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The similarity of food consumption patterns in selected EU countries combined with the similarity of food production and imports

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Abstract: The purpose of the paper was to analyse changes in food consumption patterns in the European Union (EU) countries and link these patterns with food production and imports. The two research questions posed by the authors were as follows *i*): are the structures of the consumption, production and importation of food becoming more similar or more diverse among EU countries, and *ii*) are changes in food consumption patterns caused by changes in domestic production, or has food been imported to a greater extent from abroad. The study investigated countries which that have been continuously keeping relevant statistics since 1961. The food consumption structures recorded in the years 1961–1969 and 2010–2017 were compared among these countries. Following this, the countries were grouped into subsets using the criterion of greatest similarity in terms of food consumption structures. The same was done in the case of their food production and imports. The study found that countries were becoming increasingly similar in terms of their consumption patterns. An opposite situation occurred concerning food production. In the case of food imports, structural diversity between countries decreased. It follows that changes in food consumption patterns mainly occurred through the adjustment of imports.

Keywords: food balance; market unification; structure diversity

The emergence of new data on worldwide food consumption in the years 2014–2017 from the Food and Agriculture Organization of the United Nations (FAO) makes it possible to scrutinise the latest trends in the field. The FAO data give insights into the supply of food to the market but fail to take account of food losses at a household level. However, they still constitute a reliable source of information concerning consumption patterns. This fact has been validated by studies in which data from the food balance sheets were effectively used to examine consumption patterns (Unar-Munguía et al. 2019).

As shown by previous research, consumption patterns change as the economy develops (Sadowski 2019). At the same time, they tend to converge globally (Gerbens-Leenes et al. 2010). One of the trends observed over the years is that poorer countries switch to the eating habits observed in wealthier countries. This is often referred to as the westernisation of diets because it primarily involves moving closer to what is established in the US or developed European countries (Lee et al. 2006; Sheng et al. 2008; Murakami et al. 2018). The unification of the structure of food consumption patterns is observed on a smaller or larger

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scale all over the world. In the literature, however, the largest number of studies relates to changes in Asian countries' diets, which originally differed significantly from Western patterns. As shown by numerous studies, the diet of Asians has shifted toward the Western patterns of a high-energy and high-protein diet (Ito et al. 1989; Pingali 2007). Similarly, studies conducted for African and Latin American countries indicate diets that are increasingly similar to Western patterns (Reardon et al. 2003).

Changes in food consumption around the world depend on several major trends, which include urbanisation processes (Popkin 1999; Huang and Bouis 2001), the increased consumption of processed foods (Minten et al. 2010), the increased consumption of food outside the home (Bai et al. 2010; Okrent and Alston 2012), and a concern for the natural environment, a trend mainly observed in highly developed countries. This is reflected by a switch to a diet not containing animal products (Janssen et al. 2016).

The literature concerning European food consumption trends usually identifies two groups of countries, the Nordic countries and the Southern countries, which differ in terms of culture and food consumption traditions (Bech-Larsen et al. 2016; Savino et al. 2018). There is also a large number of studies focusing on individual countries (Cupák et al. 2015). However, relatively little attention is paid to the analysis of the similarities between food consumption trends in a larger group of countries and the evolution thereof within the same timeframes, especially in the long term. Learning about the most recent food habits and how similar European countries are in that respect creates a new perspective on the regional differences between countries, which implies a shift away from the simplistic distinction between the North and South. Moreover, further studies are needed to link consumption patterns to production and international trade.

Previous research shows that changes in the structure of food consumption cause changes in the structure of food production and imports. For example, changes in food consumption in China have reduced rice production and resulted in a shift to another type of agricultural production (Pingali 1997). In response to the increasing demand for meat, larger enterprises have specialised in livestock production based on cultivation-breeding and industrialised systems (Van der Zijpp 1999). Efficient food production through specialisation leads to an exportable surplus but also a shortage of food that is not produced, leading to imports (Van der Zijpp 1999). According to Murakami et al. (2019), there is a need to analyse food consumption patterns from an international perspective, while Gehlhar and Coyle (2001) indicate the importance of the relationship between dietary changes and changes in the structure of food production and imports. The current literature lacks similar studies, especially for EU countries. Most of the research concerns Asian countries, which differ significantly in their production and political conditions from European countries. This article aims to fill that gap, and therefore, it focuses on linking food consumption, production, and imports in EU countries.

