Lili Jantyik

The food quality schemes of the European Union and their implications on the Hungarian market

Department of Agricultural Economics

Supervisor:
Áron Török, PhD

Corvinus University of Budapest
Doctoral School of Business and Management

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Jantyik Lili

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Table of contents

List of tables

List of figures

Executive summary

It is becoming increasingly important for consumers to know exactly what kind of foods they consume, while it is increasingly vital for food producers to excel from the competition in global market. This requires a great deal of information exchange between these two market players. The most common way to do this is through various food labels. I have focused one group of such labels in my research, trying to find out as much useful information as possible about the geographical indications (GI) of the European Union. After a comprehensive theoretical summary and processing of the previous literature (which is mostly covered in my first article), I analysed the demand and the supply side of the GI food market in Hungary. On the demand side I concentrated the topics of the awareness of GI labels, the usage of labels during purchase and the trust in the labels. The focus on the supply side was on the market size and the price premium of the GI products. In my final research, I look internationally at whether GI-labelled foods can provide a comparative advantage to individual countries. So, for example, is it worthwhile for Hungary to invest resources in these marks in order to be more competitive in the international market. In this study, we examined other factors in addition to the GI label for comparability.

The results show that the awareness of the GI labels in Hungary is definitely low and this should be increased for a higher consumer confidence level and for that, costumers really use these labels when they purchase. The market size of the GI products was extremely low in the examined discount stores but the price premium of these products was significant. On the analysed beer market, it shows that the number of GI-registered products is positively related to comparative advantages. From this, it can be concluded that it is not pointless to promote the increase in the number of GI products and devote resources to GI labels.

1. Introduction

As early as in 1970, Akerlof defined the concept and problems of information asymmetry, which are still very typical of today's food market. Labelling food products to give information to consumers developed long time ago, especially to show the quality and quantity of the goods.

Globalisation has increased the length of supply chains in the food trade and products may travel great distances before they get to the consumer. In many cases, even the basic foodstuffs come from outside the European Union, where producers work with a completely different regulatory framework. On the positive side, the choice of food available in each country has increased and producers can deliver their products to a much larger market but the negative result is that the traceability of product quality and origin has decreased and competition between producers has increased. Long-distance transport of certain raw materials can also be considered harmful from environmental point of view. Simultaneously with liberalisation of markets, food-related scandals and problems also escalated (Juhász et. al., 2010). For example, the case commonly referred to as the "horsemeat scandal". In 2012, the European food market was hit by a food fraud: horsemeat was found in pre-prepared foods, without any declaration on the package (Agnoli et al. 2016). Due to faster flow of information and similar food scandals, more and more conscious customers appeared. Conscious consumers are increasingly aware of their rights and opportunities, so they explicitly resent incorrect information, misleading and scandals (Törőcsik, 2003). If we look at consumers' attitudes and motivations, two main lines of conscious consumption can be distinguished: in some cases, consumers focus on their own interests (quality awareness, price awareness, brand awareness, value awareness, consumer rights awareness, health awareness, nutrition awareness), while in others they focus on the interests of others (environmental awareness, social awareness, ethical consumption, responsible consumption, sustainable consumption) (Dudás, 2011). However, no matter how much consumers become more aware, they can only assert their needs in case they have enough information about the product they want to buy.

Most characteristics of foods can only be known after purchase and some of them can only be learned during laboratory testing. Literature classifies information on product

characteristics into three groups: "search characteristics" (e.g., colour), "experiential characteristics" (e.g., taste), "trust characteristics" (e.g., nutritional value, food safety) (Darby & Karni, 1973). The difference among the categories is determined by how difficult it is for the consumer to obtain information. Characteristics classified as trusted can often only be determined under laboratory conditions. This can be mitigated by, among other things, various trademarks and certificates that provide important information to the consumer. On the packaging of food products, many data and labels can be found and sometimes they are even regulated by the government. They can be divided into four groups (Caswell & Sven, 2011):

- "need to know": Governments may consider that the public needs to know certain information (such as the quality and quantity of nutrients) when making a purchase decision or to use the product safely. In this case, labelling is usually mandatory.
- "right to know": Various government agencies may consider that the public has the right to know some other information before purchasing a product. This information is often about features that are not relevant to safety but about other features that are of interest to consumers. In this case, labelling will usually also be mandatory, providing a certain minimum level of information. (e.g. GMO label),
- "want to know": The regulatory organisation may actively monitor the provision of this information if it believes it will increase market efficiency (such as certified organic farming). A common way to do this is through voluntary labelling based on setting standards or minimum requirements
- "prevention of fraud" the certification body guarantees the consumer the originality of the product.

There will be benefits and costs for all market participants from using different labels. These were detailed in an FAO study as follows. (See in table 1.)

Table 1. Benefits and costs of labels in general

BUSINESSES	GOVERNMENTS	CONSUMERS
BENEFITS		
Ability to make legal claims about the qualities of the product	Enhanced credibility of regulations and public health policies	Become more educated about a product Gain ability to make comparisons of products Gain credible information about products
Ability to compete based on the qualities of the product that the consumer cannot detect without a label	Savings in the health system from reduced incidences of illnesses where health costs are borne by government	Learn to use product information to protect health Learn to use product information to tell if a product is worth the price
Compliance with regulations	Enhanced ability to facilitate trade with countries that have label requirements	Information that affects product choice can express consumer's values and priorities
Ability to trade in markets where such information is required		
Positive image of products		
COSTS		
Administrative	Research to develop label content and format Information and records	Higher prices for goods
Marketing	Information systems	
Changes in suppliers	Collection and administering data	
Label redesign	Inspection, enforcement and audit costs	

Source: FAO (2016) pp. 15

All in all, the topic of food quality schemes and labels also has economic, social and environmental relevance. From economic point of view, food quality labels can be a solution in which producers can use the marketing tool to increase the value of their goods and conscious consumers get extra information about the products. Their social impact is to protect the producers of a unique product from fraud and to help maintain traditional production methods. Different organic labels can be very important from environmental point of view, but in some cases, traditional production may be more environmentally friendly than large industrial production. Geographical indications (GI) also guarantee the place where products are produced, so that, for example, European consumers could choose to buy rice produced in Europe over rice produced in Asia, thus reducing the route of the product. (Bellassen et al., 2022)

In my research, I focus on the effect of the European Union's food quality schemes in Hungary, specifically with the demand and supply side characteristics of GI. These indications are optional[1], so they can serve as a voluntary distinction and added value when appearing on products. Although several studies have examined quality systems in food market, research in this area is still very incomplete, especially with regard to Hungarian market. The labels examined in the research are regulated by the European Union, so in the EU, they have a uniform regulatory and usage framework. Thanks to this, the Hungarian results will be easily comparable with similar research studies in other EU countries.

2. Theoretical background

2.1. Food quality labels in the European Union and in Hungary

Although the main part of my research will focus on EU GI, it is important to get a complete picture of the voluntarily used food quality labels in the EU and in Hungary. This category mostly includes GI products, Traditional and specialty guaranteed products and Organic foods (European Commission, 2021b). Each category has a label that is used to differentiate it. (see Figure 1.)

[1] Of course if the producer/seller wants to use the protected name, the label becomes obligatory.

Figure 1. Logos of the European Union's food quality schemes

Source: European Commission, (2021b)

The European Union has been regulating the protection and constant quality of quality foods with unique characteristics for almost 30 years. The quality logos (in Figure 1.) certify special traditions and geographical origin of food and other agricultural products produced in the European Union or in other countries.

2.2. Geographical indications

GI provides intellectual property rights for products whose quality is specifically connected to the production area within the EU and in non-EU countries where a specific protection agreement has been signed. The EU's GI system protects the names of products that come from certain regions and have specific characteristics or good reputation in relation to the production area. With regards to the GI food category, we distinguish two groups with two different logos:

- **Protected designation of origin (PDO)**: Product names registered as PDOs are those that are most strongly associated with the place of production. Every part of the production, processing and preparation process of these products must take place in the specific region. E.g., Szegedi téliszalámi PDO is entirely produced in the region of Szeged, using ingredients from that area. (European Commission, 2021b)

- **Protected geographical indication (PGI):** The PGI emphasises the link between the geographical area and the name of the product, where a special quality,

reputation or other characteristics is essential thanks to the geographical origin. For these products, at least one of the stages of production, processing or preparation must take place in the specified region. An example of a PGI product is Csabai kolbász PGI, which is produced in Békéscsaba or Gyula, using traditional techniques but the meat used does not exclusively come from animals born and reared in that specific region of Hungary. (European Commission, 2021b)

Geographical Indication products can be found in the European Union's E-Ambrosia database. Table 2. contains all the Hungarian GI products from the database. As it can be seen, the place of production of the GI products covers a large area of Hungary. Thus, we can conclude that many producers are affected by GI products, so from the supply side, this may explain the legitimacy of the research topic. From a consumer perspective, geographic coverage also affects the entire country, as it is also available in a number of markets, supermarkets, and discount stores that will be examined later. Altogether in the status as of October 16, 2022 there are 33 food PDO and PGI products, 16 spirit drinks with GI label and 43 wine products from Hungary in the database (92 products altogether). Most of them are registered, although there are a few which have not got the registered status yet. The first application started in 2004, while the last ones in 2022 (of which the date of registration is indicated in the database). In my research, I will focus on the food product type, but the table contains all the category: food, spirit drink and wine

