A longitudinal and cross-sectional analysis of the distribution of Common Agricultural Policy aids in European countries

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Abstract: The primary sector plays a key role in any country, from both economic and social perspectives, as has been underscored by the ongoing COVID-19 pandemic. In Europe, this sector is highly dependent on the aid provided under the Common Agricultural Policy (CAP). Therefore, the distribution of this aid among the various recipients is crucial to maintaining a strong primary sector throughout the European Union (EU). This is especially true in light of the new funding for the period from 2021 to 2027 and the United Kingdom's departure from the EU. In this sense, the 93.5% of the first pillar of CAP aid consists of direct aid to farmers. The related literature has shown its effect on aspects such as sustainability and farmers' income, among others, and its distribution in specific geographical areas. In this vein, the present paper conducts a longitudinal and cross-sectional analysis of the distribution of aid across EU countries. The results show that the CAP reforms and the incorporation of countries into the EU influenced the distribution of aid. Moreover, there is a clear division between Eastern and Western EU countries, with a more equitable distribution of aid in the West.

Keywords: concentration; direct Common Agricultural Policy aids; Gini index; segmentation

Since the Common Agricultural Policy (CAP) was first introduced, it has been a major European Union (EU) policy both in terms of its objectives and the percentage of the EU budget allocated to it. With regard to its aims, although the initial objective established was to ensure the security of the food supply through a policy of support prices, it has since changed to become a system of compensatory income support through a series of direct payments. Whereas the CAP budget accounted for 66% of the European community's budget in the 1980s, it now represents 37.8% of the EU budget, and the recently adopted the EU Multiannual Financial Framework budget for the period from 2021 to 2027 continues this reduction (European Union Council 2020). Therefore, given the importance of the primary sector for any country, the support it receives through the allocation of CAP support is key to the countries' recovery and to ensuring the food supply in the current COVID-19 pandemic.

The income support system for farmers through direct CAP support came in with the 1992 CAP reform, or MacSharry reform (Garzon 2006). Since then, various reforms have been enacted to adapt the mechanisms to enable the achievement of the objectives established and thereby ensure multifunctional, sustainable, competitive agriculture throughout Europe. Particularly notable among these reforms, because of their effect and possible influence on the distribution of CAP support, are the 2003 reform and the 2013 reform.

The 2003 reform established a series of new mechanisms to improve the distribution of support: the decoupling of support, the creation of a Single Payment Scheme (SPS), cross-compliance, which ties payments to a series of environmental criteria, and the redistribution of the payment entitlements allocated. The latter was implemented by means of modulation, which allows funding to be transferred between Pillar 1 and Pillar 2 of the CAP to reinforce rural development, and the potential application of a regional decoupling model to allow harmonisation of payments per hectare allocated according to regional criteria (Moro and Sckokai 2013; European Parliament 2020).

Among its main objectives, the 2013 reform seeks to orient support better towards active farmers and also to ensure that environmental aspects play a more predominant role through a specific payment linked to elements known as 'greening', thus achieving a more sustainable CAP. To that end, the decoupling system of 2003 was superseded by a system in which instruments are again coupled to specific objectives, with historical entitlements no longer playing a key role. The resulting farm payments thus include seven components: a basic payment, a greening payment, a payment for young farmers, a 'redistributive payment' whereby farmers may be granted additional support for the first hectares of farmland, additional income support in areas with specific natural constraints, support coupled to production and a simplified system for small farmers. Furthermore, the direct payment will gradually be adjusted until all payments are at a minimum per-hectare payment in euros by 2019 (convergence process), and a modulation for direct payments under the Pillar 2 has been scrapped and replaced with a mandatory reduction in basic payments greater than EUR 150 000 (phased reduction). Moreover, since 2015, member states have been able to transfer up to 15% of originally allocated amounts from the Pillar 1 to the Pillar 2; some member states have been allowed up to 25%. Regulation of direct payments was also made more flexible, with total support limited to 8% of each member state's direct payments ceiling, or exceptionally 13% in countries applying the Single Area Payment Scheme (SAPS), or where member countries had used more than 5% of their direct payments ceiling in any year during the period from 2010 to 2014 for coupled payments, including Article 68 payments; this is known as 'voluntary coupled support' (VCS) (Matthews 2015; European Parliament 2020).

