria to 3.4 in Norway for women, and from 45.3 in Bulgaria to 2.8 in Sweden for men. Focusing on IPA Adriatic countries, gender gaps in material deprivation rates are around 0.6 percentage points.

A reliable indication of changes over time in the proportion of people whose living condition are severely affected by a lack of resources can be inferred from Figure 6.

Another crucial barrier to inclusion in society regards the lack of basic competence and qualifications. European reports have

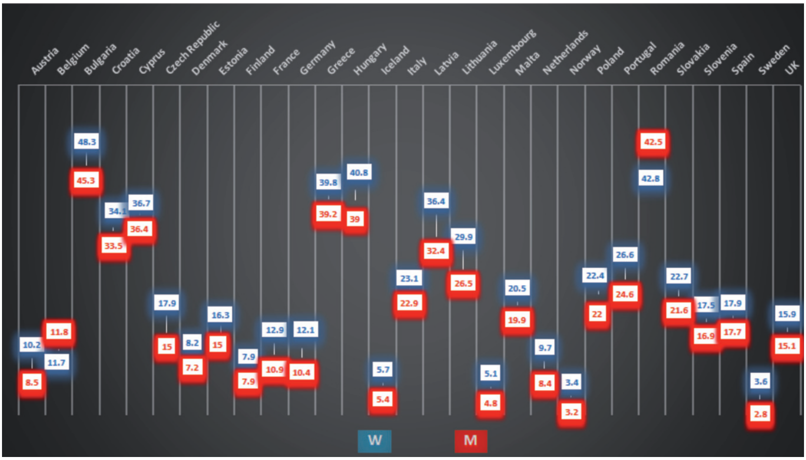

Fig. 5. *Severe materially deprived people by gender - Year 2014 (Source: Eurostat)*

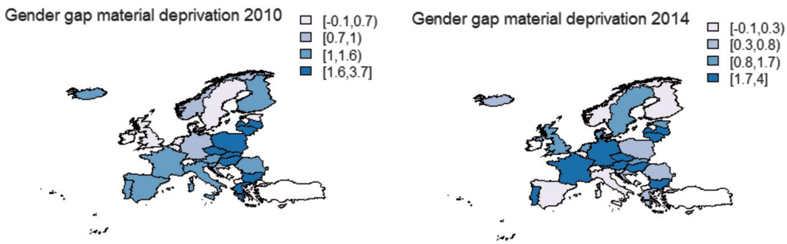

Fig. 6. *Gender gap for the material deprivation rate: left panel (Year 2010) right panel (Year 2014)*

shown that, in an increasingly knowledge-based society and economy, leaving education and training early is associated with high level of economic inequality, since it creates a higher risk of unemployment, jobs with less employment security, more part-time work, and lower earnings (NESSE, 2010; European Commission, 2011).

As shown in Figure 7, in 2014 nearly all EU Member States reported a higher *proportion of early leavers* for young men than for young women, with particularly large differences, of at least 5.0 percentage points, in Cyprus, Estonia, Spain, Portugal, Latvia and Italy. Among the non-member countries, this was also the case of

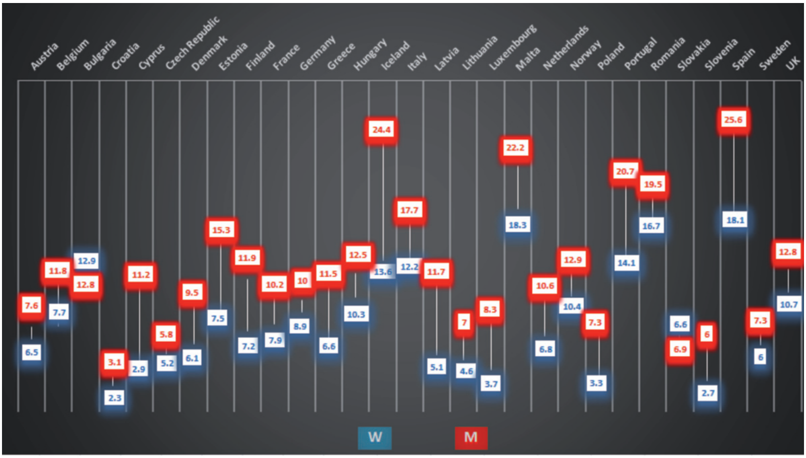

Fig. 7. *Early leavers from education and training (per cent) by gender - Year 2014 (Source Eurostat)*

Iceland. The only exception among the Member States was Bulgaria, where the proportion of early leavers was marginally lower for young men than for young women. Among IPA Adriatic countries the smallest gender gap is found in Croatia (0.6).

Between 2010 and 2014, almost all EU Member States reported a fall in the proportion of early leavers among women: Portugal (–9.9), Cyprus (–6.9), Spain (–4.5), Greece (–4), and Latvia (–3.9) recorded the largest fall in the proportion of early school leavers. As for non-member countries, rates fell noticeably in Iceland (–5.4). A similar situation was observed among young men. With the exception of Poland, Finland, Luxembourg, Bulgaria, Czech Republic, Estonia, Hungary and Slovakia, with an increase around or below 0.5 percentage points, the proportion of early leavers drops elsewhere between these two years. Portugal, again, recorded the largest fall in the proportion of men early school leavers, down 11.7 percentage points between 2010 and 2014. Although, the proportion of early leavers fell more for young men than for young women in percentage point terms, the relation between the two proportions remained stable throughout the period 2010-14 (see Figure 8). Among the IPA Adriatic countries, the largest reduction between 2010 and 2014 of both women and men

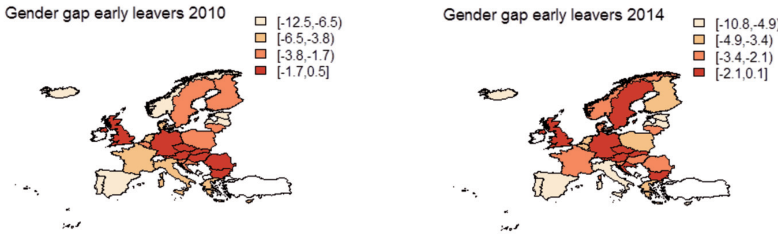

Fig. 8. *Gender gap for the early leavers rate: left panel (Year 2010) right panel (Year 2014)*

early leavers was observed in Greece, Italy and Croatia whereas the proportions are relatively unchanged in Slovenia.

