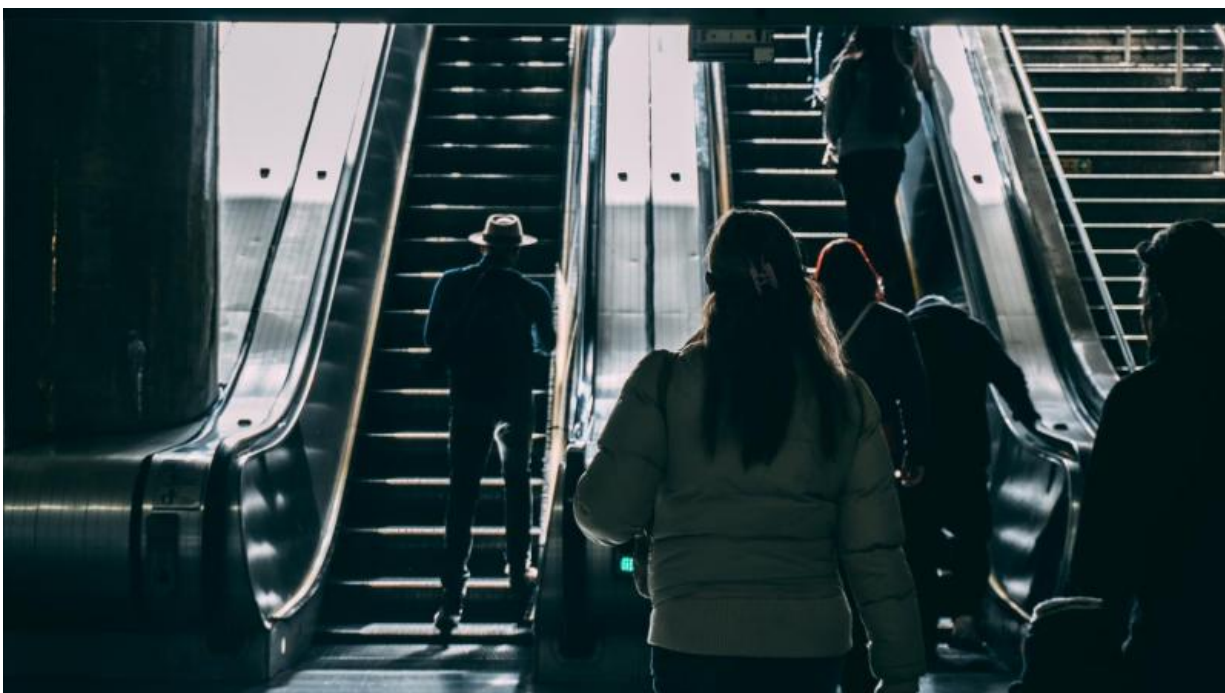


# Mathematicians reveal reasons why the level of poverty in European countries changes

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It has been estimated how and why poverty changed in 25 European countries in the period between 2005 and 2011. Credit: University of the Basque Country

Oihana Aristondo, a researcher at the UPV/EHU-University of the Basque Country, has succeeded in expressing the poverty index of a country using a mathematical formula based on three variables. She has reported on her results in the *International Journal of Approximate Reasoning*. Aristondo has analysed the change in the levels of poverty

between 2005 and 2011 in 25 European countries and has indicated what caused this change—variation in the number of poor people, intensity of poverty and the differences between poor people.

The researchers expressed an economic index rate relating to [poverty](#) by means of a mathematical operator according to three variables. By making use of the expression obtained, they have analysed how poverty in 25 European countries changed in the period between 2005 and 2011 as well as what caused this change in each country. "We have managed to relate a mathematical operator to economy formulas, although in principle it did not appear to have any relation at all," she said.

Poverty indices are based on three components: the incidence of poverty (the number or percentage of poor people), the intensity of poverty (parameter that shows the extent to which the poor are poor) and the difference in the level of poverty (differences between poor people). So the researchers managed to express the rank-dependent indices relating to poverty using a [mathematical formula](#), and according to these three variables; these are indices based on the income of the people or on the ranking corresponding to each person according to their income. And from that, it is possible to conclude why poverty in a country has increased or fallen. In other words, the increase in poverty may have three causes: an increase in the number of poor people, an increase in the poverty of poor people, an increase in the difference between poor people (greater impoverishment of some people) or a combination of the above three cases.

## **What situation is Europe in?**

The researchers concluded that between 2005 and 2011 poverty increased in 13 of the 25 European countries analysed: in Austria, Belgium, Czech Republic, Germany, Denmark, Spain, Finland, Greece, Italy, Luxembourg, Sweden, Slovenia and Slovakia. And in another 12 it

fell: in Cyprus, Estonia, France, Hungary, Iceland, Lithuania, Latvia, the Netherlands, Norway, Poland, Portugal and the United Kingdom. In each case, they analysed the reasons underlying this change and proposed the direction that should be taken to improve the situation.

With respect to the countries in which poverty increased, in Spain the incidence, the intensity and the difference between poor people increased as they did in Austria, Belgium, Czech Republic, Denmark and Finland. So they deduced that in these countries, policies that seek to improve these three components relating to poverty need to be implemented. Even though the number of poor people fell in Italy, Germany and Slovakia, the intensity and difference between them increased. In Luxembourg, however, as the difference between poor people fell, policies that reduce the incidence and intensity of poverty should be activated. Finally, the origin of the increase in poverty in Greece, Sweden and Slovenia centres on a significant increase in the number of poor people since intensity and difference fell.

As regards countries where poverty fell, it is worth pointing out that in France, Estonia and Lithuania the difference between poor people increased, but the fall in the other two variables offset the increase in this difference. On the other hand, the three variables fell in Hungary, the Netherlands, Poland, Portugal and the United Kingdom. In Cyprus the incidence of poverty increased and the other two variables fell. Finally in Iceland, Latvia and Norway, the level of poverty fell because the number of [poor people](#) fell considerably; however, the researcher pointed out that "we cannot say that good results were obtained in these countries because the intensity of poverty and the difference increased".

In Oihana Aristondo's view, "it is a very useful tool because it highlights why the level of poverty has been able to increase in one country, and the authorities can use it to set up suitable measures to remedy the situation". Right now, Aristondo is analysing data of the Spanish

National Institute of Statistics (INE) and expects to complete her analysis shortly.

**More information:** Oihana Aristondo et al. The decompositions of rank-dependent poverty measures using ordered weighted averaging operators, *International Journal of Approximate Reasoning* (2016). [DOI: 10.1016/j.ijar.2016.04.008](https://doi.org/10.1016/j.ijar.2016.04.008)

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