The purpose of this paper was to analyse changes in food consumption patterns in EU countries and link them to food production and imports. The data were obtained from the FAO (2020a) food balance sheets for 19 EU countries, for which adequate statistics have been kept continuously since 1961, namely Austria, Bulgaria, Cyprus, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Malta, the Netherlands, Poland, Portugal, Romania, Spain, Sweden, and the United Kingdom. The study focused on similarities in food consumption structures among the countries and grouped them based on structural similarity. Then, the same was done for food production and imports. The analysis covered two periods: 1961–1969 and 2010–2017. The choice of the periods resulted from the fact that food consumption patterns change slowly, which is confirmed by relevant FAO data on food consumption structures [for details, see Figure S1 in the electronic supplementary materials (ESM); for the ESM see the electronic version]. Only a long-term study allows for observable changes between countries. Therefore, the 1961–1969 period was selected because it was the first period for which food balance sheets are available. This was compared with the most recent period (2010–2017) so that the observation of changes was possible.

The paper analyses change at the level of specific groups of countries connected through the EU/European Commission (EC) single market authority and behavioural/political patterns unification. The EU countries are rather unique because EU common policies and strong cooperation influence the nature of individual countries' markets. This paper aims to answer the following question: 'Has the market unification of the territorial structure at the EU level (through the EU single market) been influencing the process of unification for the EU market commodity structure?' The paper provides an overview of the real impact of integration efforts on changes in market structure and an op-

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portunity for key market stakeholders (public entities and their political representatives or business entities and their representatives) to understand changes in market development (at the level of quantitative analyses and also at the level of structural change development).

MATERIAL AND METHODS

The FAO (2020a) data on daily energy supply per capita served as a basis for the calculation of consumption structures. It should be noted that the FAO (2020a) data indicate the food supply on the market, but we use the term 'consumption' as a synonym when referring to these data in this paper, which is a simplification. Consumption structures for nine groups of food products, i.e. cereals, meat and offal, fruits and vegetables (pulses and nuts are also included), milk and eggs, oil and oil crops, sugar, fish and seafood, alcohol and stimulants, and miscellaneous, were calculated. The selected groups represent a complete diet. The weighted average daily energy supply per capita was calculated for decades. The ratios between the population in the year concerned and the total population in the decade were used as weights.

Once calculated, the structures served as a basis for the analysis of their similarity across countries in the years 1961–1969 and 2010–2017. Likewise, the similarity between food production and import structures, which were divided into nine identical groups as consumption, was calculated. The data were also obtained from the FAO food balance sheets. It is worth mentioning that new food balance sheets were constructed for the years 2014–2017 using a different methodology than that for 1961–2013. However, the commodities consumed in a given country are established by previously validated production and import data. They do not vary between the old and new methodologies (FAO 2020b). The main difference can be found in population figures, with an impact on the daily energy supply per capita data. On the one hand, for instance, the revised population numbers for Cuba are approximately 25% higher than the previous series (FAO 2020b). On the other hand, there are no significant differences regarding the EU countries between the old and new figures. Thus, in the case of this research, it can be assumed that the data are comparable between the two methodologies.

The similarity of structures was calculated using the structure diversity ratio based on the Manhattan distance, which was defined as follows:

$$V = \frac{\sum_{i=1}^{k} \left| \alpha_i - \beta_i \right|}{2} \quad (1)$$

where: V – structural diversity ratio; α – value of the i^{th} component of the first structure; β – value of the i^{th} component of the second structure; k – number of components of the analysed structure.

Structural diversity ratio values closer to 0 indicate that the studied objects (e.g. countries) are more similar to each other in terms of the analysed structure, where 0 indicates identical structures regarding the studied phenomenon. In turn, a value of 1 indicates that the analysed structures are completely different from one another. Because the structural diversity ratio is normalised in the interval [0, 1], its changes can be interpreted in percentages; for instance, a decrease in the ratio of 0.01 can be interpreted as an increase in the similarity among the analysed structures of 1 percentage point.

The results on structural diversity were presented as a symmetric matrix $[v_{jp}]$ comparing food consumption structures between each pair of countries (the j index is used to indicate the rows, and p is used to indicate the columns of the matrix). Diagonal entries of the matrix are zeros because they are a result of comparing the structure of a country with itself. Following this, the vector elimination algorithm was used to break the countries down into subsets with similar structures for the years 1961–1969. As described in Bajan and Sowa (2019), the vector elimination procedure consists of several consecutive steps:

The diversity threshold γ value is calculated.