For the competitive and dynamic European economy a further factor, identified in European policy debates as a crucial mechanism for promoting social inclusion and eradication of poverty, is represented by *the employment*, not only because it generates income but also because it can advance social participation and personal development. Accordingly, being in *employment* is generally an effective way to protect oneself from the risk of poverty. There is abundant evidence which records gender inequalities in the labour market (see, for instance, the gender mainstreaming evalua-

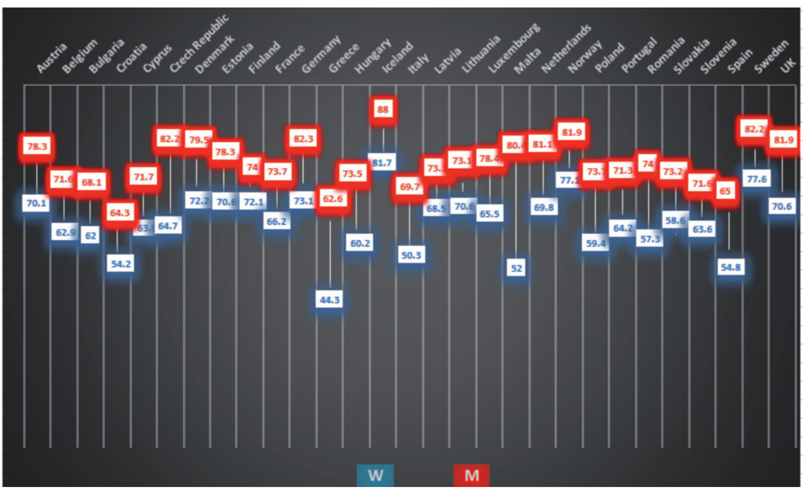

Fig. 9. *Employment rate of the total population by gender - Year 2014 (Source Eurostat)*

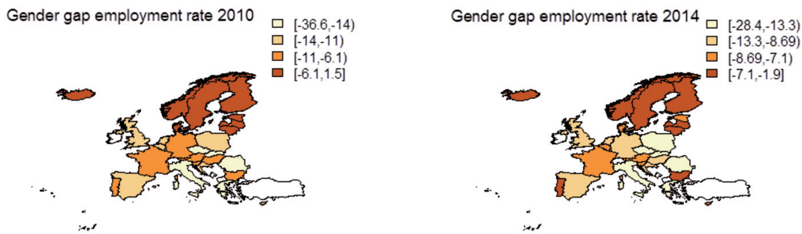

Fig. 10. *Gender gap for the employment rate: left panel (Year 2010) right panel (Year 2014)*

tions of the National Action Plans on employment, Rubery *et al.*, 2004). As shown in Figure 9, the employment rates for women still fall below those for men in all countries, although there are considerable disparities. We observe markedly lower labour market participation of females mainly in Romania, Portugal, Italy and Spain.

The dynamic of this indicator can be captured by looking at the maps shown in Figure 10 in which the values of the gender gaps of 2010 and 2014 are compared. From these maps, it emerges that the difference between employment rates by gender is narrowed between 2010-2014. Notice that the situation of IPA Adriatic countries remains unchanged: Italy and Greece display the highest dissimilarities in the employment rates between women and men. By contrast, the Nordic States (Scandinavian countries and Baltic Republics) report relatively small difference in the employment rates.

3.3. *A social protection performance via Data Envelopment Analysis (DEA)*

In order to monitor levels, worsening and enhancement of social inclusion in Europe, it appears useful to identify a single measure that can summarise the five pillars. In general, the procedure of summarising a complex phenomenon into a single number, is a delicate task, which involves the choice of individual indicators, their normalisation, in order to transform indicators into pure, dimensionless numbers, and the choice of an appropriate aggregation method.

In this last regard, a number of possible aggregation strategies can be found in literature, ranging from simple mathematical formulas, such as the mean-min function (Casadio *et al.*, 2012) to complex procedures, such as the Multicriteria Analysis (Munda and Nardo 2009).

In this chapter, we make use of a unitary input Data Envelopment Analysis (DEA) model, with entities defined only by outputs, to determine a ranking of countries and, consequently, compare levels of social inclusion among states, with a special focus on those belonging to the Adriatic area. DEA is a widely used technique, originally developed to estimate the efficiencies of Decision Making Units (DMUs) within production contexts characterised by multiple outputs and inputs (Charnes *et al.*, 1978).

DEA allows to aggregate multiple inputs and outputs of the units under study into a relative efficiency score. The efficiency of each unit is measured as the ratio of weighted outputs to weighted inputs, where the weights used are not assigned a priori, but are calculated by the technique itself so as to reflect the unit at its most efficient relative to all others in the dataset. More specifically, DEA compares the resources used (inputs) and the quantities produced (outputs) of a DMU to the levels of other units, and the result is the construction of an efficient frontier, establishing a dichotomous classification between efficient and inefficient units, with the DMUs lying on the frontier are efficient (unitary score), the other are inefficient (score of less than unity).