Most of the related studies in the specialised literature use the Gini index as a measure of concentration in the distribution of the CAP, so this will be the measure used in the present analysis because, although we have calculated other concentration measurements, such as the Theil coefficient and the entropy (E) index, all of them show similar results in general terms. In addition, said studies can be grouped into two major blocks: the first group considers the effect that CAP support has had on different aspects of agriculture, such as income, rural development, sustainability, land prices and so on, and the second group includes studies of the distribution of support in different geographical areas, although most consider specific geographical areas.

In this regard, this paper aims to go a step further and, by means of a cross-sectional analysis, determine whether the EU28 countries, without accounting for the withdrawal of the United Kingdom in 2020, can be segmented on the basis of the distribution of CAP support in the year 2018, the most current year with information available. For this segmentation, we used several different criteria [Table S1 in electronic supplementary material (ESM); for the ESM see the electronic version]: the geographical location of the countries, the scheme used in the implementation of direct payments, the flexibility in the implementation of CAP changes during the period from 2014 to 2020, according to Henke et al. (2018), and the percentage of VCS selected in 2013 (the time of reform) and modified in 2015 (subsequent adjustment of those percentages). In terms of geographical location, the analysis examines, on the one hand, countries in Eastern and Western Europe and, on the other hand, countries located in Northern, Southern or Central Europe; these groups of countries are all subject to the CAP but have followed a different course of structural changes (Guth and Smędzik-Ambroży 2020). In addition, the analysis differentiates between countries according to whether they were members of the EU15 or joined subsequently. The country groups are shown in Table S1 in ESM (for ESM see the electronic version).

Moreover, the longitudinal analysis carried out in this paper explores the effect that the different reforms implemented have had on the evolution of the distribution of CAP support in the EU during the period from 2002 to 2018. In addition, the evolution of the distribution is analysed by grouping the countries on the basis of different criteria.

Literature review. The distribution of CAP aid among recipients is an issue of particular interest for the various member states, as the unequal distribution

of aid together with a lack of transparency has sparked controversy among their citizens (Montero et al. 2009). That said, the lack of transparency has been resolved since, pursuant to various European Commission regulations, information about the recipients of the different aid payments is reported annually.

Inequality in the distribution of aid has even been examined by bodies such as the European Commission (1991, 2002, 2010), which, after successive reforms of the CAP, has analysed the contribution made by the CAP to the distribution of income. The studies focusing on CAP aid can be classified into two major groups. The first group considers the effect that CAP aid has had on different elements of agriculture such as income (Keeney 2000; Rocchi et al. 2005; Allanson 2006, 2008; Allanson and Rocchi 2008; Severini and Tantari 2013a, b, 2015a; Ciliberti and Frascarelli 2018a; Biagini et al. 2020), agricultural competitiveness (Ciliberti and Frascarelli 2016), production (Hennessy 1998; Goodwin and Mishra 2005; Weber and Key 2012), productivity (Mary 2013; Rizov et al. 2013; Kazukauskas et al. 2014; Czyżewski and Smędzik-Ambroży 2017), land values (Ciaian et al. 2018), rural sustainability (Morkunas and Labukas 2020), farms' technical efficiency (Minviel and Latruffe 2017; Minviel and Sipiläinen 2018), the socio-economic sustainability of farms (Smędzik-Ambroży et al. 2019; Guth et al. 2020) or environmental sustainability (Volkov and Melnikiene 2017), among other aspects.

The second group includes studies on the distribution of aid among recipients on the basis of comparing different geographical areas (Bonfiglio et al. 2016; Volkov et al. 2019); distribution within specific geographical areas, such as Schmid et al. (2006) for Austria, Allanson (2006) for Scotland, El Benni and Finger (2013) for Switzerland, Beluhova-Uzunova et al. (2017) for Bulgaria, and Ciliberti and Frascarelli (2018b) for Italy; or the distribution of different types of aid. Examples of the latter include Balezentis et al. (2020) for young farmers, Gocht et al. (2017), Louhichi et al. (2018) and Hristov et al. (2020) for greening, Keeney (2000), Severini and Tantari (2015b) and Sinabell et al. (2013) for direct payments, and Galluzo (2016) for rural development – that is, Pillar 2 aid.

To have information covering a series of years, we have focused on analysing the distribution of all direct payments in the countries that constitute the EU; however, for 2018, information is also available on the distribution of decoupled direct payments, so the distribution of this type of aid has also been analysed, with the results revealing, as we will show, very similar behaviour.