The matrix $[v_{jp}]$ is converted into matrix $[w_{jp}]$ so that:

$$w_{jp} = \begin{cases} 0 \; if \; v_{jp} < \gamma \\ 1 \; if \; v_{jp} \geq \gamma \end{cases} \quad (2)$$

The sum of entries in each row of the matrix $[w_{jp}]$ is calculated.

The largest sum indicates the element (country) that is least similar, at a certain γ value, to the largest number of other objects (countries). That object is eliminated by removing the corresponding row and column.

The sums are recalculated in the rows of the reduced matrix, resulting in the elimination of another object.

The elimination procedure is repeated until all components of the matrix $[w_{jp}]$ are equal to 0. This is how Group 1, whose objects (countries) demonstrate the highest structural similarity, is created.

The procedure is resumed from Step 3, with the set of objects eliminated during the creation of Group 1.

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The procedure is repeated until all objects are grouped.

The γ threshold was calculated based on the comparison of intra-group variances with population variance for particular components of the structure. This method requires the repeated performance of the vector elimination procedure at various γ values. The values are selected from the $[\overline{v}, \overline{v} - S_v]$ interval:

$$\overline{v} = \frac{2\sum_{j=1}^{r}\sum_{p>j} v_{jp}}{r(r-1)} \quad (3)$$

where: $\overline{v}$ – average value of non-diagonal entries in the structure diversity matrix $[v_{jp}]$; r – number of objects compared (countries).

This leads to the following equation:

$$S_v = \frac{2\sum_{j=1}^{r}\sum_{j,p}\left|v_{jp} - \overline{v}\right|}{r(r-1)} \quad (4)$$

where: S_v – mean deviation of non-diagonal entries in the structure diversity matrix $[v_{jp}]$.

To determine the optimum threshold value of γ, measures of grouping quality for each component of the structure were calculated at various values of γ. It was assumed that the subsequently established values from the interval would vary by 0.01. Therefore, each grouping belongs to the sequence $\gamma_1 = \overline{v}, \overline{v} + 0.01, \ldots, \overline{v} - S_v$. The quality measure for each l^{th} grouping for particular components of structure i can be expressed using the following function:

$$F_i(\tilde{a}_l) = \frac{\sigma^2_{i(pv)} / (r-1)}{\sigma^2_{i(igv)} / (r-m-1)} \quad (5)$$

where: F_i – grouping quality measure; $\sigma^2_{i(pv)}$ – population variance of the i^{th} component of the structure; $\sigma^2_{i(igv)}$ – intra-group variance of the i^{th} component of the structure, m – number of identified groups at a given γ_l.

This leads to the following equations:

$$\sigma^2_{i(pv)} = \frac{1}{r}\sum_{j=1}^{r}\left(a_{ij} - \overline{a}_i\right) \quad (6)$$

where: a_{ij} – value of the i^{th} component of the structure of the j^{th} object; $\overline{a}_i$ – arithmetic mean of the value of the i^{th} component of the structure for the j^{th} object.

$$\sigma^2_{i(igv)} = \frac{1}{r-m}\sum_{g=1}^{m}\left(n_g - 1\right)\sigma^2_{gi} \quad (7)$$

where: n_g – size of the g^{th} group; σ^2_{gi} – variance of the i^{th} component of the g^{th} group, calculated according to the following formula:

$$\sigma^2_{gi} = \frac{1}{n_g - 1}\sum_{j \in I_g}\left(a_{ij} - \overline{a}_{gi}\right)^2 \quad (8)$$

where: I_g – set of objects belonging to the g^{th} group; $\overline{a}_{gi}$ – arithmetic mean of the value of the i^{th} component of the structure for the j^{th} objects belonging to the g^{th} group.

The value for which the sum of grouping quality measures for particular components of the $F_i(\gamma_l)$ structure is the highest is considered to be the optimum value of γ. A higher grouping quality measure means a higher probability within groups of including component i and, therefore, higher homogeneity among the identified groups.

The threshold γ value from the 1961–1969 period was also used for the years 2010–2017 because the authors intended to verify how structural similarity among countries has changed between the earliest and most recent periods. The use of the value from the earliest period makes it possible to compare movements between the identified groups of countries without only a partial loss of information. Even though particular countries will not be allocated into groups for the years 2010–2017 in an optimum way, the method will emphasise changes in similarity that have occurred over 50 years. In other words, the breakdown into groups for the years 2010–2017 takes place at an optimum level of similarity to the breakdown for years 1961–1969, so both periods can be compared in terms of the number of groups and the populations within them. Therefore, the decrease of the number of groups can be seen as growth in the level of specialisation (in the case of production or imports) or a decrease in variety (in the case of consumption patterns).