In the case of the production of social protection, we could conceptualise a production process where each country is a "firm" which uses government resources to produce social outputs, such as the reduction of monetary poverty, the improvement of living conditions, greater access to labour markets, better education. For the purpose of our work, we will assume that each country has one "government" and hence one unit of input, and it produces the aforementioned outputs. Thus a DEA model with a single constant input is appropriate in our context, since we do not have the classic production model to be modeled by DEA, but we can only rely on secondary variables, obtained as rates or combinations of primary variables.

More specifically, we follow the approach proposed by Lovell and Pastor (1999); accordingly, the linearised unitary input DEA-model is expressed by the following linear programming:

$$\max h_0 \tag{1}$$

$$\text{s.t.} \quad \sum_{k=1}^{n} \lambda_k y_{jk} \geq h_0 \, y_{jo} \qquad \forall j \tag{2}$$

$$\sum_{k=1}^{n} \lambda_k \leq 1 \tag{3}$$

$$\lambda_k \geq 0, \qquad \forall k \tag{4}$$

In equations (1)-(4), denotes the inverse of efficiency of the DMU under analysis (DMU0), is the jh output of the DMU_k (k=1,…,n) and is the individual contribution of each DMU in the formation of DMUo's target. Here, n=27 and s=4.

In this output-oriented DEA model the indicators are outputs whereas a variable always equal to one is the only input: it is the Koopmans "helmsman", by which countries have an apparatus responsible for the conduct of their social policies (Koopmans, 1951). Therefore, the social inclusion performance is evaluated in terms of the ability of the helmsman in each country to maximise the levels of the five basic indicators (Knox Lovell *et al.*, 1995).

Even if DEA typically does not require normalisation of the data, here, for ease of presentation and analysis of five indicators, we undertake a min-max transformation, so that higher values correspond to a deeper social inclusion, favouring a direct reading of the values in more intuitive terms of social inclusion rather than social exclusion. Details about data transformations are given in the Appendix. In this way, we assure in the rating that 0 denotes the worst social inclusion among the European countries and 1 the best score of social inclusion (benchmark country). Furthermore, exploiting the availability of data over five years (from 2010 to 2014), we calculate a simple index of mobility of countries (MI) (Gambona and Vassallo, 2014), based on the annual changes in rank (DR), appropriately weighted with the annual difference of score (DS) for the *n* countries:

$$MI_i = \sum_{t=2010}^{2014} (-\Delta R_{t,i}).\,|\Delta S_{t,i}| / \sum_{i=1}^{n} |\Delta S_{t,i}|$$

A given country i has net improvement/deterioration of its position over time, in terms of social inclusion, if the mobility index has positive/negative values.

Tables 1 and 2 show the social inclusion efficiency scores for the 29 EU countries over the years 2010-2014, differentiated by gender, whereas a visual representation of the geographical distribution of social inclusion levels in the European countries is provided in Figure 11.

Focusing on female data, we observe that in general terms, the ability of the 29 European countries to perform social inclusion increases from 2010 to 2014. In fact, the median of the efficiency scores is 0.927 in 2010 and 0.953 in 2014. However, also the variability (coefficient of variation) increases from 0.10 to 0.15, indicating a slightly higher dispersion of the scores with a significant worsening in some countries (mean is reduced from 0.90 to 0.89). Throughout the analysed period (2010-2104), almost the same countries, namely Romania, Bulgaria, Italy, Greece and Portugal, occupy the last positions of the ranking. On the other side, many Northern European countries (Sweden, Norway, Iceland, Denmark) together with some Eastern EU Member States (Slovenia, Poland and Czech Republic) are the best performing countries. It is interesting to note a substantial comparative deterioration of social inclusion in Hungary (from 0.960 to 0.768) and Slovakia (from 0.991 to 0.910), whereas we observe a markedly improvement in Cyprus (from 0.905 to 1), Latvia (from 0.83 to 0.95) and Lithuania (from 0.927 to 0.993). In terms of ranking the results are entirely similar. As for the States belonging to the IPA Adriatic countries, Greece and Italy display the lowest levels of social inclusion.

The mobility index MI in Table 3 measures, from year to year, the changes occurred in the ranking and weights the improvements or the worsening of the position with the absolute difference in the scores, to take into account the intensity of change. The sum of the annual values determines the index for the whole