From the review of the specialised literature with an analytical focus similar to that of this paper, we can highlight the work of Shucksmith et al. (2005), who analysed the regional distribution of CAP payments and their effect on the objectives of territorial cohesion, concluding that this aid does not support cohesion, as the more prosperous regions secure higher levels of CAP transfers, and these areas are located in Northern Europe. Schmid et al. (2006) analysed the distribution of CAP direct payments across EU15 countries. Their results revealed significant differences in the distribution of aid among different countries, with a bias in terms of larger farms receiving more aid in some member states.

Sinabell et al. (2013) expanded on the previous study by including information for the years 2000 and 2006 and reached very similar conclusions. The comparison of 14 EU member states in 2000 and 2006 showed very heterogeneous behaviour among the different countries, and an analysis of the evolution of the concentration indicated that there was no uniform pattern of change. Subsequently, Sinabell et al. (2013) extended the study by considering, in light of the reform proposed by the European Commission in October 2011, the 27 countries that made up the EU in the period from 2000 to 2010. They used various concentration measures to check for differences in the distribution of direct payments. The results again revealed heterogeneity among countries, with a high concentration in Malta, Slovakia, Portugal and the Czech Republic and a low concentration in Luxembourg, Finland, Ireland and Slovenia. Furthermore, different concentration measures yielded different country rankings, and the authors were not able to find a convincing explanation for the general pattern on the basis of either the choice of model (historical, regional or dynamic) or the structural change in the number of farms. Therefore, they argued that country-specific factors can explain the differences. Between 2000 and 2010, a more equal distribution between and within the agricultural sectors of the EU's member states has not been achieved, and only a few member states have succeeded in reducing the concentration in the distribution of direct payments.

Alfaro et al. (2011) analysed the concentration in the distribution of all direct payments for the EU15 during the period from 2002 to 2008 by using the Gini index as a measure of concentration. The results showed an increase in concentration in the distribution of aid for all countries except Ireland, the United Kingdom and Luxembourg, with no clear effect of the reforms carried out by the EU. The country with the lowest con-

centration in 2008 was Austria, and the country with the highest concentration was Portugal.

Severini and Tantari (2015b) analysed the distribution of direct payments in the EU countries, comparing the years 2005 and 2010, even including non-beneficiary farms (or non-recipients). The main results revealed heterogeneity among countries, with a concentration ratio lower than 60% in Finland, Ireland and Luxembourg but higher than 90% in Hungary, Portugal and Slovakia, as well as decreasing values over the analysed period in the EU10. In addition, they showed that the distribution of land is the main cause of the concentration in the distribution of aid, whereas the SPS models of implementation do not have a significant influence.

Pe'er et al. (2017, 2019) presented the evolution of the Gini index of direct payments over time and made comparisons between different groups of EU countries. They analysed the distribution of direct payments across farm size classes, and they calculated Gini concentration indexes for all EU member states for the period from 2006 to 2015. The results showed that direct payments distribution is inefficient according to farm size; moreover, the inequality levels are stable or slightly decreasing in old member states but higher or even increasing in some new member states.

It is apparent from the literature review we carried out that one of the most commonly used concentration measures is the Gini concentration index (Gini 1921); therefore, although we have calculated other measurements, such as the Theil coefficient and the E index, we use the Gini index in the present paper, in line with Allanson (2006), Alfaro et al. (2011), El Benni and Finger (2013), Severini and Tantari (2013a, b, 2015a) and Ciliberti and Frascarelli (2018b), among others.

The main shortcomings of these studies relate to the following issues: they cover periods of time that do not allow the researcher to analyse the effect of the last reform in 2013 and its implications for the financial period from 2014 to 2020; they focus on specific moments of time without analysing the evolution over a period of time; and few of them apply a cross--sectional analysis, which would allow the researcher to segment the countries according to the distribution of CAP aid among recipients.

Thus, this paper aims to address these gaps in the literature. To that end, we conducted a longitudinal analysis, considering the evolution from 2002 to 2018, the last year with available information, and with a particular emphasis on the effect of both the CAP reforms and the expansion of the EU on said distribution. In addition, we performed a cross-sectional analysis,

making it possible to determine whether there are significant differences in the distribution of CAP aid in the EU28 countries grouped on the basis of geographical location criteria or the way in which they have introduced changes related to the various CAP reforms.

MATERIAL AND METHODS

Various regulations implemented by the European Commission have made it possible to access detailed information on the distribution of direct payments and the number of beneficiaries dating back to financial year 2002; for the year 2018, the regulation governing the publication of such information is Regulation (EU) No. 1307/2013 (European Commission 2020).