Table 2. Hungarian GI products

Category	Name	Type	Status	Date of application	Date of registration
Food	Szegedi szalámi / Szegedi téliszalámi	PDO	Registered	2004.10.21	2007.12.15
Food	Budapesti téliszalámi	PGI	Registered	2004.10.21	2009.04.21
Food	Nagykun rizs	PGI	Registered	2018.04.12	2021.05.18
Food	Alföldi kamillavirágzat	PDO	Registered	2005.12.21	2012.02.25
Food	Szegedi fűszerpaprika-őrlemény / Szegedi paprika	PDO	Registered	2004.10.21	2010.11.04
Food	Gönci kajszibarack / Gönci kajszi	PGI	Registered	2004.10.21	2011.05.20
Food	Gyulai kolbász / Gyulai pároskolbász	PGI	Registered	2004.10.21	2010.06.19

Food	Csabai kolbász / Csabai vastagkolbász	PGI	Registered	2004.10.21	2010.06.19
Food	Magyar szürkemarha hús	PGI	Registered	2009.04.07	2011.12.14
Food	Kalocsai fűszerpaprika-őrlemény	PDO	Registered	2004.10.21	2012.07.05
Food	Szőregi rózsató	PGI	Registered	2004.10.21	2012.07.25
Food	Hajdúsági torma	PDO	Registered	2004.10.21	2009.10.22
Food	Makói vöröshagyma / Makói hagyma	PDO	Registered	2004.10.21	2009.11.06
Food	Szentesi paprika	PGI	Registered	2011.11.30	2014.02.21
Food	Akasztói szikiponty	PDO	Registered	2018.02.15	2020.09.25
Food	Jászsági nyári szarvasgomba	PGI	Registered	2018.07.04	2021.08.19
Food	Nagykörűi ropogós cseresznye	PGI	Applied	2018.04.12	
Food	Győr-Moson-Sopron megyei Csemege sajt	PGI	Registered	2017.03.23	2020.04.20
Food	Makói petrezselyemgyökér	PGI	Registered	2016.07.22	2017.12.05
Food	Szomolyai rövidszárú fekete cseresznye	PDO	Registered	2017.12.20	2020.11.17
Food	Szilvásváradi pisztráng	PGI	Registered	2018.06.04	2020.09.18
Food	Keleméri bárányhús	PGI	Published	2018.09.07	
Food	Tuzséri alma	PDO	Registered	2018.09.20	2021.08.02
Food	Őrségi tökmagolaj	PGI	Registered	2018.09.12	2021.08.02
Food	Újfehértói meggy	PGI	Registered	2018.02.15	2021.02.18
Food	Szegedi tükörponty	PGI	Registered	2019.03.06	2021.09.08
Food	Balatoni hal	PGI	Registered	2018.05.25	2021.06.14
Food	Derecske alma	PGI	Registered	2019.09.04	2022.07.11
Food	Budaörsi őszibarack	PGI	Registered	2018.04.12	2021.04.19
Food	Fertőd vidéki sárgarépa	PGI	Registered	2019.03.08	2021.11.03
Food	Hegykői petrezselyemgyökér	PGI	Registered	2019.03.08	2021.06.03
Food	Szabolcsi alma	PGI	Applied	2022.06.22	
Food	Lajta sajt	PGI	Applied	2022.05.23	
Spirit drink	Békési Szilvapálinka	GI	Registered		2003.09.23
Spirit drink	Kecskeméti Barackpálinka	GI	Registered		2003.09.23
Spirit drink	Szabolcsi Almapálinka	GI	Registered		2003.09.23
Spirit drink	Nagykunsági birspálinka	GI	Registered	2016.10.18	2021.08.31
Spirit drink	Nagykunsági szilvapálinka	GI	Registered	2016.10.14	2021.05.03
Spirit drink	Szatmári Szilvapálinka	GI	Registered		2003.09.23
Spirit drink	Újfehértói meggypálinka	GI	Registered	2010.06.08	2014.02.04
Spirit drink	Törkölypálinka	GI	Registered		2008.02.13
Spirit drink	Gönci Barackpálinka	GI	Registered		2008.02.13
Spirit drink	Pálinka	GI	Registered		2008.02.13
Spirit drink	Vasi vadkörte pálinka	GI	Registered	2017.12.22	2021.03.25
Spirit drink	Sárréti kökénypálinka	GI	Applied	2019.03.06	
Spirit drink	Madarasi birspálinka	GI	Registered	2019.03.06	2021.09.21
Spirit drink	Nagykörűi cseresznyepálinka	GI	Applied	2018.07.13	

Spirit drink	Homokháti őszibarack pálinka	GI	Pegistered	2018.05.25	2022.03.07
Spirit drink	Borzag pálinka	GI	Applied	2022.05.23	
Wine	Badacsony / Badacsonyi	PDO	Registered		2006.02.17
Wine	Balaton / Balatoni	PDO	Registered		2006.02.17
Wine	Balatonboglár / Balatonboglári	PDO	Registered		2006.02.17
Wine	Balaton-felvidék / Balaton-felvidéki	PDO	Registered		2006.02.17
Wine	Balatonfüred-Csopak / Balatonfüred-Csopaki	PDO	Registered		2006.02.17
Wine	Balatonmelléki	PGI	Registered		2007.04.28
Wine	Bükk / Bükki	PDO	Registered		2007.05.10
Wine	Csongrád / Csongrádi	PDO	Registered		2006.02.17
Wine	Csopak/Csopaki	PDO	Registered	2017.11.13	2020.07.20
Wine	Debrői Hárslevelű	PDO	Registered		2007.05.10
Wine	Duna / Dunai	PDO	Registered		2009.08.08
Wine	Dunántúli / Dunántúl	PGI	Registered		2007.04.28
Wine	Duna-Tisza-közi	PGI	Registered		2006.01.26
Wine	Eger / Egri	PDO	Registered		2006.02.17
Wine	Etyek-Buda / Etyek-Budai	PDO	Registered		2006.02.17
Wine	Etyeki Pezsgő	PDO	Applied	2021.05.14	
Wine	Felső-Magyarország / Felső-Magyarországi	PGI	Registered		2006.01.26
Wine	Hajós-Baja	PDO	Registered		2006.02.17
Wine	Izsáki Arany Sárfehér	PDO	Registered		2007.05.10
Wine	Káli	PDO	Registered		2009.08.01
Wine	Kőszeg / Kőszegi	PDO	Applied	2021.10.04	
Wine	Kunság / Kunsági	PDO	Registered		2006.02.17
Wine	Mátra / Mátrai	PDO	Registered		2006.02.17
Wine	Monor / Monori	PDO	Registered	2013.05.02	2018.02.17
Wine	Mór / Móri	PDO	Registered		2006.02.17
Wine	Mura / Murai	PDO	Applied	2021.11.26	
Wine	Nagy-Somló / Nagy-Somlói	PDO	Registered		2007.05.10
Wine	Neszmély / Neszmélyi	PDO	Registered		2006.02.17
Wine	Nivegy-völgy / Nivegy-völgyi	PDO	Applied	2021.11.26	
Wine	Pannon	PDO	Registered		2009.08.01
Wine	Pannonhalma / Pannonhalmi	PDO	Registered		2006.02.17
Wine	Pécs	PDO	Registered		2006.02.17
Wine	Soltvadkerti	PDO	Registered	2016.04.28	2020.11.13
Wine	Somlói / Somló	PDO	Registered		2006.02.17
Wine	Sopron / Soproni	PDO	Registered		2006.02.17
Wine	Sümeg / Sümegi	PDO	Applied	2021.12.11	
Wine	Szekszárd / Szekszárdi	PDO	Registered		2006.02.17
Wine	Tihany / Tihanyi	PDO	Registered		2009.08.01
Wine	Tokaj / Tokaji	PDO	Registered		2006.02.17
Wine	Tolna / Tolnai	PDO	Registered		2006.02.17

Wine	Villány / Villányi	PDO	Registered		2006.02.17
Wine	Zala / Zalai	PDO	Registered		2007.05.10
Wine	Zemplén / Zempléni	PGI	Registered		2006.01.26

Source: European Commission, (2022) eAmbrosia database, download date: 16.10.2022.

Several international research studies deal with various aspects of the regulatory framework of the EU GI system. Table 3. shows some of the more important, up-to-date research related to this topic, which deals, for example, with the trade, administration, modification, and geography of GI products.