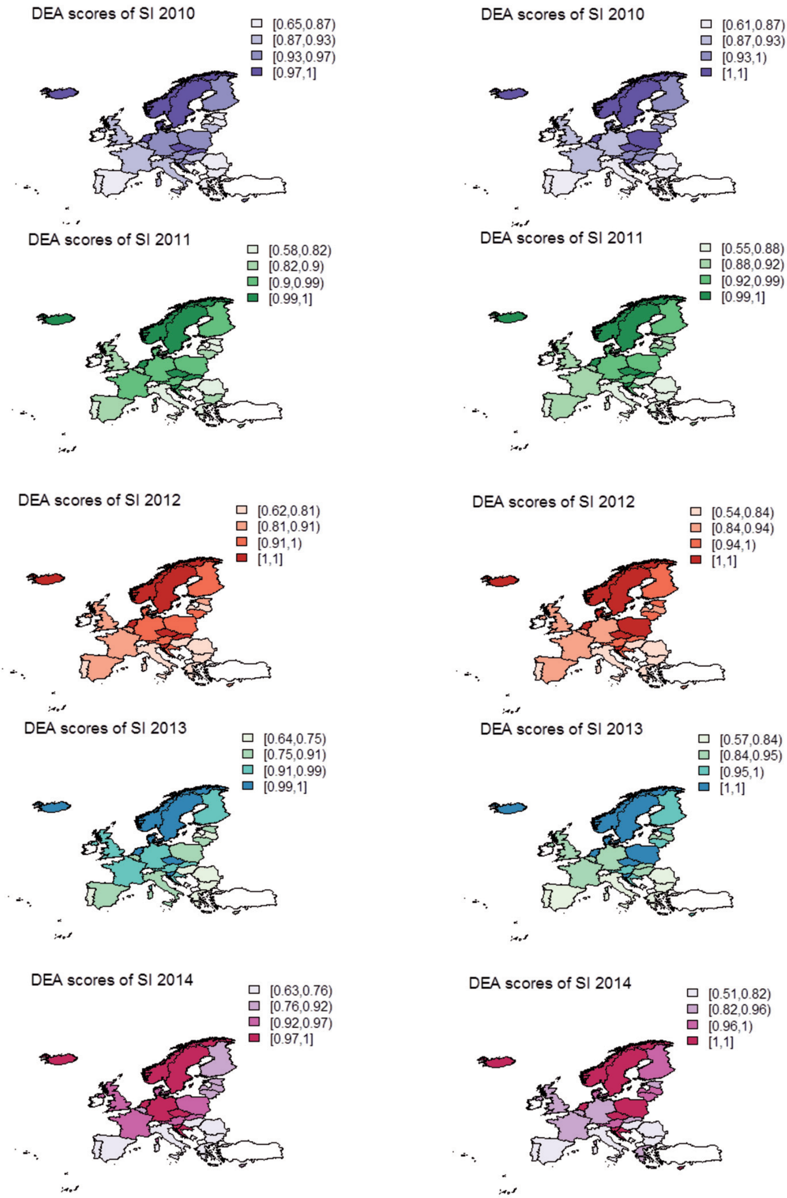

Fig. 11. *DEA efficiency scores of Social Inclusion (SI): Left panel Males Indicators-Right Panel Female Indicators*

Table 1. *Social inclusion score and ranking for the EU countries (2010-2014)-Females*

		2010	2011	2012	2013	2014	diff.	p/n	2010	2011	2012	2013	2014	pos.
1	Austria	0.928	0.927	0.939	0.947	0.954	0.027	+	8	8	6	6	5	3
2	Belgium	0.892	0.888	0.893	0.921	0.892	0.000	+	14	13	12	11	10	4
3	Bulgaria	0.706	0.668	0.654	0.677	0.663	–0.043	–	22	22	20	20	19	3
4	Croatia	0.981	0.937	0.945	0.963	1.000	0.019	+	4	7	5	5	1	3
5	Cyprus	0.905	0.900	0.894	0.947	1.000	0.095	+	13	12	11	7	1	12
6	Czech R.	1.000	1.000	1.000	1.000	1.000	0.000	=	1	1	1	1	1	0
7	Denmark	0.972	0.971	1.000	1.000	0.990	0.018	+	5	5	1	1	3	2
8	Estonia	0.915	0.906	0.935	0.967	0.887	–0.028	–	11	10	7	3	11	0
9	Finland	0.938	0.952	0.948	0.966	0.958	0.020	+	7	6	4	4	4	3
10	France	0.907	0.904	0.908	0.914	0.919	0.012	+	12	11	10	12	8	4
11	Germany	0.922	0.916	0.922	0.941	0.933	0.012	+	10	9	9	9	7	3
12	Greece	0.786	0.747	0.743	0.772	0.816	0.031	+	20	21	18	17	13	7
13	Hungary	0.960	0.766	0.820	0.850	0.768	–0.191	–	6	19	15	13	14	–8
14	Iceland	1.000	1.000	1.000	1.000	1.000	0.000	=	1	1	1	1	1	0
15	Italy	0.843	0.766	0.727	0.758	0.716	–0.127	–	17	20	19	18	17	0
16	Latvia	0.830	0.882	0.932	0.945	0.953	0.123	+	19	14	8	8	6	13
17	Lithuania	0.927	0.978	0.980	0.976	0.993	0.066	+	9	3	3	2	2	7

18	Luxembourg	0.996	1.000	1.000	1.000	1.000	0.004	+	2	1	1	1	1	1
19	Malta	0.867	0.847	0.804	0.818	0.724	–0.143	–	16	17	16	16	16	0
20	Netherlands	1.000	1.000	1.000	1.000	1.000	0.000	=	1	1	1	1	1	0
21	Norway	1.000	1.000	1.000	1.000	1.000	0.000	=	1	1	1	1	1	0
22	Poland	1.000	0.972	1.000	1.000	1.000	0.000	=	1	4	1	1	1	0
23	Portugal	0.763	0.785	0.778	0.743	0.679	–0.084	–	21	18	17	19	18	3
24	Romania	0.609	0.545	0.531	0.570	0.505	–0.104	–	23	23	21	21	20	3
25	Slovakia	0.991	0.984	0.996	0.934	0.911	–0.080	–	3	2	2	10	9	–6
26	Slovenia	1.000	1.000	1.000	1.000	1.000	0.000	–	1	1	1	1	1	0
27	Spain	0.840	0.875	0.842	0.824	0.742	–0.099	–	18	15	13	15	15	3
28	Sweden	1.000	1.000	1.000	1.000	1.000	0.000	–	1	1	1	1	1	0
29	United Kingdom	0.867	0.872	0.838	0.840	0.858	–0.009	–	15	16	14	14	12	3
	Mean	0.908	0.896	0.898	0.906	0.892								
	Median	0.927	0.916	0.935	0.947	0.953								
	SD	0.097	0.111	0.118	0.111	0.132								
	CV	0.107	0.124	0.131	0.122	0.148								

diff: difference between score 2014 and score 2010; pos: improvement/worsening of ranking between 2010 and 2014