These data are available for EU countries for each year under study. They are based on the total amounts aggregated by every individual beneficiary identification code and show the number of beneficiaries grouped into different categories of aid, from those receiving aid in the range of EUR 0 to EUR 500, up to those who receive amounts greater than EUR 500 000. There are a total of 14 categories, plus a category for beneficiaries that overall had to reimburse money to the European Agricultural Guarantee Fund. Of these categories, the lowest category has been discarded because it has values lower than zero and does not show the amounts, and using negative values could affect the concentration index value. Lastly, some categories had to be regrouped to ensure the values were comparable across the years.

The first important decision concerned what information to use: the total of direct payments is available, but in recent years the information has also been broken down into decoupled direct payments and other direct payments. However, we decided to analyse the total of direct payments since not all the years with available information provide the same breakdown. Furthermore, the results shown later for decoupled direct payments in 2018 show a very similar distribution to the total.

In the field of agricultural economics, an analysis of concentration has been used to study the distribution of subsidies, income, wealth, operated land, land ownership across farms or the allocation of aid among aid recipients; to that end, many studies (Allanson 2006; Alfaro et al. 2011; El Benni and Finger 2013; Severini and Tantari 2013a, b, 2015a; Ciliberti and Frascarelli 2018b) have used the Gini index. In this paper, the Gini index (*G*) has been determined for each of the countries with information available in each of the years. This index is calculated as the ratio of the area between the line of perfect equality and the observed Lorenz curve,

to the area between the line of perfect equality and the line of perfect inequality. We used R (R Core Team 2020) and, specifically, Equation (1) programmed in R.

$$G = \frac{\sum_{i=1}^{n-1}\left(p_i - q_i\right)}{\sum_{i=1}^{n-1} p_i} \tag{1}$$

where: G – Gini index; n – number of classes; p_i – cumulative proportion of beneficiaries; q_i – cumulative proportion of aids.

For the Theil coefficient, we used the R package ineq (Zeileis and Kleiber 2015); for the E index, we did our own programming. The results for the Gini index, according to the information available from the European Commission (2020) for the period from 2002 to 2018, are shown in Table S2 in ESM (for the ESM see the electronic version). Moreover, we have included the results for the Theil coefficient and E index in Table S3 in ESM (for the ESM see the electronic version) to show that the main performance is, in general, similar.

A static analysis of the information for the year 2018 gives an idea of the performance of each country in terms of the distribution of CAP aid among beneficiaries, showing mixed results among countries. In the next section, we characterise their heterogeneous performance by using longitudinal and cross-sectional analyses of the information. Specifically, the value of the Gini index for the EU28 as a whole in 2018 was 0.437; 18 countries registered indexes below that average concentration level. The most equitable distribution was found in Ireland, with a Gini index value of 0.220, and the highest concentration was in Slovakia, with 0.718.

In the longitudinal analysis, our focus was on the evolution of the concentration index for the EU28 as a whole and the effect on this evolution of the various reforms implemented and the incorporation of new countries into the EU. For the cross-sectional analysis, we classified the countries on the basis of a number of different criteria: the geographical location of the countries, the scheme used in the implementation of direct payments, the flexibility in the implementation of CAP changes during the period from 2014 to 2020, according to Henke et al. (2018), and the percentage of VCS chosen in 2013 and modified in 2015.

In terms of geographical location, a distinction is made between countries that have been in the EU longer, the EU15, and the rest, between Eastern and Western countries, and between countries from Northern, Southern and Central Europe. In addition, in the 2003 reform, the European Commission agreed to al-

low two schemes for the implementation of direct payments: the SAPS and the SPS. In the SPS, there are three options for calculating the entitlement value: the historical model, in which individual farmers receive entitlements based on their income during the period from 2000 to 2002, the regional model, in which the value of entitlements is based on amounts received by farmers in a given region in the reference period, and the hybrid model, which is a combination of the two aforementioned approaches. This division will be considered to determine whether the implementation scheme chosen in 2003 influenced the distribution of CAP aid because we are observing its influence both in 2018 and in previous years.

Henke et al. (2018) developed a classification of countries according to the degree of flexibility in CAP implementation during the period from 2014 to 2020. To that end, their classification was based on flexibility, speed and the extent of transition in the convergence process, yielding four groups of countries: sprinters, mid-distance runners, cautious, and in the box (Table S1 in ESM; for the ESM see the electronic version). We use this classification here to determine the extent to which the degree of flexibility countries used after the 2013 reform has influenced the distribution of CAP aid. To conduct all these analyses, we used analysis of variance (ANOVA), which allowed us to determine whether there were significant differences in the average value of the Gini index in 2018 for the countries included in each of the established groups and, thus, to determine the influence of these elements individually or jointly.