Table 3. Studies about the regulatory framework of EU geographical indications

Author, year	Issues reviewed	Key findings
Sorghoa and Larue, 2014	Regulation and intra-trade	Domestic bias is increased by GIs, GIs significantly affect trade between EU countries.
Quiñones-Ruiz et. al., 2016	GI-registration processes	The support of well-established, pre-existing producer organizations and local authorities are critical factors in the GI registration process. Participatory processes, even if time consuming, may result in a collaborative learning process as GI-stakeholders can better understand the specifics of the product and develop collective strategies and initiatives that should go far beyond mere GI registration.
Quiñones Ruiz et. al., 2018	Amendments of GI product	Out of 1,276 EU protected GIs, 251 non-minor amendments for 219 products had been approved until the end of October 2016. The most amendments are for French, Spanish and Italian products, processed food products and those products that have been GIs for a longer time. There are external changes such as technological innovations, customer needs, or internal changes as vertical or horizontal relationships of the supply chain.
Cei et al., 2018	Effects of GIs on local economic development (literature review)	GIs can actually create added value, especially at the consumer and retailer level, while the effects on producers' economic performance are more heterogeneous and depend on local conditions. It is difficult to draw firm conclusions about the actual impact of GI policy at European level. GI tools show good potential for improving local economic

		conditions, but more structured and focused research is needed for the general conclusion.
Meloni and Swinnen, 2018	World's first GI	The world's first GIs were in the wine sector and focused on the delineation of the place of production, the 'terroirs': the Burgundy wines in the 15th century, the Port and Chianti wines in the 18th century (also Tokaj wines from Hungary), and the Champagne wines in the early 20th century. Trade was a very important role in the creation of the 'terroirs'. While issues of concern for quality and collective reputation were consistently used, it appears that both economic (efficiency) and political (redistributive) components have contributed to the use of the GI.
Dao, 2018	GI in EU-Vietnam Free Trade Agreement	In 2015, the European Union-Vietnam Free Trade Agreement (EVFTA) has marked another successive glory of the EU in line with its strategy to globally transplant its notorious sui generis protection regime of GIs. The study shows the details of this agreement.
Arfini, 2019	EU policy for the protection of GI in the food sector	First, a brief historical recap of the steps that led to the current EU food quality policy, followed by a description of the current policy framework for GIs in the EU and their management in multilateral agreements.
Raimondi et al., 2019	Trade effects of GI policy	GIs affect trade differently depending on whether GIs are produced by the exporter or importer country. The presence of GIs in the exporter country systematically exerts a positive trade effect on both the extensive and intensive trade margin. When registered only in the importer country, GIs seem to act weakly as a trade-reducing measure, at least at the intensive trade margin. In addition, GIs positively affect export prices, consistent with the idea that GI products are perceived by consumers as higher quality goods.
Huysmans and Swinnen, 2019	Geography of Geographical Indications	GIs are most used in south part of the EU. Historical studies conclude that both economic and political factors contributed to this. A potential economic explanation for that southern countries have more differentiated and higher quality food products, which would benefit more from reductions in asymmetric information. There are also potential political explanations for more GIs in the south. The first is that agriculture and the food industry in the southern EU countries is less productive and is therefore more inclined to use GIs as a tool to protect their agriculture and food industry from competition. Second, increasing the number of GIs is consistent with protectionist behaviour.

Kneller, 2020	EU-Australia negotiations about GI	In 2018, EU and Australia have been negotiating an ambitious and comprehensive free trade agreement (FTA). The problem is that Australia provides weaker protection for GIs than the EU. The study focuses on where the main challenges lie in negotiating GIs for the FTA and what are the main potential points of convergence for GIs in the EU-Australia FTA.

2.3. Traditional Specialities Guaranteed

Traditional Specialities Guaranteed (TSG) products are out of the category of GI, but they are closely related. As shown in Figure 1. (3th logo), the design of the TSG logo is very similar to the mark of GI products. It focuses on the traditional aspects, such as the way of production or its composition, without being linked to a specific geographical area. E.g., Rögös túró TSG is a traditional food that is generally produced in Hungary. Nonetheless, being a TSG, its production method is protected but it could be produced somewhere else. (European Commission, 2021b)

Table 1. shows the Hungarian TSG products. There are only 2 products from Hungary with this mark, so this is not an overrepresented notation. However, the European Union's eAmbrosia database (previously called DOOR database) contains a total of only 81 TSG products in the status as of December 31, 2021. For comparison, there are 3,828 GI products in the same database (excluding wines).

Table 4. Hungarian TSG products

Name	Type	Country	Status	Date of application	Date of registration
Rögös túró	Traditional Specialities Guaranteed (TSG)	Hungary	Registered	2013.05.16	2019.08.01
Tepertős pogácsa	Traditional Specialities Guaranteed (TSG)	Hungary	Registered	2010.09.27	2013.11.14

Source: eAmbrosia database (2021), download date: 31.12.2021.

2.4. Organic label

Figure 2. EU organic label

Source: European Commission, (2021a)

Another very important quality label in the European Union is the EU organic label (in use: since 2010, see in figure 2.). As a kind of response to the effects of pesticides, genetically modified products and various food safety scandals on health and environment, the demand for organic food has grown dramatically in recent decades (Török et. al., 2019). The first regulation on certification and labelling of organic products in the EU was adopted in 1991 and has since been amended several times to take on its current form (European Commission, 2021a). The essence of organic farming is that food is produced with sustainable farming in mind, with a strong emphasis on environmental protection and animal welfare (European Commission, 2021a). The essence of the regulation is that the EU organic label must be affixed to all pre-packaged organic food that is intended to be placed on the market as an organic product. However, the use of the EU label is not exclusive and it is possible to mark the products with different national and/or private certification bodies as well. In Hungary, two state-accredited certification bodies are currently involved in verifying the right to use the EU bio-label (Biokontroll Hungária Nonprofit Kft. and Bio Garancia Kft.). Both organisations also have their own logos, so in practice - in the case of organic products of Hungarian origin - the logo of the EU and one of the Hungarian certifiers appear on the packaging of the certified food at the same time (Török et al., 2019). (See the Hungarian logos in Figure 3.)

Figure 3. Hungarian Bio logos

Source: Biokontroll Hungária, (2021); Bio Garancia Kft., (2021)

Certification bodies may inspect and certify the following activities under organic legislation (Nébih, 2021b):

- organic crop production,
- collection of organic wild plants,
- organic mushroom growing,
- organic beekeeping,
- organic animal husbandry,
- keeping organically farmed aquatic animals,
- production of processed organic feed,
- trade in organic products,
- production of processed organic food,
- storage of organic products,
- import of organic products,
- organic wine production.

2.5. Other food schemes

These are the most commonly used quality logos in the EU, but there are a few more other schemes that can be used in food products, such as Mountain product, Product of EU's outermost regions or other voluntary certification schemes used at national level or those run by private operators. (European Commission, 2021b)

These logos and others are also used for wines and spirits, but in my research, I focus on the food category, so I will not detail these categories here.

The importance of the topic of quality foods in Hungarian environment is justified, among others, by the excellent agricultural production areas of Hungary, so the examination of agriculture and the food sector is a really important issue of the national economy. This may explain why we can find many quality labels in Hungarian food market. In addition to the EU and other foreign labels, there are marks used specifically in Hungary or in the package of Hungarian products.

Figure 4. Example of Hungarian food quality logos

Source: hungarikum.hu, (2021); Agrárminisztérium, (2021)

There are many certification systems and trademarks operating in Hungary at national level as well, such as Traditions – Tastes – Regions, Quality Hungarian Pork, Premium Hungaricum, Hungarian Product, etc. (Juhász et al., 2010). These regional systems contribute to the protection of the country's rich cultural heritage at national level. In Hungary, major changes took place in this topic in 2012, as in that year Hungarian products were regulated by Decree VM74 / 2012, the aim was to provide consumers with clear information on the origin of the product's ingredients, whether these products come exclusively or only partially from Hungary (Nébih, 2021a). Also this year, in 2012, the Parliament adopted Act XXX of 2012 on Hungarian National Values and Hungaricums. It defines the concept of hungarikum as follows: "Hungarikum is a collective term indicating a value worthy of distinction and highlighting within a unified system of qualification, classification, and registry and which represents the high performance of Hungarian people thanks to its typically Hungarian attribute, uniqueness, speciality and quality." (hungarikum.hu, 2021)

We can see that important initiatives have been launched both in the European Union and in Hungary in order to protect local values by communicating the outstanding geographical or quality characteristics of the product to consumers as clearly as possible.

3. Materials and Methods

In my research, I analysed the demand and supply characteristics of products with geographical indication (PDO, PGI) on Hungarian market. My main research question is the following: What is the impact of EU GI on Hungarian food market? To find a comprehensive answer to this question, I divided my research area into four main parts, which I examine separately using different methodologies in order to obtain the most appropriate information everywhere. Table 5. shows how I divided the topic into parts. It is important to mention that in these research studies we often examined issues outside the main topic of this dissertation. This table summarizes the elements that form the main part of the dissertation.

Table 5. Research frame

Topic	Literature review	Demand side	Supply side	International market
Subject of investigation	Collect empirical studies focusing on the economic impact of GI Market size, Price premium Impacts on rural development.	Awareness of labels Usage of labels when making a purchase Trust in labels	Presence of labelled products in discount stores Price premium for labelled products in discount stores	Is it worthwhile for the countries to devote their resources to the GI label? Number of beers with geographical indications impact on comparative advantages
Methodology	Systematic literature review	Questionnaire Descriptive statistical analysis Binary logistic regression	Descriptive statistical analysis Mystery shopping	Descriptive analysis and panel regression

Research questions	What are the most important results in the topic of market size, price premium and impacts on rural development in terms of GI products?	How well-known are the labels of EU GI products among Hungarian consumers, and how well do they know their meaning? What is the level of trust in the labelling of EU GI products, and what influences this trust? How often do consumers buy EU GI certified products, and what affects them?	In the Hungarian market, what is the market size of products with geographical indication, examining the example of discount stores? In Hungarian discount stores, what is the price premium of products with a Hungarian geographical indication compared to their direct substitutes, estimated from below?	Are geographical indications positively related to comparative advantages in the beer market?