IPA ADRIATIC countries

Table 2. *Social inclusion efficiency scores and ranking for the EU countries (2010-2014)-Males*

		2010	2011	2012	2013	2014	diff.	p/n	2010	2011	2012	2013	2014	pos.
1	Austria	0.952	0.948	0.984	0.970	0.967	0.015	+	6	7	5	5	5	1
2	Belgium	0.880	0.877	0.885	0.884	0.837	–0.044	–	14	12	12	12	15	–1
3	Bulgaria	0.785	0.819	0.779	0.740	0.689	–0.096	–	20	17	18	17	23	–3
4	Croatia	0.948	0.984	0.990	0.982	1.000	0.052	+	7	5	3	4	1	6
5	Cyprus	0.952	0.890	0.826	0.680	0.885	–0.067	–	5	11	14	22	14	–9
6	Czech R.	1.000	1.000	1.000	1.000	1.000	0.000	=	1	1	1	1	1	0
7	Denmark	0.970	0.987	0.977	1.000	0.953	–0.016	–	3	4	6	1	7	–4
8	Estonia	0.804	0.802	0.810	0.814	0.804	0.000	–	19	18	16	14	17	2
9	Finland	0.942	0.940	0.951	0.956	0.908	–0.034	–	8	8	7	6	13	–5
10	France	0.895	0.900	0.907	0.923	0.914	0.019	+	11	10	10	8	11	0
11	Germany	0.927	0.964	0.989	0.982	0.969	0.042	+	10	6	4	3	4	6
12	Greece	0.784	0.717	0.720	0.723	0.736	–0.049	–	21	22	21	19	20	1
13	Hungary	0.894	0.784	0.780	0.739	0.736	–0.159	–	12	19	17	18	19	–7
14	Iceland	1.000	1.000	1.000	1.000	1.000	0.000	=	1	1	1	1	1	0
15	Italy	0.866	0.781	0.736	0.742	0.707	–0.159	–	17	20	20	16	22	–5
16	Latvia	0.666	0.675	0.690	0.698	0.752	0.086	+	23	23	22	21	18	5
17	Lithuania	0.874	0.856	0.908	0.901	0.912	0.038	+	16	15	9	10	12	4

18	Luxembourg	1.000	1.000	1.000	0.983	0.962	–0.038	–	1	1	1	2	6	–5
19	Malta	0.876	0.854	0.841	0.842	0.807	–0.069	–	15	16	13	13	16	–1
20	Netherlands	1.000	1.000	1.000	1.000	0.980	–0.020	–	1	1	1	1	3	–2
21	Norway	0.999	0.989	1.000	1.000	1.000	0.001	+	2	3	1	1	1	1
22	Poland	0.929	0.938	0.924	0.900	0.918	–0.010	–	9	9	8	11	10	–1
23	Portugal	0.748	0.780	0.764	0.699	0.626	–0.122	–	22	21	19	20	25	–3
24	Romania	0.647	0.572	0.616	0.633	0.632	–0.015	–	24	24	23	23	24	0
25	Slovakia	1.000	1.000	0.992	0.947	0.941	–0.059	–	1	1	2	7	8	–7
26	Slovenia	0.965	0.991	1.000	1.000	0.982	0.017	+	4	2	1	1	2	2
27	Spain	0.841	0.872	0.822	0.806	0.720	–0.122	–	18	13	15	15	21	–3
28	Sweden	1.000	1.000	1.000	1.000	1.000	0.000	=	1	1	1	1	1	0
29	United Kingdom	0.883	0.867	0.894	0.903	0.927	0.044	+	13	14	11	9	9	4
	Mean	0.898	0.889	0.889	0.877	0.871								
	Median	0.927	0.900	0.908	0.903	0.914								
	SD	0.097	0.110	0.112	0.120	0.120								
	CV	0.108	0.124	0.126	0.136	0.138								

diff: difference between score 2014 and score 2010; pos: improvement/worsening of ranking between 2010 and 2014

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Table 3. *Mobility index of social inclusion in the EU countries (2010-2014)*

	Females						Males					
	annual mobility					mobility index	annual mobility					mobility index
	2010	2011	2012	2013	2014	2010-2104	2010	2011	2012	2013	2014	2010-2104
Austria	–	0.00	0.06	0.00	0.01	0.06	–	–0.01	0.14	0.00	0.00	0.01
Belgium	–	0.01	0.01	0.06	0.04	0.00	–	0.01	0.00	0.00	–0.16	–0.03
Bulgaria	–	0.00	0.06	0.00	0.02	0.10	–	0.14	–0.08	0.07	–0.35	–0.21
Croatia	–	–0.18	0.04	0.00	0.19	0.04	–	0.10	0.02	–0.01	0.06	0.23
Cyprus –	–	0.01	0.01	0.44	0.40	0.85	–	–0.52	–0.37	–2.24	1.89	–0.43
Czech Repubblic	–	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00
Denmark	–	0.00	0.27	0.00	–0.03	0.03	–	–0.02	–0.04	0.22	–0.32	–0.05
Estonia	–	0.01	0.20	0.27	–0.82	0.00	–	0.00	0.03	0.02	–0.03	0.00
Finland	–	0.02	0.02	0.00	0.00	0.04	–	0.00	0.02	0.01	–0.39	–0.12
France	–	0.00	0.01	–0.03	0.02	0.04	–	0.01	0.00	0.06	–0.03	0.00
Germany	–	0.01	0.00	0.00	0.02	0.03	–	0.21	0.10	0.01	–0.01	0.18
Greece	–	–0.05	0.03	0.06	0.22	0.16	–	–0.10	0.01	0.01	–0.01	0.04
Hungary	–	–3.47	0.50	0.12	–0.10	–1.15	–	–1.08	0.02	–0.08	0.00	–0.80
Iceland	–	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00