Finally, to analyse the influence of the chosen VCS, we carried out a bivariate correlation analysis using the Pearson correlation coefficient. The main results are presented here.

RESULTS AND DISCUSSION

Longitudinal analysis of the distribution of direct payments in the EU28. The Gini index values for each country for the period from 2002 to 2018 are shown in Table S2 in ESM (for the ESM see the electronic version). An analysis of the correlation between the index values for each country and the year reveals that there are countries for which the correlation is negative, indicating a negative trend in the evolution of the index over time, leading to a more equitable distribution of aid among recipients. Notable among these countries are the United Kingdom, with a Pearson correlation coefficient of 0.889, followed by Ireland, Belgium and France.

Conversely, Romania and Cyprus showed an increase in concentration over time, with a correlation coefficient of 0.977 and 0.825, respectively. Lastly, the countries where concentration is declining are all in Western Europe, and the countries where the index does not show this negative trend are still in the majority.

If we compare the results of the individual countries with those of the EU28 as a whole, we find that, in 2018, 18 countries registered a level of concentration lower than the 0.437 calculated for the EU28 as a whole. A very similar situation is revealed when using a dynamic approach and taking the average value for the period from 2015 to 2018 – there are 19 countries with values below the EU average. In addition, although the results are not included in the ESM, the correlation coefficient between the Gini index for all direct payments and decoupled direct payments for 2018 is 0.973, indicating that the results do not change much when the concentration analysis is based on decoupled direct payments rather than the total.

To analyse the evolution of the concentration index over time, and since it is not possible to represent all countries at the same time, we decided to represent the evolution of the index for the EU as a whole and for countries grouped into east and west (EW) and north, centre and south (NCS). Thus, Figure 1 shows the evolution of the concentration index for the EU as a whole, the composition of which has changed over time.

Figure 1 shows a clear effect of the accession of new countries to the EU; thus, in 2005, coinciding with the EU25, there is an increase in the level of concentration. With the new additions, after 2008, the effect is the opposite, registering a notable reduction. For the final composition in 2014, a rebound effect

is observed – an initial increase in the level of concentration, which then starts to decline and continues to do so until the last year with available information. The graph shows a very clear effect of the various reforms implemented. After the 2003 reform, the effect of which starts to emerge in 2004, there is a clear upward trend in the index, meaning that there was no effect in terms of a more equitable distribution of the aid. Conversely, the 'Health Check' in 2009, as well as the 2013 reform, show a marked effect in improving the distribution of aid, with a rebound effect for the 2013 reform, although it is not possible to determine whether this reversal is a result of the reform or the incorporation of new countries.

The longitudinal analysis of the grouped countries (Table S2 in ESM; for the ESM see the electronic version) covers the period from 2005 to 2018 to minimise the possible effect of the change in the EU member states, as only three countries joined during that time. Figures 2–4 show the evolution.

The results in Figure 2 show a clearly differentiated trend between the countries that have been in the EU for the longest and the rest: the EU15 countries show a downward trend towards a more equitable distribution of aid, whereas the opposite trend is observed for the rest of the countries. This situation is very similar for the division between Eastern and Western European countries (Figure 3). However, the divisions among Northern, Central and Southern Europe (Figure 4) do not yield major differences in the results, except for the most recent information available, for which a downward trend can be discerned in the countries of Central Europe and an upward trend in the countries of Northern and Southern Europe.
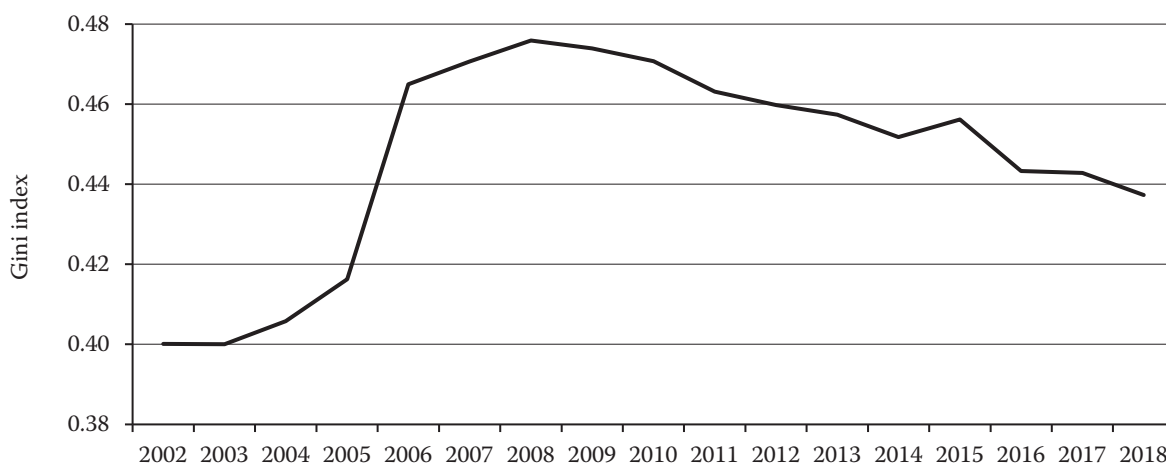

