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Social policies for families in Europe: an efficiency analysis

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Abstract. Applying a two-stage Free Disposal Hull (FDH)/Tobit approach to a sample of 23 European countries, we find that the efficiency of social expenditure for families is positively correlated to per-capita GDP, population size, the education level of people, the weight and the ethics of the public sector.

Key words: Efficiency of social expenditure for families; free disposal hull; data envelopment analysis; non-discretionary factors.

JEL codes: H53, H59, I 38

E-PFRP N. 41

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1. Introduction

The economic literature shows that social policies for families have important effects on socio-economic variables like female participation to labour market, fertility, child well-being and poverty reduction (Bradshow and Attar-Schwartz 2011; Del Boca 2002). After the proclamation of the European Pillar of Social Rights, family and child policies are receiving an increasing attention (Olivetti and Petrongolo 2017). Using the usual two-stage DEA/FDH-Tobit methodology, we find that several EU countries are below the efficiency frontier, and that inefficiency is correlated to variables that are beyond the control of policymakers.

2. Methodology

We use a two-stage approach suggested by Afonso et al (2005, 2006, 2011). As a first step, we perform a non-parametric efficiency analysis calculating DEA/FDH scores for the year 2015 for 23 European countries[1] representing our Decision-Making Units (DMU). The calculated efficiency scores are the dependent variables in the Tobit regression implemented in the second stage of the analysis investigating the impact of socio-economic variables on the efficiency of national social expenditure for families.

3. The efficiency analysis

Welfare policies for families are multidimensional. However, their main goals are work-family reconciliation (encouraging female participation in the labour market and the birth rate) and income support (to combat poverty and social exclusion).

Thus, we consider the following output variables: maternal employment, fertility rates, proportion of children aged 0-2 enrolled in formal early

[1] We use both Eurostat and OECD (Family database and SOCX database) data to expand the set of socio-economic variables. The 23 countries considered in the analysis represent the set of the common countries in the various datasets.

childhood education and care, proportion of children aged 3-5 enrolled in pre-primary (or primary) education, population under 16 at risk of poverty and social exclusion[2], mean equivalised net family income (in PPP US dollars)[3].

As in Antonelli and De Bonis (2019) each variable ranges from 0 to 1 after the normalization with the formula:

$$\frac{x_{i,j}-x_{min,j}}{x_{max,j}-x_{min,j}} \quad \text{for i= 1, 2…23} \quad \text{j= 1, 2,5}$$

To ensure that the highest values represent the best performances, we consider the complement to one of the variables "population under 16 at risk of poverty and social exclusion. The sum of the five normalized variables (with equal weight) gives a synthetic indicator of the performance of welfare for family policies (Afonso et al 2005,2010).

Our input is total per capita[4] social expenditure for families (average value for the years 2011-2015 in PPP US dollars) including cash benefits (income maintenance benefits in the event of child birth, parental leaves, other direct cash transfers), benefits in kind (child day care, home day-care help, accommodation[5] and other services) and tax-expenditures measures (family or child allowances).

[2] Population under 16 at risk of poverty or social exclusion (abbreviated as AROPE under 16) is defined by Eurostat as the sum of persons under 16 who are either at risk of poverty, or severely materially deprived or living in a household with a very low work intensity. Persons are only counted once even if they are present in several sub-indicators. The AROPE rate for total population is a target of the EU 2020 strategy, aiming at lifting at least 20 million people out of the risk of poverty and social exclusion by 2020.

[3] The equivalised disposable income is the total income of a household, after tax and other deductions, that is available for spending or saving, divided by the number of household members converted into equalised adults according the OECD equivalence scale.

[4] In the Eurostat and OECD databases the per capita social expenditure is calculated considering the total population. However, we think that this data could underestimate the real amount of benefits provided to families. We calculate per-capita expenditure dividing social expenditure for families by the number of potential beneficiaries (not by total population). This last variable is estimated by multiplying the number of families (couples and single parent families) by the average composition of families (couples and single parents).

[5] Accommodation includes the use of a rent free house or a house with a rent below the market value.

Table 1 reports the results for the DEA/FDH variable-returns-to-scale analysis.

Table 1. FDH and DEA efficiency scores (2015)

	FDH scores		DEA scores	
Countries	Input efficiency	Output efficiency	Input efficiency	Output efficiency
Austria	0,84	0,66	0,82	0,66
Belgium	0,91	0,98	0,90	0,91
Czech R.	0,94	0,51	0,94	0,51
Denmark	1,00	1,00	1,00	1,00
Estonia	0,99	0,62	0,96	0,61
Finland	0,86	0,72	0,84	0,69
France	1,00	1,00	0,99	0,99
Germany	0,83	0,74	0,82	0,74
Greece	1,00	1,00	1,00	1,00
Hungary	0,90	0,32	0,89	0,30
Ireland	0,94	0,59	0,91	0,56
Italy	0,94	0,45	0,94	0,44
Latvia	1,00	1,00	0,99	0,84
Lithuania	1,00	1,00	0,99	0,85
Luxembourg	0,79	0,83	0,79	0,83
Netherlands	1,00	1,00	1,00	1,00
Poland	0,97	0,63	0,97	0,38
Portugal	1,00	1,00	1,00	1,00
Slovak Rep.	0,92	0,25	0,91	0,24
Slovenia	0,96	0,85	0,94	0,82
Spain	0,96	0,49	0,96	0,49
Sweden	1,00	1,00	0,95	0,96
UK	0,89	0,75	0,87	0,74
Average	0,94	0,76	0,93	0,72

DEA scores are generally lower than FDH scores given the additional assumption of convexity for the DEA frontier.