Source: own editing

My research goal is to get a detailed picture of the effects of EU food quality schemes in Hungary by examining the purchasing habits of consumers, the characteristics of the supply side and the international market. I use a mixed-method research technique for this, and I think I have to examine each segment with different research methods in order to get a detailed picture.

The essence of "mixed-method research" is that it uses multiple methodologies for problem solving, whether it uses quantitative (e.g., experiments, surveys) and qualitative (e.g., focus groups, interviews) research methodologies to analyse a topic. By using both qualitative and quantitative methodologies, we can reinforce the information and gain a deeper understanding of the problem, in addition to eliminating the weaknesses of the two methodologies. The most advantageous feature of mixed methodological research is the possibility of triangulation, so we can use several tools (method, data source and researcher) to study the same phenomenon. Triangulation allows more accurate identification of a phenomenon by analysing it from different perspectives and using different methods. I chose the "mixed method research" methodology because I want to examine the research questions from different angles and thus clarify unexpected results or possible contradictions. Of course, like all research methodologies, this has its limitations. First, great care must be taken to ensure the research plan not to become too

complicated. It takes much more time and resources to plan and conduct this type of research. Designing and implementing one method can be difficult to rely on the findings of another. It is not always easy to resolve differences in the results obtained using different methodologies. Several types of "mixed-method research" can be distinguished. In the present research, I use the type of "concurrent triangulation", the essence of which is that the quantitative and qualitative data collection and analysis must be performed separately. Findings are integrated with the interpretation phase of the study and generally have equal priority for both types of research. The essence of this type is to be able to understand the topic much more deeply and to mutually validate or confirm the findings (Brannen, 2005).

In this regard, my dissertation is structured as follows. I will start by processing the previous literature, firstly focusing specifically on studies in Hungary. Then my first article of the dissertation is a systematic literature review published in a Q1 ranked article, in 2020, with the title of *Understanding the Real-World Impact of Geographical Indications: A Critical Review of the Empirical Economic Literature.* With my three co-authors, we analysed the international literature of the topic of GI. Within this, we focused on the following areas: market size, price premium and impacts on rural development. For this, a comprehensive literature review was conducted using five major online databases (Scopus, Web of Science, JSTOR, ProQuest and Science Direct) and key European Commission reports and in the end, the most important identified articles' references were also added to our database. The keywords used were "geographic*" and "indication*". These two expressions had to appear in the title, abstract, or among keywords. In addition, the article had to contain empirical data and/or analysis. The search was restricted to studies published in English or with some information available in English. After several rounds of exclusions, the final package of relevant studies employing the empirical approach was 80, trying to cover all the empirical GI literature published until the end of February 2020. In terms of validation, in this systematic literature, the system of finding and narrowing the criteria of the used literature is thoroughly detailed in the article, so in theory, the search can be repeated. Also, it is really important to note that, in this article, we summarise results, which were validated independently.

This is followed by the main part of my research, which is detailed in 3 published articles. The first one is the *Relationship between Hungarian consumers and EU geographic indication labels*, published in Hungarian language in the Statisztikai Szemle (Classification: Category "A") Volume 97 No. 6 in 2019, on which I worked with two co-authors. The aim of this study is to show how well Hungarian consumers know these labels, how much they trust them, how much they are aware of the meaning of the labels and how often they buy such products. The data used in the study is therefore derived from an online consumer survey conducted in the second half of 2017. The surveyed consumers were divided into two groups according to the questions asked from them. While the questions on the PGI label were addressed to both groups, the questions on the PDO label were addressed only to Group 1 and the questions on the TSG label only to Group 2. After the data cleaning, we processed 875 responses from the data of the Hungarian survey.

In addition to descriptive statistical analyses and two-sample ratio tests, we used binomial logistic regression to find answers to the question of what in the case of Hungarian consumers can explain trust in a given certification and the regular purchase of marked products. Based on all this, the models are structured as follows:

$Pr(\textit{trust in the quality system} = 1) = F(\beta_0 + \beta_1 \textit{know the label} + \beta_2 \textit{know the meaning of content} + \beta_3 \textit{Gender} + \beta_4 \textit{Age} + \beta_5 \textit{Residence} + \beta_6 \textit{Highest level of education})$, and

$Pr(\textit{Regular customer} = 1) = F(\beta_0 + \beta_1 \textit{know the meaning of content} + \beta_2 \textit{trust in the quality system} + \beta_3 \textit{Gender} + \beta_4 \textit{Age} + \beta_5 \textit{Residence} + \beta_6 \textit{Highest level of education})$.

Table 6. Variables and their values included in the models

Variables	Values
Trust in the quality system	1, if the respondent considers the label to be reliable, otherwise 0.
Regular customer	1, if the consumer has purchased such a product in the 2 weeks prior to the survey, otherwise 0.
Know the label	1, if the consumer is familiar with the label, otherwise 0.
Know the meaning of content	1, if the respondent was able to select at least one of the ten statements that correctly defines the label, otherwise 0.
Gender	1, if the respondent is a woman, otherwise 0.
Age	Age of the respondent.
Residence	Place of residence of the respondent (village/small town/ big city)

Highest level of education	Respondent's highest level of education (primary school grade 8 or lower / grammar school, vocational secondary school, vocational school, other non-tertiary education/college, bachelor's degree/university, master's degree, PhD).

Source: own composition

Examining validation for this article, it can be said that, a questionnaire was used to examine the consumer side. In it was necessary to ensure that the representativeness of the sample could not be questioned and that the number of items was sufficient. It can be observed from the data that in the case of gender and age, the sample is really close to the representativeness but in the case of residence, the respondents from the village are under-represented, in the case of the highest education, the higher educated are over-represented. It can probably be explained by the online format of the survey. So, the results obtained can therefore be evaluated in light of these characteristics. However, it is also important to observe that a significant part of the presented literature is not considered to be fully representative either; only some studies can be considered an exception.
In order for the questionnaire to be well applicable, the set of questions was tested on a sample set after the first design, and then after the results obtained here, we could modify the structure of the questionnaire or the questions. The European Union carried out similar research on this topic a few years ago, so we could compare our results.

The next article, where I am the first author, is the *Estimating the Market Share and Price Premium of GI Foods—The Case of the Hungarian Food Discounters,* published in a Q1 ranked journal in English in 2020. In order to have real market data, I conducted monthly mystery shopping for one year (January–December 2018) at three food discount stores (Lidl, Aldi, and Penny Market) operating in Budapest, the capital of Hungary. In our research, we tried to get an overview of the GI food-related services of the Hungarian food discounters (in particular whether they have any GI foods on their shelves) and also wanted to measure the price premium of these products. In order to get comparable results, I visited the same store on the same day each month. So first, we collected data on all the GI products available in the store and their closest substitutes. Then we monitored their availability, and the level of price premium was calculated as follows:

$$Price\ premium(\%) = \frac{Price_{GI} - Price_{NonGI}}{Price_{NonGI}}\ x\ 100$$

where $Price_{GI}$ is the price of the identified GI food, and $Price_{NonGI}$ is the price of the identified GI food's direct substitute, both measured in Hungarian Forints per kilogram or per litre. Later, these time-series data were analysed. With the method presented above, we managed to create a database of 816 observations.

In supply-side research, for the validation, we tested prices and product availability in discount stores, precisely because the supply and prices of discount stores are uniform throughout the country; their supply rarely changes. If it does change, it is usually with periodic promotions. So this study of ours could be repeated in any part of the country in the local store of that particular discount chain. When interpreting the results, it is important to consider the limitations of this study. Despite the fact that food discounters represent major trends, they are not representatives of the whole food retail sector. With the market size and price premium in the discounters, we can probably give an appropriate lower estimate for both of the attributes, since a food retailer with a much greater variety of supply and/or focusing on food specialities and less price-sensitive customers may have a much higher share and price premium of GI foods.

My fourth article of the dissertation (title: *Factors Influencing Competitiveness in the Global Beer Trade*, published with 2 co-authors in a Q1 journal in 2020) investigates the factors influencing competitiveness in the global beer trade on the macroeconomic level. Within this research, among several other variables, we examined whether the GI of beers are positively related to comparative advantages.

In our study, we examined the comparative advantage using the index of symmetric revealed comparative advantage (SRCA), calculated for all countries exporting beer between 1988 and 2017. To identify the factors influencing the competitiveness of the beer trade, we also ran a panel regression model. We applied a panel-data linear model by using feasible generalised least squares and linear models.

$$SRCA = \alpha + \beta_1 logBarleyprod_{ij} + \beta_2 logFDI_{ij} + \beta_3 logPop_{ij} + \beta_4 logGdppc_{ij} + \beta_5 logBeerprod_{ij} + \beta_6 pccon_{ij} + \beta_7 eumember_{ij} + \beta_8 gibeer_{ij} + \beta_9 tuv_{ij} + \varepsilon_{ij}$$

Table 7. Variables included in the panel regression

Variable	Remark	Source
SRCA	dependent variable, normalised RCA index	own composition based on World Bank data
logBarleyprod	logarithm of the barley production	FAOSTAT
logFDI	logarithm of FDI income measured in current USD	World Bank
logPop	logarithm of the population	World Bank
logGdppc	logarithm of the GDP/capita	World Bank
logBeerprod	logarithm of the beer production	FAOSTAT
pccon	per capita beer consumption	World Health Organization
eumember	dummy variable, = 1 if the given country was the member of the European Union in the given year	European Commission
gibeer	number of beers with geographical indications in the DOOR database in the given year	European Commission
tuv	unit value of the beer export	FAOSTAT

Source: own composition.