RESULTS AND DISCUSSION

Food consumption similarity. The analysis showed that, from 1961–1969 to 2010–2017, the surveyed countries were becoming increasingly similar in terms of their consumption structures. Over this period, the average structure diversity ratio decreased from 0.18 to 0.11, which can be interpreted as an increase in similarity among consumption structures of 7 percentage points. Thus, these findings confirm the trend of food consumption unification, which can be observed around the

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world, including within the EU. Figure 1 presents groups of countries established using the criterion of greatest similarity in terms of food consumption structures in both periods covered by the analysis. Detailed structural calculations can be found in Tables S1–S4 in ESM (for the ESM see the electronic version).

In the 1961–1969 period, the greatest similarity in food consumption structures was observed in the group composed of Cyprus, Greece, Hungary, Italy, Poland, Portugal, and Spain. These countries recorded a high share of energy derived from vegetables and fruits in the daily diet and a relatively high share of oil, as well as a high share of cereals. A low share of energy derived from meat could also be observed in these countries, with Hungary being the sole exception. Because these are the characteristics of the Mediterranean diet that prevailed at that time (Nestle 1995), finding Poland and Hungary in this group comes as a surprise. The second group included Austria, Denmark, Ireland, the Netherlands, Sweden, and the United Kingdom. These countries reported a relatively low share of cereals and fruits and a high share of sugar consumption per capita. These countries, except for Austria, are geographically close to one another. However, under today's standards, all of them can be classed as Northern countries. The third group included France and Germany, which are countries that share a border and are similar in terms of the natural conditions for farming. Compared to other countries, their distinctive features were a low share of energy derived from cereals in the diet and a high share of energy obtained from stimulants. The consumption structure in the fourth group, composed of Bulgaria and Romania, was characteristic of today's poor countries, where energy is predominantly obtained from cereals, and small amounts of animal products and sugar are consumed. The structures found in the remaining countries, i.e. Malta and Finland, were the most distinct from other countries and were not classified in any other group. The consumption structure observed in Malta was somewhat similar to that of other Mediterranean countries. However, it differed considerably in terms of the low share of energy obtained from fruits and vegetables and the high share of energy derived from sugar.

As mentioned above, in the 2010–2017 period, countries are more homogenous in terms of eating habits than they were in the 1961–1969 period. It is also visible in the number of groups of countries that are similar in terms of their food consumption structures (Figure 1). The number of groups decreased, which means an increase in the average number of countries per group and can be seen as a decrease in the variety of the food consumption patterns in the analysed countries. This is further confirmed by the results showing that, during the analysed period, most Southern countries became more similar to Northern European countries in terms of food consumption patterns, mainly due to the increase in meat consumption in Mediterranean countries. These changes were also confirmed by Buzina et al. (1991) and Sans and Combris (2015), who indicated that meat consumption in Southern European countries has doubled since the 1960s. Interestingly, Spiekermann (2005) indicates that the increasing similarity of diets in Europe had little to do with European integration because it had begun much later.

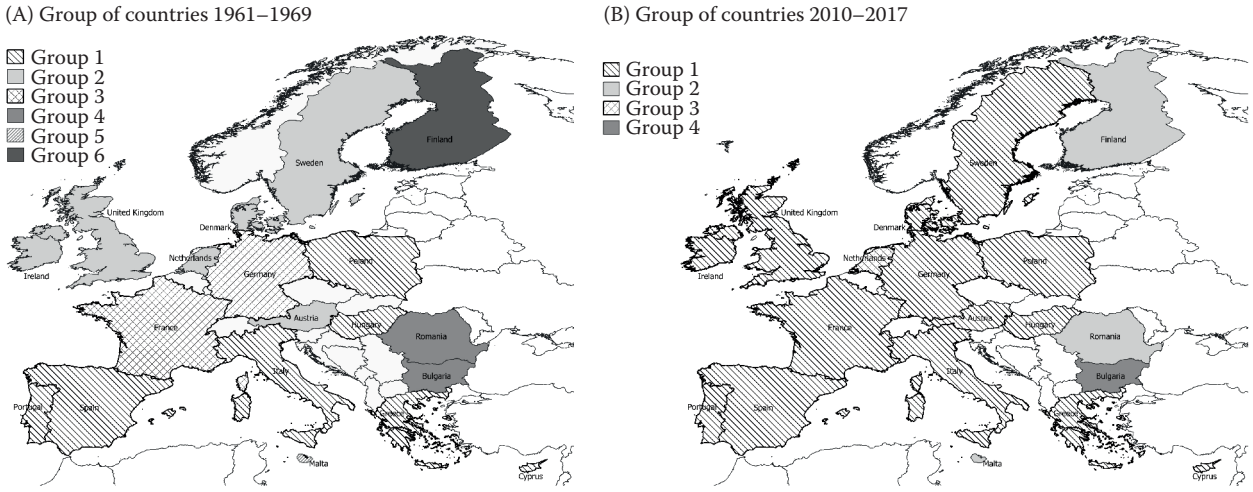

Figure 1. Groups of countries with similar food-consumption structures in (A) 1961–1969 and (B) 2010–2017 ($\gamma = 0.15$)