Figure 1. Gini concentration index for EU
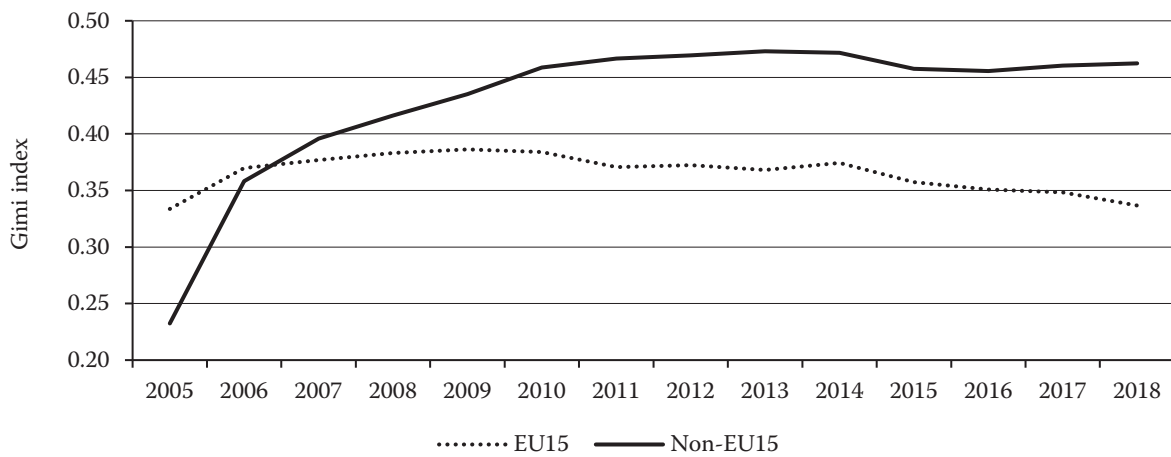
Source: Own elaboration

Figure 2. Gini concentration index for EU15 *vs.* non-EU15 countries
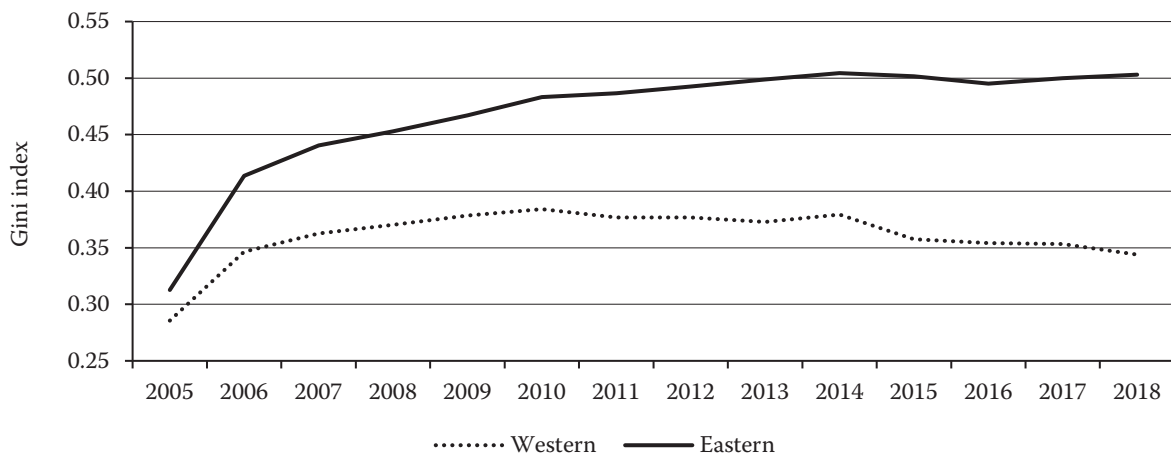
Source: Own elaboration