For the present dissertation, I have to highlight Hypothesis 5 from this article, which is the following: Geographical indications are positively related to comparative advantages.

In terms of validation, we obtained data from the databases of large world organisations (such as FAOSTAT, World Bank, WHO or European Commission), accessible to everyone. Then, we set up several hypotheses to test with the panel regression model, including if GI are positively related to comparative advantages. Both used regression models provide solid results, and the vast majority of the variables are statistically significant (mostly with $p < 0.01$).

The GI labels examined in my whole research are regulated by the European Union, so in the EU, they have a uniform regulatory and usage framework. Thanks to this, the Hungarian results will be easily comparable with similar research studies in other EU countries. It also contributes greatly to the validity of my dissertation.

4. Summary of the research

My first article contains the processing of the systematic literature but for methodological reasons, the articles written in Hungarian language were omitted. So before I briefly describe the published articles, I will complete the literature review. Because of the topic, the Hungarian aspect is relevant, so in this section, I will process the articles published in Hungarian language separately.

In the recent period, the number of studies about Hungarian food with GI has increased, which also indicates the legitimacy and importance of the topic, but even so, just a few literatures are available about the GI products. Popovics and Gyenge (2005) in their research among German consumers, they tried to prove that traditional foods are preferred and that the following product characteristics became important: origin, place of origin, traditional character. The aim of the study was to examine the awareness of Hungarian PGI products at the Grüne Woche 2004 international exhibition in Berlin. The 157 evaluable questionnaires were processed using Microsoft Excel and SPSS 10.0 statistical software package. The demographic characteristics of the respondents were also recorded: 62 men and 95 women completed the questionnaire, of whom 65 live in Berlin, 27 in other large cities and 65 in small towns and villages. In terms of education, 84 completed higher education, 56 completed secondary education and 17 completed primary education. The first question concerned the frequency of purchases of Hungarian products. 40% of the respondents buy a Hungarian product every month, about a third of them buy it once a year but there is also a relatively high proportion of those who consciously take them off the shelf every week or two. They gave very positive feedback on the quality of Hungarian products, 108 (69%) rated it as very good, and 38 (24%) as excellent, which together (93%) is considered a great recognition. The next question was about the actual knowledge of the listed 11 protected Hungarian products (Makó onion, Szeged salami, Budapest salami, Szeged pepper meal, Kalocsa pepper meal, Kecskemét peach spirit, Békési plum brandy, Szatmári plum spirit, Gyula sausage). Almost half of the respondents heard about the Budapest salami as opposed to the Szeged salami. Among the spontaneous mentions to be analysed later, these products were also mentioned by most, so salamis, in addition to wines, can play a leading role in promoting products protected by a geographical indication.

In another article, Panyor (2007) points out that it is important to expand the range of Hungarian GI products. A good basis for this is the 300 products in the "Traditions-Flavors-Regions" collection, which have a chance to apply for community protection. However, the creation of producer groups/consortiums is an essential condition for the application. After all, only products based on a producer group can be protected in the European Union, so the applicant and the compiler of the product specification are the group that produces the product. In the light of all this, it is important to support the formation of producer groups and marketing cooperatives.

Szakály et al. (2014) made a comprehensive survey of Hungarian knowledge, attitudes and preferences about food labels and premium pricing focused on consumers' reactions to quality and origin labels with 1,000 participants from all over the country. Among other labels they examined the PGI label. They found that the inducted knowledge of the PGI label was the lowest among the examined labels, with only 45 people recognized it, and the respondents did not accept the premium price linked to this designation. In 2014 the Hungarian Institute of Agricultural Economics made a comprehensive research in the topic of GI and other trademarks used in Hungarian food market. In this study, they concluded that since the success of a label usually depends on the marketing effort, it is mostly the larger companies that deal with different kind of trademarks. GI do not really have a tradition in Hungary, with the exception of the wine sector. The authors found that consumers are not really familiar with GI. In their view, the success of a trademark depends on the knowledge of consumers, so it is worthwhile to label only products that reach consumers directly. The improvement of GI labels can be achieved if the producers get more education, how they should use these labels and if the costumers get much more information about them. (Darvasné Ördög et al., 2014)

The focus of the research of Panyor and Vörös (2021) is on agricultural products and foodstuffs with a geographical indication; they were interested in how well-known GIs are known to domestic consumers and what factors influence their relationship with the label, how the consumption of these distinguished quality products could be increased. An online questionnaire survey was conducted in the summer of 2019, 219 completed questionnaires were returned, and SPSS Statistics 22.0 was used for statistical analysis of the responses. Demographically, 44% of respondents were male and 56% were female. In terms of age distribution, 6% of respondents were between 0-18, 28% were between 19 and 29 and also 28% between 30 and 45 years old. The proportion of middle-aged people aged 46–60 years was 22%, while the proportion of those over 60 years of age

was relatively high (16%). Based on the results, it can be stated that the awareness of GI products is rather low, and consequently, the proportion of regular consumers is only 7% among the respondents. More than half of those surveyed (56%) never look at the GI logo, and only 4% look consciously. Of the Hungarian products under geographical protection (15 pieces), the rate of awareness and regular consumption was outstanding only in the case of salami from Szeged, thick sausage from Csaba and pair sausage from Gyula. Their results also show that consumers are slightly influenced by their place of origin and tradition in their food purchases

Table 8. Connected articles published in Hungarian language

Author(s)	Year of publication	Topic
Anett Popovics, Balázs Gyenge	2005	Recognition of Hungarian products with geographical indications
Ágota Panyor	2007	Geographical indication products in rural development
Zoltán Szakály, Adelina Horvát, Mihály Soós, Károly Pető, Viktória Szente	2014	The role of quality and origin markings in consumer decision-making
Edit Ördög Darvasné, Katalin Székelyhidi, Beáta Olga Felkai, Dorottya Szabó	2014	The situation of the European Union and National food quality systems and trademarks in Hungary
Ágota Panyor, Ágnes Vörös	2021	Awareness and consumption patterns of GI products

The first published article of the dissertation is a systematic literature review which reveals that only very limited relevant empirical economic data is available on the impact of GIs. The main reason for this is probably the lack of official, available database. The only data source available is the eAmbrosia, which simply summarizes the registration information without any economic data. So, there is a shortage of hard data on the EU GI sector; however other European food quality schemes (organic production, in particular) are supported with centralized data collection, and through EUROSTAT, easily accessible datasets are available.

Although willingness-to-pay studies were not included in this review due to methodological problems and the lack of systematic data, the available sources show that the most important market for GI is the EU internal market. Previous research also shows that GI products account for only a small proportion of total EU agri-food production (7% in 2017) (European, Directorate-General for, & Rural, 2021). There are some GI products with significant market size and market share, but these represent a small group of all GI products and are concentrated in only a few countries, mainly in the Mediterranean EU countries.

Studies have shown that it is difficult to determine whether there are certain product types or places where GI labelling is more likely to result in a premium price. This hinders the effective development of GI policy. Based on the available data, it is not possible to say where a good return on the investment related to the GI will take.

Available studies show that farmers can achieve higher prices but also show that this is not certain in all cases. According to previous publications, the production of GI products is also associated with higher costs: costs of producing a better quality product and costs of complying with the GI regulations. The problem, however, is that the impact of GIs on net producer income is unclear. According to studies, it is not assumed that higher net income would come to producers; it is much more likely to occur in the upper participant in the value chain.

The studies we found (with a few exceptions) show that PDOs tend to receive a higher premium price than PGIs, and that higher value-added products also tend to receive a higher premium. It has also been reported that if different quality labels (especially GI and trademarks) are affixed to a given product, the value of the GI label may be low as consumers prefer and/or are more familiar with other quality labels.

Positive regional development effects have also been associated with GI in previous literature. One of the most important indirect effects may be regional employment. A geographical indication can make a positive contribution to regional prosperity if a product with a geographical indication requires significant labour.

Positive spill over effects from other participants in the local system may also be essential, for example, where there is a close link between different industry sectors, such as GI food production and tourism. On the other hand, as several publications have pointed out, an attempt to increase local revenues by reaching markets outside local markets could have negative effects on regional prosperity. One conclusion is that great care must be taken to design and implement GI strategy of a product.

In the second article, we analysed the awareness connected to GI in Hungary. The study shows that the trend of knowing GI labels is increasing but the rate of awareness is still low. In our research, the awareness of the PGI and TSG labels ranged from 25 to 31 percent but in the case of PDOs, it reached only 15 percent. Compared to previous European results, labels are much better known (up to 70-80%) in the south part of Europe (Arfini, 1999; Tsakiridou, Mattas, Tsakiridou, & Tsiamparli, 2011) however, these rates are very similar to the European average (Aprile & Gallina, 2008; Fotopoulos & Krystallis, 2001; Philippidis & Sanjuan, 2003). It also emerged from the research: only half of the surveyed consumers know the approximate meaning of the labels from those who said earlier that they know the label. Although these rates are higher than in 1999 (around 15%) in France, Greece, Italy, the Netherlands and the United Kingdom (van Ittersum, Candel, & Thorelli, 1999). However, this low number does not seem to have such a direct effect on the frequency of purchases. In contrast, it seems the trust significantly determines customer behaviour for products with the PDO, PGI and TSG logos. Half of the Hungarian respondents (PDO and PGI 49%, TSG 55%) trust the logo. In general, in Hungary, our research shows that trust in the quality system is stronger than the European average, especially in Central and Eastern Europe.