Source: Own calculations based on FAO (2020a) Food Balance Sheets using food supply data (kcal/capita/day)

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Due to the diet changes, the group that demonstrates the greatest similarity in food consumption structures in 2010–2017 included as many as 14 countries, namely Austria, Cyprus, Denmark, France, Germany, Greece, Hungary, Ireland, Italy, Poland, Portugal, Spain, Sweden, and the United Kingdom. While the Mediterranean diet underwent strong changes, Northern countries adopted some Southern European eating habits as well. Compared to 1961–1969, there was an increase in the share of energy derived from meat in Southern countries and a decline in the share of energy derived from cereals. Northern countries reduced their share of these two product categories in their diets. Hence, it can be concluded that, in the 2010–2017 period, countries from the first group met halfway between their respective eating habits recorded in 1961–1969. The results are confirmed by Vilarnau et al. (2019), who showed that the consumption patterns of Southern EU countries have been moving away from the traditional Mediterranean diet since the 1960s. These changes were observed over 5 years. At the same time, the countries of the northern and central parts of the EU have been moving away from the traditional Mediterranean diet at a slower pace or, in some cases, even approaching such a diet.

The second group, composed of Finland, Malta, and Romania, had a consumption structure different from that of the first group, especially in terms of the lower share of energy derived from oil. These are the only three countries, among all investigated, in which the share of oils in the consumption structure did not exceed 15%. The Netherlands and Bulgaria were not assigned to groups with any other countries. The Netherlands has the second-highest share of energy derived from milk and eggs and the lowest share of energy derived from cereals, which makes it stand apart. The opposite is true in Bulgaria, where the share of cereals in the daily diet is the highest among the analysed countries. However, compared to the 1961–1969 period, the share of cereals declined by nearly 15 percentage points.

Food production similarity. Changes in food patterns force changes in the structure of food production. The directions of these changes, however, are not always analogous to the changes in the consumption structure, as is confirmed by studies. The average diversity of food production structure among the studied countries increased from 0.28 in 1961–1969 to 0.33 in 2010–2017. Despite the decrease in average similarity (increase in diversity) in 2010–2017, fewer groups were distinguished, which indicates that there is an increase in the specialisation of food production in the studied countries (as the result of the liberalisation of the EU and global markets and also significant changes in EU agricultural support policy). Groups of countries with similar production structures in the 1961–1969 and 2010–2017 periods are presented in Figure 2. Detailed structural calculations can be found in Tables S5–S8 in ESM (for the ESM see the electronic version). As many as ten groups of countries were distinguished in the 1961–1969 period, which is associated with a relatively high level of diversity in food production.

The first and largest group was composed of five countries: Austria, France, Germany, Ireland, and the