Italy	–	–0.32	0.09	0.06	0.05	0.00	–	–0.36	0.00	0.04	–0.24	–0.57
Latvia	–	0.36	0.69	0.00	0.02	1.20	–	0.00	0.03	0.02	0.19	0.31
Lithuania	–	0.42	0.00	0.01	0.00	0.34	–	0.03	0.59	–0.01	–0.03	0.11
Luxembourg	–	0.01	0.00	0.00	0.00	0.00	–	0.00	0.00	–0.03	–0.10	–0.14
Malta	–	–0.03	0.10	0.00	0.00	0.00	–	–0.03	0.07	0.00	–0.12	–0.05
Netherlands	–	0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00	–0.05	–0.03
Norway –	–	0.00	0.00	0.00	0.00	0.00	–	–0.01	0.04	0.00	0.00	0.00
Poland –	–	–0.12	0.19	0.00	0.00	0.00	–	0.00	0.03	–0.14	0.02	–0.01
Portugal	–	0.09	0.02	–0.14	0.08	0.19	–	0.04	0.06	–0.12	–0.42	–0.26
Romania	–	0.00	0.06	0.00	0.08	0.23	–	0.00	0.09	0.00	0.00	0.00
Slovakia	–	0.01	0.00	–1.04	0.03	–0.36	–	0.00	–0.01	–0.43	–0.01	–0.30
Slovenia	–	0.00	0.00	0.00	0.00	0.00	–	0.07	0.02	0.00	–0.02	0.02
Spain	–	0.15	0.15	–0.08	0.00	0.22	–	0.21	–0.19	0.00	–0.59	–0.26
Sweden	–	0.00	0.00	0.00	0.00	0.00	–	0.00	0.00	0.00	0.00	0.00
United Kingdom	–	–0.01	0.15	0.00	0.05	0.02	–	–0.02	0.15	0.03	0.00	0.12

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period, which does not necessarily coincide with the mobility only between the first and the last year. Positive values of MI indicate positive dynamics with a comparative improvement of social inclusion. For example, Cyprus, which we have already noticed, shows a positive mobility in all the years, especially in 2013 compared to 2012. Similar interpretation can be provided to the mobility of Lithuania and Latvia. Hungary stands out among the countries with negative mobility, both characterised by repeated worsening in the years.

Turning to analyse the results of DEA obtained through the inclusion indicators of males, we find out that the ability of the 29 European countries to perform social inclusion slightly decreases from 2010 to 2014. In fact, the median of the efficiency scores is 0.927 in 2010 and 0.914 in 2014, whereas the average values of the scores ranging from 0.898 in 2010 to 0.871 in 2014. Likewise for the women's ranking, last positions are again occupied by Bulgaria, Romania, Portugal and Greece (see Table 2).

The results of DEA analysis also evidence the poor performance of Latvia in performing men social inclusion, differently from the elevated scores achieved in the females case. Conversely, higher efficiency results are especially exhibited by the Northern European Countries, with some exceptions represented by the Slovenia, Croatia and Czech Republic, which are often in the best practice frontier throughout the analysed period. Monitoring the improvements or deteriorations of the countries' positioning in their levels of social inclusion, we observe that much more States, compared to the female situation, worsen their performances, with mobility index values shifting from positive to negative. This is particularly the case of Italy, Portugal Hungary, Cyprus and Slovakia (see Table 3).

Similar interpretations can be inferred from Figure 12 which crosses social inclusion level in 2010 and its variations between 2010-2014. That visualisation creates a four quadrant map. In the bottom sides of the map we find countries which experienced a deterioration of their levels of social inclusions. By contrast, points located above the horizontal axis represent States that increased performance over time. Actually, this analysis enabled classifying the

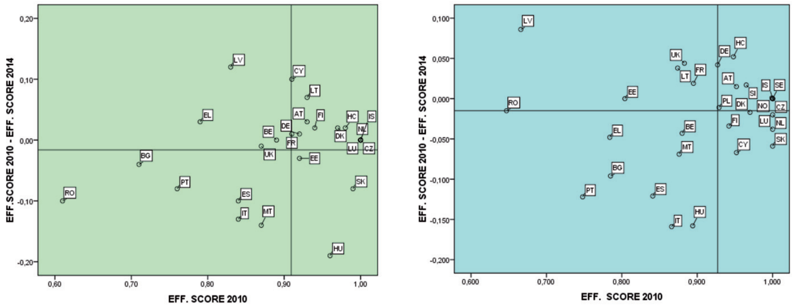

Fig. 12. *Social inclusion scores in 2010 and its variation between 2010 and 2014 for the European countries. Left panel Women-Right panel Men*

States in four groups, according to their original values of social inclusion performance and evolution over time. The countries that belong to the first group are those positioning in the top-right side of Figure 12. They presented good performance at the beginning of the analyzed period and were still able to improve the performance over time and are named *star countries*. The countries in the second group (top-left quadrant) displayed relatively lower performance in 2010 but enhanced their performance over time and are considered *rising stars*. The third group (bottom-left side of the map) is composed by States characterized by Social Inclusion DEA scores below the average of efficiency scores of 2010 and also declined performance over time. We labelled them as *challenging countries*. Finally, in the last group (bottom-right side of Figure 12) we find countries with good performance in the 2010 but with lower performance over the five years (*falling stars countries*).