However, it is important to note that accurate knowledge of GI can make a significant contribution to building and maintaining confidence in the system.

Results related to sociodemographic factors explained that among Hungarian consumers, men tend to be the regular customers of products with PDO/TSG logos. Age has a positive effect on trust in certification, while it is negatively related to the frequency of purchases. People living in rural areas are typically more loyal consumers of PDO, PGI and TSG certified products. It seems the confidence in EU food quality labelling is the highest among rural consumers who recognize the certification label on a product and/or know the meaning of the scheme. The regular buyers identified as younger rural men who trust the system.

In the third article the supply side was analysed. Products with GI labels have only limited importance in Hungarian food market, both in terms of the number of products and their market share. There are only a few GI products on offer at food discounts, and the number of GI products at each discount in Hungary did not reach 1% of the total food supply (in pieces). In recent years, these discount stores have achieved the fastest growth in store numbers and sales, which is why the trends observed here can be a good indicator of the Hungarian food retailing processes, even if the research on discounters is not

representative of the whole industry. If the DOOR database is used as a reference, we can find more PDO products in the Hungarian food discounters, than PGI. Examining the origin of the goods, most of the food comes from abroad; however, 18% of Hungarian products significantly exceed the share of Hungarian products in the DOOR database. Discounts are increasingly focusing on local products, so the role of domestic GI products may continue to grow. In addition to domestic products, we found a large number of Italian, Greek and German products compared to their national share in the DOOR database.

The 41% share of Italian products is not surprising, as Italy is the world's largest producer of GI-labelled products, while the high proportion of German products is explained by the fact that the discounts examined are all German-owned. The complete shortage of products from other Mediterranean countries in the permanent stock is surprising because they represent a large number of products in the DOOR database. It is likely that during thematic weeks (such as French Days), the number of these will also increase in stores. In terms of product categories, processed products (e.g., cheeses and meat products) are significantly over-represented in the range on offer, while fresh products (e.g., vegetables, fruit, fresh meat) are unlikely to be found on discount shelves probably for logistical reasons. In terms of the premium available in consumer prices, it is outstandingly high, averaging 43% in the three discounts examined, which indicates that the price premium for products with a geographical indication is perceptible on Hungarian market. Our results are consistent with previous literature where, looking at the premium price from a consumer perspective, they found that consumers are willing to pay more for GI labelled products (among others: (Aprile & Gallina, 2008; Bryła, 2017; Fotopoulos, Krystallis, & Anastasios, 2011; Groot & Albisu, 2009; Sahelices, Mesias, Escribano, Gaspar, & Elghannam, 2017; Urbano, González-Andrés, & Casquero, 2008). Looking at the relationship between the country of origin and the price premium, we can see that a premium price of 45-55% is available in most countries. To accurately understand the results, it should be noted that by examining discounts, we do not get a complete picture of the domestic food industry. Due to the nature of discounts, we are likely to be able to give a lower estimate, as a food retailer with a much wider selection, targeting less price-sensitive customers may have a much higher share and price premium among GI foods.

The fourth article of the dissertation investigates the factors influencing competitiveness in global beer trade on the macroeconomic level. In this, the results of panel regression, mostly with statistically significant results, show that the logarithm of the barley

production, of the FDI, of the population, and of the GDP/capita and unit value of the beer export have negatively influenced competitiveness in the beer trade. In contrast, the other variables of total beer production and per capita consumption, EU membership, and the number of EU GI beers have a positive impact on this index. Thus, highlighting the most relevant result of my topic, the presence of GIs in the exporting country has a positive effect on export performance, as we have seen in previous research (Balogh & Jámbor, 2017; Leufkens, 2017; Raimondi, Falco, Curzi, & Olper, 2018), so the number of GI-registered beers is positively related to comparative advantages.

5. Conclusion

After summarizing the individual studies separately in the previous section, I would like to answer briefly on the research questions in the following part. Then reflect on the study as a whole in general.

How well-known are the labels of EU GI products among Hungarian consumers, and how well do they know their meaning?

The awareness of the GI labels in Hungary is definitely low (in the best case, it was 31%), even if this number is not much lower than the average in the EU. This number is probably too low for these labels to be effective marketing tools for producers. It also includes the fact that only 50% of those who said they know the label know at least approximately the meaning of the label. Can you build a marketing campaign currently on these markings? Probably not an effective one but what gives hope is that awareness of all three labels compared to previous surveys is constantly increasing. The EU focuses on GI products, so this growth is expected to be continued. So far, the EU has completed more than 30 international agreements, which allow the recognition of many EU GI outside the boundaries of the EU and the recognition of non-EU GI inside the territories of the EU. GI represent an increasingly important aspect of trade negotiations between the EU and other countries. The Commission separates around €50 million year after year to support quality products in the EU and all over the world. Taking this into account, these labels can play an important role in the food markets in the near future.

What is the level of trust in the labelling of EU GI products, and what influences this trust?

About half of the respondents said that they trust the mark. When we analysed the possible variables, which can influence trust, we came to the conclusion that knowledge of logos is important because if someone knows the label, they have more than three times the chance to trust them, while in terms of meaning, the chance is almost double. Based on the research, we can say that gender, education and age does not affect trust in EU GI labels. In the case of place of residence, it can be said that someone who lives in a more urban environment trusts less in GI labels. All in all, consumer education is most needed to build confidence in GI, as those who recognize the labels on food packaging or are aware of what those labels mean will treat these products with much greater confidence.

How often do consumers buy EU GI certified products, and what affects it?

More than 35% of those surveyed are regular customers of GI-labelled products. The frequency of purchases is mostly determined by consumer confidence (the result is not significant for the PDO). Women become much fewer regular customers (not significant for the PGI). In terms of age, the older a consumer is the less likely it is to become a regular buyer (not significant for PDO), while residents of rural, smaller settlements are more loyal buyers of PGI products. The highest level of education has no detectable effect here either. So, in this topic also, we have to repeat that the most important thing is to inform consumers as widely as possible.

In the Hungarian market, what is the market size of products with geographical indication, examining the example of discount stores?

The number of GI products available in Hungarian discounts is limited, there are an average of 11 products per store. The supply is fairly constant; however, even though there are only a limited number of GI products on the shelves, they are at least always available to consumers and are part of the chains 'core product portfolio. However, the number of GI products usually increases during the thematic days (e.g., Greek days). We can see that the supply is very limited for GI products, so buyers rarely meet face to face with the label, they are even less likely to find out about the meaning of the markings on their own. Targeted information on GI labels is needed for consumers, for that they start to appreciate them.

In Hungarian discount stores, what is the price premium of products with a geographical indication compared to their direct substitutes, estimated from below?

The average price premium for GI products is 29% in the Aldi, 46% in the Penny Market and the highest was in Lidl with 54%. Overall, the average premium was around 43%. It is also important to mention that in addition to supply, prices did not really change during the observations. Although the price of some products may also change during promotional periods, consumers can plan to purchase GI products in advance. On the other hand, discount stores provide a continuous market for producers as well.

Are geographical indications positively related to comparative advantages in the beer market?

Our results show that the number of GI-registered beers is positively related to comparative advantages. Countries with traditional beer products closely linked to their place of origin are usually with a higher level of comparative advantages as the number of GI beers positively determines SRCA indices. From this, it can be concluded that it is not pointless to promote the increase in the number of GI products and devote resources to GI labels.

Usage of labels has benefits and costs for all the participants of the market. These are listed in Table1. at the beginning of the dissertation and for some elements of the table (not for all the items of the table), the studies also yielded results in terms of GIs. Businesses have the ability to make legal claims about the qualities of the product. In this term, for example, the retailers, including discount stores, can legitimately expect GI-labelled suppliers to ensure adequate quality. For example, if they have a Feta cheese with GI label on their shelves, they can be sure how and from what it is made from. In the same way, the PDO and PGI labels ensure that retailers or food producers can compete based on the qualities of the product that the consumer cannot detect without a label. The preparation of food products in the traditional way and from traditional ingredients is just such an attribution. Without labelling, the consumer (anywhere in Europe) cannot be sure during everyday shopping whether, for example, a traditional Spanish ham is really made according to the traditions expected by the consumer. Of course, the GI labels ensure the market players about the compliance with regulations. Retailers and food producers can win a new market segment where GI information can be required. Research has mostly shown that those consumers who are familiar with the label associate more likely a

positive image of the products. So, producers can endow their products with an extra positive feature.

From the point of view of governments, the most important benefit of the GI labels, appears in the last study. The number of GI-labelled products seems to have increased the comparative advantage. I would associate this with the following point in the FAO table: "Governments enhanced ability to facilitate trade with countries that have label requirements", with so much modification in regard to the GI labels, that it is not trade with countries, but for consumers who have such label needs.