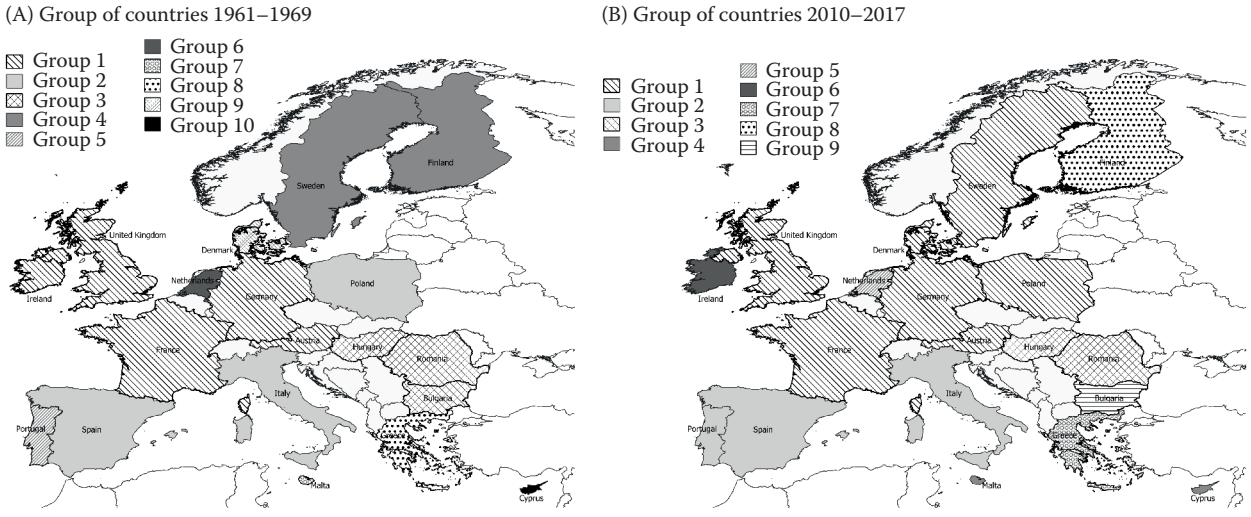

Figure 2. Groups of countries with a similar structure of food production in 1961–1969 and 2010–2017 (γ = 0.19)

Source: Own calculations based on the FAO (2020a) Food Balance Sheets using production quantity data

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United Kingdom. All these countries have similar geographic locations and climates, which could be the reason for the similarities in production structure among these countries. The first group was identified by a lack of a specific specialisation, specifically the production of all product groups at an average level as compared to other countries. The second group included Italy, Poland, and Spain. The structure of food production in this group was characterised by a relatively small share of meat and offals and a large share of fruit and vegetables. As compared to other groups, the structure of food production in the third group, which consisted of Bulgaria, Romania, and Hungary, was characterised by the largest share of cereals in production. The next identified group included Sweden and Finland, which are Scandinavian countries. Such countries' distinctive feature, apart from Denmark, was the smallest share of fruit and vegetables in the production structure. The next five groups consisted of individual countries characterised by diverse food production structures: Portugal, the Netherlands, Malta, Greece, Denmark, and Cyprus. In these countries, selected groups of products significantly dominated the structure of general food production, which may prove a high level of specialisation in these regions. Nine, instead of ten, groups of countries with similar production structures were identified in the 2010–2017 period. In the 2010–2017 period, groups consisted of countries with similar geographical locations and relatively similar climates, which translates into the direction of production. The first group is composed of seven countries, including four countries from the initial period: Austria, Germany, France, and the United Kingdom, as well as Denmark, Poland, and Sweden. It differs from other groups in terms of its large share of sugar in the structure of food production and average values concerning other types of food. Another group of countries is composed of countries with a similar climate, i.e. Italy, Spain and Portugal. They are distinguished by the largest share of alcohol and other stimulants in food production, as well as a relatively large share of fruit and vegetables. The next two groups are also composed of countries that are similar in terms of food production conditions. The third group, i.e. Romania and Hungary, are characterised by an exceptionally large share of cereals in the production structure and a relatively small share of meat and offals. The structure of production is different in the next group, composed of Cyprus and Malta. The production of these two islands, located in the Mediterranean Sea, is focused on vegetables and fruit, the share of which in the food production structure is the largest among the identified groups, with the share of cereals being very small. The other countries belong to individual groups due to their specific production structures. Based on the above, it can be seen that the studied EU countries have been following the path of specialised production based on the production of food most adequate to the climate prevailing in their territories, which is confirmed by the geographical closeness and similar climates of the countries belonging to the same groups.

Therefore, it can be concluded that in the 2010–2017 period, the EU countries are, based on the international division of labour, compliant with the principle of comparative advantage to a greater extent than in the 1961–1969 period. During that earlier period, many countries under investigation did not apply any cooperative policy; rather, they applied mainly full-scale food self-sufficiency policies. Even those countries that operated under the EC did not apply full mutual cooperative market policy because the agricultural market was considered to be autonomous. Also, individual EC members, as part of their application, accepted EC common agricultural policy and individual agri-food market supporting policies financed by national sources/budgets.

Based on the above analysis, we can conclude that changes in eating habits have not caused an identical shift in food production. Although food patterns are becoming increasingly similar in the studied countries, their production has taken on a more specialised form. This seems to confirm the conclusions of Rask and Rask (2011), according to which the pace of change in food consumption frequently exceeds possibilities for national production adjustment. In addition, differences in the natural conditions between countries have an impact on production specialisation, which is aimed at profit maximisation. An important role was also played by the World Trade Organisation negotiations because, after the General Agreement on Tariffs and Trade Uruguay Round, the EC/EU countries were obliged to significantly reduce the value of and change the structure of the agricultural supports and subsidies provided at the national level and also at the level of EC/EU common agricultural and trade policies. This resulted in the need to import certain foodstuffs. It was also confirmed by Baer-Nawrocka and Sadowski (2019), who observed that most countries are striving for self-sufficiency in terms of food due to its strategic importance; however, when large discrepancies between food consumption and production occur, imports can reduce them.