For the females case, we are able to summarise the following results. The quadrant analysis reveals that in the challenging area are mainly located countries of the Mediterranean region (Portugal, Spain, Italy and Malta) together with the Romania and Bulgaria. Instead, examples of *falling stars countries* are Estonia, Slovakia and Hungary. It is worth noting that in the group characterized by good efficiency scores in the assessment carried out in both time periods are mainly Northern European countries (Iceland, Netherlands, Sweden, Norway, Latvia) along with Cyprus, Croatia and Czech Republic. In the males representation, Hungary, Italy, Spain, Malta, Belgium, Bulgaria, Portugal and Greece stand out among countries with negative mobility, characterised by worsening over the five years, being located in the challenging area of the Figure 12. Furthermore, we find that Finland, Cyprus, Slovakia and Netherlands and Luxembourg are examples of countries classified as *falling stars.*

3.4. *Microsimulation modelling. The role of EUROMOD technique in assessing the impact of social policies on income distribution and inequalities indexes*

In this last section, we give an overview on how ex ante evaluation techniques can be functional for the analysis of gender-oriented policies and for capturing gender differences with respect to social inclusion indicators. Ex-ante policy evaluation represents an important tool to inform the design of policies, their implementation and subsequent refinements. There are several distinct motivations for using ex-ante policy evaluation methods. Their main strength relies on the ability to predict the potential impact of a series of policies as well as the impact of a specific policy under different scenarios, complementing and informing subsequent ex-post evaluation of the same programme. Essentially, ex ante analysis can answer "what if" questions, since counterfactual must be generated, showing how each micro-units in a sample survey would fare depending on the reform being undertaken and how much the reform would cost.

The policy evaluation literature has been a long dominated by ex-post techniques which by definition are used to evaluate the impact of interventions and programmes following their implementation. Thus, a fundamental requirement of all ex-post evaluation techniques, is, however, that the policy has been implemented. In an effort to overcome the requirement to collect data post-implementation, a number of studies have moved beyond historical analysis towards ex-ante policy evaluation methods.

An established method for ex-ante evaluation of public policies is represented by microsimulation techniques. Over the last decades there has been an increasing utilise of microsimulation models in qualitative and quantitative analysis of public policies. In general terms, these models allow to simulate the effects that a policy have on the state or behaviour of micro-level units, e.g. individuals, households, firms (Figari *et al.*, 2013).

In social sciences the origin of microsimulation models dates back to the pioneristic work of Orcutt (1957), where a new approach for simulating the effects of the change in policy or other changes on micro-units has been proposed. In his paper, Orcutt posited that microsimulation models consisting of "various sorts of interacting units which receive inputs and generate outputs" (Orcutt, 1957, p. 117) could be used to investigate "what would happen given specified external conditions and governmental actions" (Orcutt, 1957, p.122). However, owing to the limitations in computing power and the lack of suitable data, the use of microsimulation models in economics for public decision-making started to develop only recently. Today, these techniques are routinely and extensively employed not only for tax and transfer policy purposes but in many areas which have a public policy-relevance.

The importance of microsimulation in the analysis of public policies owes to several of its qualities. First, they allow to capture the interaction between policies and the complexity of economic and social life (Zaidi *et al.*, 2009; Zucchelli, *et al.*, 2010). As stressed by different authors (see, among others, Gilbert and Troitzsch, 2005), the microsimulation approach has the advantage of relying on the richness of information contained in the data from the real world, individual-level data, or microdata relating to the characteristics and behaviours of individuals, to create an artificial one that mimics the original, but upon which experiments can be undertaken and scenarios tested. The usefulness of microsimulation techniques in the analysis of public policies can also be ascribed to the ability to account for the widest heterogeneity possible of the agents within the population of interest. Furthermore, through dynamic microsimulation techniques is possible to measure the effects of a policy across a number of time-horizons.

The number of national studies using microsimulation modeling to compare reforms, specifically aimed at reducing poverty and social exclusion, has dramatically increased over recent years.

Particular attention has been given in Europe to the analysis policy reforms at domestic and European level in an attempt to accelerate the convergence of social policies.

Our main emphasis in this chapter is on EU-wide tax-benefit model for ex-ante policy, named EUROMOD. EUROMOD is a research project, financed by the European Union and involving researchers from the EU 28 countries with the objective of building a European-wide microsimulation model (Sutherland and Figari, 2013). Combing information on policy rules with detailed and nationally representative micro-data on individual and household circumstances, drawn from household income surveys and other data sources, EUROMOD enables a wide range of applications and comparability of results. For most countries input data are derived from the European Union Statistics on Income and Living Conditions (EU-SILC), which is the main source of comparable statistics on income distribution, risk of poverty and social exclusion in the EU countries. Input data can enhanced with additional adjustment to capture changes in the population characteristics over time. Furthermore, data on which the method relies on, are synchronised to have comparable and consistent results across countries. EUROMOD can profitable be used in simulating many reforms in the direction of promoting the social inclusion target, stated by the European Social Agenda, agreed at Lisbon and Nice European Council in 2000, and at the core of the Europe 2020 Agenda. Through this multi-country tax-benefit model it is possible to simulate a wide variety of policy instruments, including income taxes, local and national, social insurance contributions paid by employees, employers and the self-employed, family benefits, housing benefits, and social assistance and other income-related benefit[2]. Currently EUROMOD[3] simulates the policy systems up to 2010 for all EU 27 countries, but its framework is also equipped to accommodate any future enlarge-

[2] See the official EUROMOD web site (*https://www.iser.essex.ac.uk/euromod*) for up-to-date information and detailed instructions on how to access the model.