GI marks can be absolutely beneficial to consumers to become more educated about a product, to acquire the ability to make comparisons of products, to gain credible information about products and to learn to use product information to tell if a product is worth the price. Information that influences product choice can express the values and priorities of the customers. Being a conscious consumer is becoming more and more trendy, so using GI labels when shopping can also be a social compliance.

On the other hand, different types of costs appear in different segments of the market connected to the GI label. After understanding the system, it can be said that the supply-side costs associated with the GI logo do not occur at the retailers' level (apart from, of course, that his purchase price may be higher due to the logo) but at the producers'. At the beginning of the process of applying a GI label, a consortium must be formed, and after that, the process requires a large amount of documentation. The appraisal process takes several years. Thus, the return on the administrative cost of the investment can start even after several years, as the producer will not be able to use the label until then. Although we have not yet seen a large marketing campaign specifically targeting GI values in Hungary, companies would also have to calculate marketing costs in order for this value of products to have a larger target audience. There may be an additional cost to the manufacturer of the product if they need to change their suppliers due to the GI mark. As this is a European Union designation, government cost does not affect the governments of individual countries but the EU as a whole. At the beginning, it started with the cost of the research to develop the label content and format. However, there are activities that need to be done continuously since the beginning, and these also have a cost. Such as maintaining the information systems, collection and administering data and the most important one, which is necessary to keep the label trustworthy, is the Inspection, enforcement and audit costs.

The extra cost of the consumers, connected to the GI labels, is the premium price of the GI product. In our research, we get about a 43% premium for the GI products, which is not a low number, so we can say the consumers also have to pay for the usage of the GI label.

All in all, the use of EU food quality labels can be effective and bring mutual benefits to all market participants. The key to this is to make consumers know, understand and trust these labels. This is the only way to get people to consciously start looking for foods with these labels when they purchase foods. Improving consumer information on the labelling of foodstuffs with a geographical indication has a key role to play in this, whereas these systems have been introduced in the European Union for 30 years, but still only a small percentage of buyers recognize these logos and even fewer understand the exact meaning of these labels. Not only should these products be promoted at the EU level but it is also in the interest of all Member States, as the study in the dissertation has shown that increasing the number of GI products also increases the comparative advantage. There are also government programs in Hungary, which are mainly concerned with increasing the number of Hungarian GI products but in addition to this, resources must be devoted to expanding the knowledge of consumers, which can also strengthen the trust and knowledge of the GI system in Hungary. Attitudes of customers towards food quality programs need to continue to be monitored, as the various governmental and EU initiatives can only achieve their goal if consumers prefer products with GI when purchasing, because they understand and trust these indications.

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The author's published articles on the subject:

Török, Á., Jantyik, L., Maró, Z. M., Moir, H. V. J., (2020). Understanding the Real-World Impact of Geographical Indications: A Critical Review of the Empirical Economic Literature, SUSTAINABILITY 12 : 22 Paper: 9434 , 24 p.

Török, Á., Maró, Z. M., Jantyik, L., (2019). A magyar fogyasztók és az európai uniós földrajzi árujelzős élelmiszercímkék viszonya, STATISZTIKAI SZEMLE 97 : 6 pp. 546-567. , 22 p.

Jantyik, L., Török, Á., (2020). Estimating the Market Share and Price Premium of GI Foods—The Case of the Hungarian Food Discounters. SUSTAINABILITY 12 : 3 Paper: 1094 , 15 p.

Török, Á., Szerletics, Á., Jantyik, L., (2020). Factors Influencing Competitiveness in the Global Beer Trade SUSTAINABILITY 12 : 15 Paper: 5957 , 15 p.

Published articles of the candidate

This chapter contains the literal text of the published articles and, in the case of articles published in Hungarian, the literal translation.

Article no.	**Title**	**Journal**	**Ranking**	**Number of citations (Status in 14.11.2022)**
Article 1	Understanding the real-world impact of GIs: A critical review of the empirical economic literature	Sustainability	Q1	20
Article 2	A magyar fogyasztók és az európai uniós földrajzi árujelzős élelmiszercímkék viszonya / Relationship between Hungarian consumers and EU geographic indication labels	Statisztikai szemle	A	2
Article 3	Estimating the market share and price premium of GI foods – the case of the Hungarian food discounters	Sustainability	Q1	14
Article 4	Factors Influencing Competitiveness in the Global Beer Trade	Sustainability	Q1	14

6.1. Understanding the real-world impact of GIs: A critical review of the empirical economic literature[2]

Abstract: In our study, we tried to collect empirical studies focusing on the economic impact of Geographical Indications (GIs). Using a systematic literature review approach, we investigated three different aspects: market size, price premium and impacts on rural development. Based on the findings of studies both from the grey and academic literature, the results are quite mixed. Though the number of GI-related empirical studies has risen in recent years, there is a lack of economic data to support policies related to GIs, even in the European Union (EU), where the most important GI system exists. Overall, it is impossible to draw any general conclusions about the economic impact of GIs. Some countries have remarkable GI market size, and some GI products have a determinative role in both domestic and export markets; however, it is not general. Again, some particular GI products of some regions could gain significant price premiums, but due to the associated higher production costs and unequal distribution in the value chain, it might not result in higher producer incomes. The most conflicting empirical results were found in how GIs can contribute to regional prosperity, as evidences of the harmful effects of GIs on rural development were also identified.

Keywords: geographical indications; PDO; PGI; market size; price premium; rural development

1. Introduction

Geographical Indications (GIs) were introduced into international trade treaties by the European Union (EU) during the Uruguay Round trade negotiations. Although strongly resisted by the USA and other New World countries, the 1994 Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement, under the World Trade Organization (WTO) Agreement, created an effective compromise. Since then the EU has been a strong advocate for increasingly strong GI regulation, and is currently consulting of further extending EU GI regulations.[i]

2 Áron Török, Lili Jantyik, Zalán Márk Maró, Hazel V. J. Moir 2020: Understanding the Real-World Impact of Geographical Indications: A Critical Review of the Empirical Economic Literature, SUSTAINABILITY 12 : 22 Paper: 9434 , 24 p.

Within the EU, the GI program is managed by the Directorate-General, Agriculture and Regional Development. In this paper, the focus is on how GIs perform as an instrument of agricultural and regional policy, reflecting the EU arrangements. Our particular focus in this study is on the size of the market for GI products, the extent to which they contribute to increased net producer income and the extent to which they contribute to regional development. There are, of course, many other important questions about how GIs operate, for example what price premiums consumers are willing to pay, but these are beyond the scope of this particular study[3].

By 2009 GI systems were used already in 167 countries and regions. Recently China has become the country with the largest number of registered GIs, but for many years the majority of registered GIs were found in the EU [1]. In general, in bi-lateral trade agreements between the EU and other countries, the number of GIs in the EU (and listed for inclusion in trade treaties) far exceeds the number in partner countries.

The EU-wide system for GIs was first introduced in 1992 [2] and has been revised twice since then (in 2006 [3] and 2012 [4]). The EU system has two major types of GI. Protected Designations of Origin (PDOs) are very similar to the French Appellation d'Origine Contrôlée (AOC) system, both existing before the EU GI system [5,6]. Protected Geographical Indications (PGIs) have a German origin with a strong reputational element but a much lower link to the place of origin [7]. Just five EU Member States (Italy, France, Spain, Portugal and Greece) are the primary users of the EU's GI system, both in terms of the number of registered products and in economic importance.

Recent trade agreements clearly indicate the political importance for the EU places on GI policy. In current negotiations with both Australia and New Zealand, the EU has again indicated that GIs are an essential element in any trade agreement. This may be surprising considering their limited economic importance in both domestic production and international trade. According to the results of research published in 2019 [8], on average, the share of GI products in the national food and drink industry in 2017 was around 7% in the EU Member States. Further, 58% of EU GI production is sold in domestic markets, and only 22% of EU GI products is sold outside of Europe. Of GI exports, 90% are wines or spirits. The primary beneficiaries of GI labelled exports are France and Italy. But

3 Several comprehensive reviews on GI related WTP exist (e.g., Grunert & Aachmann, 2016), however with conflicting results. Even in the European Union, the recognition of GI labels is low and other quality attributes of food products (brand in particular) might have a greater influence on purchasing decision, therefore the role of GIs on WTP for quality food product is not clear.

largely due to very limited available data, there is as yet little general analysis of the economic impact of GI policy for either particular product lines or particular countries.

It does need to be said that there are significant methodological challenges in separating the impact of GI policy – which is effectively a regulation about food labelling – from other closely associated characteristics. It is not a simple matter to isolate the effects of a product's quality in itself, from the place it is made, in itself, from the GI label that proclaims the place-product combination is regulated. Further, a GI labelled product may also carry a trademark and, as will be seen from the literature reviewed below, the GI and trademark labels to not always work in harmony. The lack of useful data does not make these challenges any easier.

Despite the limited data, there is a voluminous literature on GIs. Given the data limitations, much of this literature is theoretical or conceptual, drawing conclusions on this basis rather than on empirically verified data. To the best of our knowledge, so far, there were only a few attempts to synthesise the evidence-based literature on GIs.

But these existing GI literature reviews focus mainly on the European system and only give general overviews of the available resources, both in terms of methodologies and disciplines (see Table 1). None had the primary purpose of assessing the empirical results. Rather they considered the GI literature from a specific viewpoint (e.g. welfare implications, consumers' attitudes, or simply the papers from a given geographical region).