The set of efficient countries is heterogeneous including Nordic (Denmark, Netherlands) and Southern countries (Portugal, Greece) in both specifications (FDH and DEA) and also France with some Eastern countries (Latvia, Lithuania) in the FDH specification. This last wider set of countries thus

includes countries on the FDH frontier.

Regarding output efficiency, the average score is 72% in the FDH specification and 76% in the DEA one, pointing out possible improvements for many countries: the same amount of input (per capita social expenditure for families) could provide about 25% more output. Input efficiency scores range from 0,79 to 0,97 for the 15 inefficient countries.

Note that countries on the frontier are efficient in a relative sense: no other country obtains a higher performance with a lower expenditure level. This might underestimate inefficiencies.

4. The econometric specification

To explain cross-country differences in efficiency levels, we follow the existing literature (Afonso and Aubyn 2005, 2006, 2011; Afonso et al. 2005, 2010; Antonelli and De Bonis 2019) analysing the role of some institutional and socio-economic variables. Beside the discretionary input (public expenditure), other variables, the so-called non-discretionary inputs, might be correlated to efficiency.

Given that the distribution of the efficiency scores is not normal and it is truncated at 1, as for its maximum value, we estimate the following censored Tobit regression:

$$\delta i = \beta Zi + \varepsilon i,\ i=1, 2..., 23$$

where δi is the (22x1) vector of the FDH input efficiency scores; Zi is the (1xs) vector of non- discretionary variables; β is the (sx1) vector of coefficients to be estimates and εi is the (22x1) errors vector.

As a dependent variable we use the FDH input efficiency score, because this method only assumes free disposability of resources, thus imposing the smallest amount of restrictions on the data, and because the debate on public production efficiency mainly focuses on input waste, given that inputs are more

than outputs under the policymaker's control.

The independent variables used in the regressions and the corresponding hypotheses we test are: per capita GDP as a proxy of the available amount of physical capital, which improves efficiency and the ability of monitoring policy makers; population size, to control for the role of scale economies, found to be relevant in sectors like education (Curristine et al. 2007), that is a component of our output indicator; the share of bachelors within the population as a proxy for the competence of bureaucrats as well as for the citizens' ability to control them; the relative size of public intervention within social protection, for which we adopt two alternative measures: the ratio of public to private social expenditure and the universality degree of the welfare system; a corruption index, given that countries with less corruption are expected to be more efficient, for which we use two alternative measures, the Corruption Perception Index (CPI) survey data measure and the Global Competitiveness Index (GCI) Report public sector "Ethics and Corruption" measure[6].

Table 2 reports the results: efficiency is related to factors that, at least in the short- to medium-run, are outside the control of the DMU. The estimated coefficients of per capita GDP, population size and education are statistically significant and positively related to the efficiency score; the result is robust to the introduction of other variables: the public/private sector mix and universality, on the one hand, and the CPI and GCI corruption measures, on the other hand. These variables also are statistically significant and positively correlated to efficiency[7].

[6] Per-capita GDP: 2011-2015 average (Source: OECD); population: 2011-2015 average (Source: Eurostat); share of bachelors in population: 2011-2015 average (Source: Eurostat); public/private mix: ratio between public and private (mandatory plus voluntary) social expenditure (Source: OECD SOCX, ratio 2006-2015); universality degree: ratio between in-kind benefits and total social benefits (cash and in kind), 2011-2015 average (Source: our elaborations on OECD SOCX Database); corruption (higher values denote a lower corruption level): CPI/per-capita GDP)*100000
(Source: https://www.transparency.org/research/cpi/overview); Ethics and Corruption/per capita GDP (Source: http://reports.weforum.org/global-competitiveness-report-2017-2018/).
[7] The p-value of the GCI corruption variable is around 10%.

Table 2. Censored normal Tobit results

	Model 1	Model 2	Model 3	Model 4
Y	6,92924e-09 (0,0003)	3,42497e-06 (0,0296)	3,45093e-06 (0,0317)	3,08415e-06 (0,0376)
POP	3,93044e-09 (0,0120)	1,52813e-09 (0,0449)	1,42216e-09 (0,0695)	1,36306e-09 (0,0808)
E	0,223379 (<0,0001)	0,0657496 (0,0006)	0,0649581 (0,0009)	0,0618126 (0,0016)
MIX		0,550149 (0,0001)		
U			0,555547 (0,0002)	0,584094 (<0,0001)
CPI		39,9675 (0,0981)	41,3244 (0,0908)	
EC				622,420 (0,1056)
Σ	0,197377 (0,0291016)	0,0872875 (0,0128698)	0,0882554 (0,0130125)	0,0886697 (0,0130736)

Notes: *Y*, GDP per capita; *POP*, population; *E*, educational level, *MIX*, public to private social expenditure ratio; *U*, universality; *CPI*: CPI corruption measure; *EC*: GCI corruption measure. P-values in brackets.

5. Conclusions

We construct a performance index for 23 European countries to measure their relative outputs in social expenditure for families for the year 2015. Based on this output indicator, we measure countries' relative efficiency applying non-parametric methods and use nondiscretionary factors to explain cross-country variability in efficiency. We find that per-capita GDP, population size, the education level of people, the weight and the ethics of the public sector have a significant positive association with the efficiency of social expenditure for families.

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