Figure 3. Gini concentration index for Eastern *vs.* Western European countries
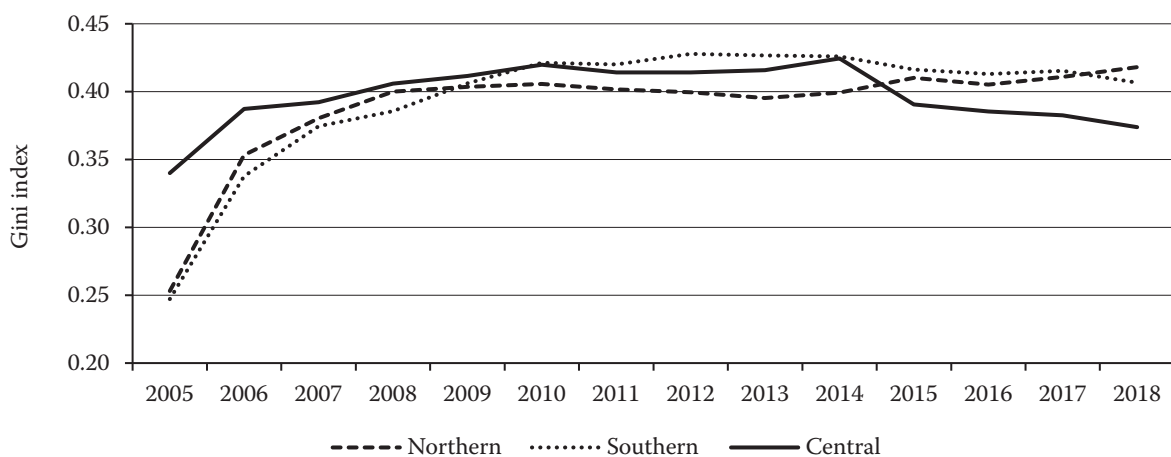
Source: Own elaboration

Figure 4. Gini concentration index for Northern, Southern and Central European countries

Source: Own elaboration

Cross-sectional analysis of the distribution of direct payments in the EU28. To carry out the cross-sectional analysis of the information, we used ANOVA. The first segmentation is based on geographical areas, with the classification of countries used in Figures 2–4 being key. Thus, we first performed ANOVA for three factors. Results show that the average concentration index value differs significantly when taking into account the three factors separately, but the interaction is not significant (Table 1).

These results call for the use of three single-factor ANOVAs that examine the effects separately. The results in Table 2 confirm that the variances are homogeneous for the three factors considered (EU15, EW and NCS); therefore, Welch's ANOVA is appropriate (Table 3).

The results in Table 3 show that there are significant differences in the average level of concentration reported by EU15 countries compared with those reported by more recently incorporated countries; in addition, these differences are also significant between Eastern

Table 1. Gini index analysis of variance (ANOVA) for three factors

	Sum of squares kind III	df	Mean square	F	Significance
Adjusted model	0.212	7	0.030	2.899	0.029
Intercept	3.670	1	3.670	351.504	0.000
EU15	1.283E–5	1	1.283E–5	0.001	0.972
EW	0.071	1	0.071	6.791	0.017
NCS	0.009	2	0.005	0.442	0.649
EU15*EW	0.000	0	–	–	–
EU15*NCS	0.006	1	0.006	0.608	0.445
EW*NCS	0.020	1	0.020	1.931	0.180
EU15*EW*NCS	0.000	0	–	–	–
Error	0.209	20	0.010	–	–
Total	4.789	28	–	–	–
Adjusted total	0.421	27	–	–	–

*Both factors are considered; EW – east and west; NCS – north, centre and south; the comparison between EU15 and EW and among EU15, EW and NCS are not possible because there are not Eastern countries in EU15

Source: Own elaboration

Table 2. Levene's test

Factor	Levene statistic	df2	df2	Significance
EU15	1.258	1	26	0.272
EW	0.747	1	26	0.395
NCS	3.011	2	25	0.067
Direct payments implementation scheme	1.172	3	23	0.342
Henke et al. (2018) classification	0.461	3	24	0.712

EW – east and west; NCS – north, centre and south
Source: Own elaboration

Table 3. Gini index single-factor analysis of variance (ANOVA)