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Food imports similarity. In the case of the food import structure, a similar trend as in the case of food consumption structure has been observed over the years. The structural diversity ratio for food imports between the countries has decreased from 0.29 in 1961–1969 to 0.24 in 2010–2017, which can be interpreted as a 5 percentage point decrease, and the number of identified groups decreased as well. This means that, in this case, the structures are becoming somewhat more similar, and the countries are becoming less diverse. However, it should be noted that the overall results for diversity suggest that it remains relatively high. Groups of countries with similar import structures for the years 1961–1969 and 2010–2017 are presented in Figure 3. The number of groups of countries has decreased from nine to seven since the initial period. Therefore, fewer groups mean less diverse import patterns in analysed countries, which can be interpreted as indicating higher levels of similarity. Detailed structural calculations can be found in Tables S9–S12 in ESM (for the ESM see the electronic version).

Groups identified based on the similarities in the food import structure in 2010–2017 do not overlap with the groups from 1961–1969. In 2010–2017, Group 1 is comprised of seven countries: Bulgaria, Finland, Poland, Germany, Hungary, Sweden, and the United Kingdom. Compared to other countries, the group is characterised by a relatively large share of vegetables and fruit in the food import structure and a small share of cereals. The other identified group is composed of six countries: Austria, Italy, the Netherlands, Portugal, Romania, and Spain. Compared to other groups, they are distinguished by relatively large shares of cereals in the food import structures, with average values for other shares. The third group is comprised of Malta and Ireland, and their distinctiveness stems from a small share of oils with a relatively large share of cereals in the import structure. The fourth group is comprised of Greece, which is distinguished by the largest, next to Finland, share of milk and eggs in the import structure, along with a large share of cereals and a smaller share of fruits and vegetables. In Group 5, i.e. France, the largest share in the food import structure, among the studied countries, belongs to fruits and vegetables. At the same time, France imports relatively small amounts of cereals, but it is different from the countries of Group 1 in terms of its smaller share of milk and eggs in food imports. Denmark, which constitutes Group 6, is clearly distinguished from the other countries because the share of fish and seafood in its food import structure is considerably larger than in other countries. The final seventh group is comprised of Cyprus, characterised by a smaller share of cereals in food imports as compared to other countries.

When analysing the food import structure of individual countries, it can be noticed that it mostly consists of products for which demand exists due to insufficient domestic production. The dominant position, in this regard, is occupied by subtropical and tropical products because many EU countries are not able to constantly cover increasing demand from their sources. This specific role is played by several import items, e.g. fishery products, for which production volume in the EU is restricted and constantly increasing demand is covered by imports. This is con-

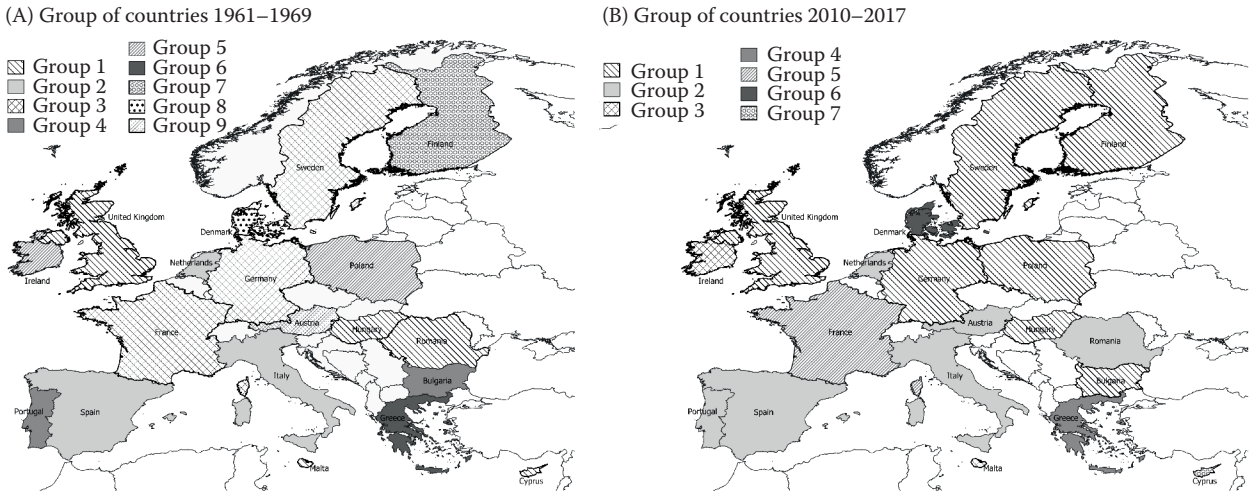

Figure 3. Groups of countries with similar food import structures in 1961–1969 and 2010–2017 (γ = 0.22)