[3] Latest EUROMOD public version F6.0 released in August 2012.

ment of the EU. EUROMOD is of value in assessing the effects of different policies on the income distribution and inequality indexes. Most use of this approach is concerned with the simulation of previous, current, future and "potential" tax-benefit rule, complex policy reforms, counterfactual ("what if") scenario and policy swapping analysis. These latter simulations focus in the potential impact of "borrowing policies" in place in other countries. The "policy swapping" experiments may be particular valuable to understand the likely impact of any policies on a given population of interest, to capture the interaction between tax-benefit systems and the characteristics of such a population and to assess the effectiveness of the national policies.

As for EU action on social inclusion and gender mainstreaming, the starting point within EUROMOD regards the possibility to assess the implications for women and men of a given policy. In this respect, it is worth noting that EUROMOD allows direct calculation of three of the primary social inclusion indicators agreed at Laeken (European Commission, 2003), namely: proportion below 60% median, ratio of top quintile share to bottom quintile share, and median poverty gap, whereas, since the model does not contain data on previous income, it does not allow calculation of poverty persistence. Furthermore, given that the labour market behaviour is assumed fixed, the model cannot at present predict changes in the labour market indicators or the proportion in education. By contrast, in view of the fact that employment is seen as a key mechanism for gender equality, it would be an interesting exercise to examine how an increase in female employment affects the levels of financial poverty, to have insight on the implications of gender mainstreaming policies on employment for the indicators of social exclusion. It is possible to simulate the differential impact by gender of policy changes. For example, we could be interested in examining to what extent the higher poverty rate for women than for men aged 65 + would be reduced be reduced by a common minimum pension guarantee for all Member States. Simulation of other hypothetical changes in social policy could be also introduced with the aim of reducing the differences affecting various aspects of women and men's lives.

3.5. *Concluding remarks*

In this chapter, we focused on gender inequalities in the risk of poverty and social exclusion in 29 European countries. As emerged from the literature, the EU official documents and political debates, the intersection of gender and social inclusion is complex, with varying national differences in the size or direction of gender gaps. In order to provide the necessary context information, we first provided a synthetic comparative analysis of the situation and trends over recent years of social inclusion in the European Union. To underpin the analysis of social situation and monitoring the progress towards gender equalities, there was a primary focus on a set of commonly agreed indicators, endorsed by the Laeken European Council, broken down by gender. The selected indicators reflect the main operational objectives for a higher social inclusion of individuals: reduction of monetary poverty, improvement of living conditions, adequate educational attainment level and greater access to labour market. Our analysis revealed that the women's increased risk of poverty and social exclusion is still an issue of particular concern in nearly all the European countries. In a second stage of our study, we developed a composite measure of social inclusion. More specifically, the construction of a composite indicator to assess EU States' performance in providing social inclusion, is based on DEA. This techniques has already been applied in the context of policy performance assessment, to gauge, for example countries' performance with regard to aggregate deprivation (Zaim *et al.*, 2001), to provide an alternative weighting system for the Human Development Index (Mahlberg and Obersteiner, 2001, Despotis, 2005), to gauge EU member states' performance with regard to the Lisbon objectives (European Commission, 2004, p. 376-378). By following the DEA approach, we were able to identify the best practices of gender social inclusion among European Countries. Rankings obtained both using females and males indicators, reveal that some Northern European countries, namely Iceland, Sweden, Norway, Denmark and Netherlands, are frequently in the best positions. We could also identify a group of Eastern European States (Slovenia, Croatia, Czech Republic) with relatively high efficiency scores. On the other hand, when we look at the States that are the worst performers we can conclude that the majority belongs either to the Mediterranean basin (Italy, Spain, Portugal, Greece) or to Eastern Europe (Romania, Bulgaria). The last stage of the analysis pertains to the assessment of performance change over time. For this purpose, we used a simple mobility index, based on annual changes in ranks, to monitor improvements or deteriorations of the countries' positioning. Crossing social inclusion level in 2010 and its variation between 2010-2014, the countries are classified in four groups: stars, rising stars, falling stars and challenging, according to their changes in performance over time.

Finally, we conclude the chapter by highlighting the possibility to build a microsimulation model to assess the differential impact by gender of policy changes.

Appendix A
Min-max transformation

Social exclusion indicators used in this study are not measured in the same units nor have the same direction. Therefore data transformation is required to guarantee that the higher values reflect better social inclusion performance. There is a wide range of normalisation methods (OECD, 2008).

In this study, we deal with a min-max transformation in a continuous scale from 2 (minimum) to 10 (maximum). According to the original direction of the variable is used min-max formula (1) or (2)

$$I_{pc} = \frac{x_{pc} - min_c(x_p)}{max_c(x_{pc}) - min_c(x_p)} 8+2 \quad (1)$$

$$I_{pc} = \frac{max_c(x_p) - x_{pc}}{max_c(x_{pc}) - min_c(x_p)} 8+2 \quad (2)$$

where is the value of indicator p for country c.

More specifically, for the first four indicators (at-risk-poverty rate, persistent at-risk-poverty rate, material deprivation rate and early leavers rate) we apply the transformation given in Equation 2. In this way, the direction of the indicators is changed allowing a direct reading of the values in more intuitive terms of social inclusion rather than social exclusion. Furthermore, the values move from a scale 0-1 to a scale 2-10. Given the technique used in this paper these data transformations did not distort the final results.

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