Factor	df1	df2	Statistic value	Significance
EU15	1	19.515	8.641	0.008
EW	1	11.450	11.283	0.006
NCS	2	14.082	0.260	0.775
Direct payments implementation scheme	3	4.353	3.944	0.100
Henke et al. (2018) classification	3	8.619	4.822	0.030

EW – east and west; NCS – north, centre and south
Source: Own elaboration

and Western European countries. In this respect, the EU15 countries have a more equitable distribution of aid among recipients, registering an average Gini index value of 0.337, whereas the corresponding value for non-EU15 countries is 0.462. Taking into account that all member states face the same rules, the differences maybe are primarily due to differences in the pattern in land concentration among holdings, given that the payments are mostly linked to area.

In the comparison of the Eastern and Western EU countries, the concentration value is lower in the Western countries, registering an average Gini index value of 0.344, whereas in the Eastern countries the corresponding value is 0.503. It is therefore evident that the countries that have the longest experience in the implementation of CAP aid and those located in Western Europe have a more equitable distribution of all direct payments under the CAP.

Another criterion for classifying countries proposed in this paper is based on the 2003 scheme for the implementation of direct payments. The results in Table 2 again indicate the use of Welch's ANOVA, the results of which (Table 3) show that in 2018 there are no significant differences in the level of concentration of the distribution of CAP aid according to the manner of implementing direct payments. Moreover, on expanding the study, we confirmed that these differences were not significant in any of the years with available information. In line with results from Severini and Tantari (2015b), this result indicates that the scheme of implementation of direct payments does not influence the distribution of payments.

The degree of flexibility used in CAP implementation, on the basis of the country classification developed by Henke et al. (2018), reveals differences in the average level of concentration. The group of sprinters shows the lowest concentration, with an average Gini index value of 0.299; thus, the countries that drastically changed their model managed to achieve a more equitable distribution of aid in 2018. In contrast, it is the in-the-box group, made up of the new member states that opted to stick to the previous model, that reports the highest average Gini index value, at 0.495. This result reinforces the findings obtained when the countries were divided into EU15 and non-EU15 countries.

Finally, another aspect which may affect the distribution of CAP aid is the percentage of VCS chosen by each member state. In this case, we take the first value reported by countries in 2013 and the modified value in 2015. Given the characteristics of the information, we used the Pearson correlation coefficient for this analysis to check whether there was a significant relationship between the variables and the direction of any relationship. Although the relationships were not statistically significant, the results indicate that the relationship between the 2018 Gini index and the 2013 VCS is negative, whereas it is positive for the 2015 VCS (Pearson correlation coefficients of –0.187 and 0.208, respectively). This finding means that those countries with a higher VCS percentage initially achieved a more equitable distribution, but this relationship later changed such that the higher VCS meant a less equitable distribution, as indicated by the higher Gini index value. Furthermore, this result holds when considering the value of the concentration index in any year from 2013 to 2018, so it cannot be considered circumstantial.

CONCLUSION

The distribution of CAP aid is a thorny issue of particular relevance to the EU's member states. This distribution currently plays a fundamental role and is set to become even more important given the proposed changes in CAP funding for the period from 2021 to 2027, with a decrease in funds at the European level; the departure of the United Kingdom from the EU; and the COVID-19 pandemic, which threatens the security of the food supply. However, despite the relevance of the subject, few studies to date have involved an in-depth analysis of the distribution of this aid among recipients at the European level.

We conducted a longitudinal and cross-sectional analysis of the concentration in the distribution of aid, measured through the Gini index. From the longitudinal analysis, the main conclusions are that both the incorporation of new countries into the EU and the various reforms have had a notable influence on the evolution of the Gini index. Moreover, there is a marked trend towards greater equity in the distribution of aid since the 2013 reform. From the cross-sectional analysis, the clearest difference appears between the countries of the East and the West, with a more equitable distribution of aid in Western European countries. This finding can be linked to the other conclusions: the distribution is more equitable in the EU15 and in the countries that adapted most rapidly to change, and these groups are mainly made up of Western European countries.

Lastly, we have opened up new lines of research that, subject to the availability of information, can build on the analysis performed here. Thus, the United Kingdom's exit from the EU, the changes stemming from the

forthcoming reform and revised funding of the CAP, and the current COVID-19 pandemic are all elements that can be expected to affect the distribution of aid and that can be incorporated into the analysis as the necessary information becomes available.

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