Source: Own calculations based on the FAO (2020a) Food Balance Sheets using import quantity data

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firmed by Brás et al. (2019), who investigated growing external dependency in EU-28 food consumption in the context of extreme weather disasters. Between 35% and 100% of EU-28 soybeans, banana, tropical fruits, coffee and cocoa consumed come from imports. It is these products, among others, that increased their share in total consumption over the years in the analysed countries. However, the greatest changes were caused by the liberalisation of the food trade in the region. Liberalisation of the market, as a consequence of the EU enlargement process, as well as regional integration, had positive effects on the total foreign trade of agri-food products (Matkovski et al. 2018). Török and Jámbor (2013) pointed out that trade in food between EU countries intensified after 2004. However, even before that, EU countries mostly traded food with one another. Above mentioned research also indicates an increase in the differences in food trade between the countries that joined the EU in 2004; on the other hand, our results also show an increase in the similarity of food imports, as compared to the 1960s, among the New Member States.

This paper has confirmed the key trends related to EU market consumption, production, and import pattern development. It can be seen that the EU market is making food consumption patterns more homogenous. This is because of the standardisation of food consumption preferences and better food availability, both from EU sources and also imports from outside the EU. On the other hand, food production realised in individual EU countries, is becoming more heterogeneous because of food production process specialisation. These trends are very important for a better understanding of applied EU policies, especially for new EU agri-food policy ambitions developed to align with the Farm to Fork strategy and the European Green Deal.

CONCLUSION

The conducted research aimed to determine whether the structures of the consumption, production and import of food in EU countries are becoming more similar or more diverse, as well as to identify differences between countries in this regard. From the economic point of view, the most important question is whether changes in food consumption patterns cause changes in domestic production or food must be imported to a greater extent from abroad. In a broader context, the answer to this question may also indicate some relationship between changes in consumption patterns and countries' food self-sufficiency.

The study proved that the food consumption patterns observed in EU countries are becoming increasingly similar. The average structure diversity ratio decreased from 0.18 in the 1961–1969 period to 0.11 in the 2010–2017 period. Differences were particularly noticeable between the Northern and Southern European countries. However, over time, the Northern countries adopted some of the Southern patterns and *vice versa*, which resulted in the homogenisation of their food consumption structures. In terms of food production, the average structural diversity between the examined countries increased from 0.28 in 1961–1969 to 0.33 in 2010–2017. However, the number of groups of similar countries decreased, which indicates an increase in production specialisation. In the case of food imports, structural diversity among countries decreased from 0.29 in 1961–1969 to 0.24 in 2010–2017, and the number of groups of similar countries also decreased.

The conducted studies show that food consumption patterns are becoming similar among the studied countries, with a simultaneous increase in differences concerning food production structure, driven by its specialisation, which results in the need to satisfy some of the demand for food through imports. At the same time, the food import structures of countries within the studied period were homogenising, similar to the consumption pattern. Thus, the observed changes in consumption habits were mainly satisfied by imports. The implemented directions of production, to a larger extent, correspond to the favourable climate conditions of the studied countries, which is confirmed by the fact that neighbouring countries, which are similar in terms of climate, belong to the same groups. Future research should focus on linking changes in food consumption patterns and food self-sufficiency in EU countries directly. To do so, changes in consumption structures should be compared to various indicators of food self-sufficiency.

Nevertheless, based on the research results and the literature review, some concluding policy recommendations can be formulated. As a clear specialisation of production has been observed, with the simultaneous unification of food consumption patterns, a very important issue is to strengthen the free movement of food products within the single European market. In this context, the possibility of addressing the existing non-tariff barriers to food trade at the EU level should be considered. The second issue concerns paying special attention, during the preferential trade agreements negotiations by the EU, to the trade liber-

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alisation in the area of these food products, which have to be imported to a greater extent due to insufficient supply on the EU market caused by unfavourable natural production conditions.

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