Marchesini, *et al.* [9] conducted a literature review on the perception of agro-foods quality cues in the international environment, where GIs were one of several quality attributes. In his conceptual paper Réquillart [10] reviewed willingness to pay (WTP) research, summarising eight previous studies on consumers' willingness to pay for GI products. Barjolle, *et al.* [11] collected the methods used for evaluating GI systems and summarised the results of the EU funded SINER-GI project designed to raise GI awareness. Teuber and her co-authors reviewed the (mainly theoretical) economic literature on GIs, focusing on the welfare implications, concluding with some empirical findings that consumers prefer local and GI food [12,13].

Deselnicu, *et al.* [14] undertook a meta-analysis of GI food valuation studies and found that "brands [trademarks] and GIs may play a similar role in product differentiation, and thus, be substitutes for each other" (p. 43). Using the same approach, Deselnicu, *et al.* [15] collected 25 GI valuation studies and found the GI price premium to be lower when

other product differentiating tools are also available (e.g. brands/trademarks for processed food products).

Herrmann and Teuber [16] collate a number of WTP studies, finding that origin is valued by consumers, mainly because of quality

and cultural preferences. Bienenfeld [17] provides a meta-analysis of willingness to pay, especially for organic foods. Feldmann and Hamm [18] reviewed literature of how consumers react to locally produced foods and found a willingness to pay a price premium. Grunert and Aachmann [19] reviewed the demand side literature, mainly focusing on publications about consumers' reactions to the EU quality labels. Papers about the implications of GIs available in Elsevier's Brazil database were meta-analysed by Mirna de Lima, *et al.* [20]. Dias and Mendes [21] prepared a bibliometric analysis of articles using EU GI labels. They found that the most investigated issues were PGI, olive oil, dairy (mainly cheese) and chemical composition.

Leufkens [22] tried to quantify and evaluate the overall marginal consumer willingness to pay for the European GI label. Using a meta-analysis and a heterogeneity analysis, he found that consumers have substantial willingness to pay for GIs; however, there are significant differences among products. Caputo, *et al.* [23] investigated consumers choices regarding traditional food products. They highlighted the low level of recognition of the EU quality labels. Also, they collected the main drivers why consumers seek for traditional products and found that sensory appeal and the natural character, health and safety issues, origin, ethical concerns, price, and convenience are the most important. Lastly, their results indicated that it is not clear what are the most important factors of consumers' decision-making process about such products.

To the best of our knowledge, the last GI-related review was conducted by Cei, *et al.* [24], with particular attention given to the economic effects serving rural development initiatives. They concluded that GIs could generate value-added at the end of the value chains: for consumers and retailers in particular. However, on the producers' level, the results are somewhat mixed and depend on the specific local conditions.

A summary of these identified literature review articles is provided in Table 1.

Table 1. Studies reviewing academic literature on GIs.

Author (year)	Country/ region	Issues reviewed	Key findings
Marchesini et al. (2007)	various, EU and extra EU	perception of agricultural product and foodstuff quality cues	It is unlikely that the EU GI system would be recognised outside of Europe. Authenticity is not always a quality attribute, and large scale industries can produce products with high quality where the origin is not the most important attribute. Other quality attributes (like animal welfare, protection of natural resources) might appear in the EU parallel with the GI labels.
Réquillart (2007)	EU	welfare impacts of GIs	PDO/PGI labels, but also trademarks, usually achieve a higher value on the market, though brands sometimes realise higher positive values and the GI and trademark labels interact with each other. But there are exceptions where the GI label as a signal of quality is only partially accompanied with a positive willingness to pay. Some of the studies reviewed suggested that GIs could result in higher prices, but these are often needed to cover the additional costs of GI production. Overall, there is no clear evidence that the income level of GI farmers would be higher.
Barjolle et al. (2009)	various, EU and extra EU	methods for assessing the territorial impact of GIs and analysis of 14 case studies from the SINER-GI project	The impacts of GI systems are more linked with economic or economic-related issues (e.g. market stabilisation, price premium, value-added in the producing region) than social and environmental ones.

Author (year)	Country/ region	Issues reviewed	Key findings
Teuber et al. (2011)	various, EU and extra EU	GI welfare implications, willingness to pay	Consumer ethnocentrism (belief in the inherent superiority of products from one's own region) or support warranty (supporting local or extra-local because of characteristics such as fair trade) dimensions are important for consumers when they decide about the purchase of local food (or GI products in particular), but not all consumers prefer origin attributes per se. Agri-food products have several quality dimensions beside origin, and they can be not only complementary but also substitutable with remarkable trade-off effects.
Deselnicu et al. (2012)	various, EU and extra EU	meta-analysis for price premium of GI products	In GI production, agricultural products and minimally processed foods get the highest price premiums. Processed GI products sold via longer supply chains usually use trademarks to gain a reputation premium. Comparing different levels of GI, PDO products usually receive a higher price premium, compared to PGI products. When multiple labelling schemes co-exist (trademarks together with GI labels) the price premium is lower when the higher quality is indicated only by a single label.
Herrmann and Teuber (2012)	EU	willingness to pay for origin labels, economic rationale of GIs	There is low awareness and recognition of the EU GI system and PDO/PGI logos among consumers. For wine and high-quality coffee, a price premium is generally obtained. There is no uniform pattern as to how psychographic and sociodemographic characteristics of consumers affects their attitudes to GI products. On the other hand, "clear ethnocentric behaviour" was highlighted in all studies. GI labels are more beneficial for producers who do not have a high reputation for their products.

Author (year)	Country/ region	Issues reviewed	Key findings
Deselnicu et al. (2013)	various, EU and extra EU	meta-analysis for price premium of GI products	GI captures the highest price premium for products sold via a short supply chain or having lower added value. When other tools for product differentiating co-exist (e.g. branding, trademarks), the price premium is lower, especially for wines and olive oils. Stricter regulations result in higher price premiums.
Bienenfeld and Roe (2014)	various, EU and extra EU	meta-analysis of willingness to pay, especially for organic foods	Based on 132 observations derived from 29 papers, for organic products, a higher price premium is realised by fruits and animal products. From a methodological point of view, studies using contingent valuation and based on more representative samples show higher price premiums.
Feldmann and Hamm (2015)	USA and Europe	perceptions and preferences for local food	Unlike organic food, local food is not perceived as expensive. Consumers are willing to pay a premium for local food.
Grunert and Aachmann (2016)	EU	consumer reactions to the use of EU quality labels	The results are conflicting; overall conclusions cannot be made. Low levels of awareness with significant country differences (e.g. higher in South Europe, lower in the North – in line with the number of the registered GI products). GI labels can play a role, but this might be smaller than the role of other quality attributes (e.g. brand, origin information), and it is highly dependent on the product and the context. Evidence on actual perception and use of the labels in real shopping circumstances is very limited.
Mirna de Lima et al. (2016)	mainly Brazil	summarising the findings of GI-related papers in the Brazilian CAPES journal database	The very general conclusions suggest that GIs can be designed as a tool for protection (both for consumers and producers), for marketing (helping in product differentiation), for rural development (maintenance of local employment and identity), and preservation (culture, ingredients).

Author (year)	Country/ region	Issues reviewed	Key findings
Dias and Mendes (2018)	various, EU and extra EU	bibliometric analysis of the various research topics connected to GI	Based on bibliometric analysis of academic research (all disciplines) in the field of food quality labels (501 articles), the papers can be sorted into four clusters, indicating the most relevant research topics.
Leufkens (2018)	EU	meta-analysis on GI label effects	Consumers have a highly significant and positive marginal willingness to pay for GIs. However, the marginal willingness to pay differs significantly between the individual GI standards and indicates great heterogeneity between the protected products.
Caputo et al. (2018)	mainly EU	consumers' attitude towards traditional food products	European consumers are not familiar with the food quality labels of the EU. Origin is not the most important motivation when buying traditional food products, though it is often seen as an added value.
Cei et al. (2018)	EU	effects of GIs on local economic development	GIs can generate value-added, especially at consumer and retailer levels; however, effects on producers are not apparent.

Against this background, the aim of this paper is twofold. First, it updates current knowledge about GIs, focusing on empirically validated results. Second, it tries to identify the key areas where policy-makers need to understand when, where and how GIs work best, updating earlier research conducted by the authors.

To achieve this, the study includes all agricultural and food GI products (also wines and spirits). However, non-agricultural and food products, together with services, are excluded and are not part of this research.

After section 2 describing the methodology, section 3 considers the evidence. First general results from the grey literature are summarised, then the next part with three subsections covers three different topics based on the academic literature: the market size for GI products, the effects of GIs on net producer income involving the issue of price premiums, and the GI-related tools to enhance rural development and prosperity. Section 4 draws together the results and findings, identifying key gaps in knowledge and identifying critical areas for policy-oriented research.

2. Materials and Methods

To achieve a wide-ranging overview of the empirical evidences on GIs, a comprehensive literature review was conducted using five significant online databases: Scopus, Web of Science, JSTOR, ProQuest and Science Direct. The keywords used were "geographic*" and "indication*". These two keywords had to be included in the title, abstract, or keywords. Also, the article had to contain empirical data and/or analysis. The search was restricted to studies in English or with some information available in English.

We also included key European Commission reports. Finally, our review was also extended to the references found in the most important articles identified and these references were also added these to our database.

From the online databases, the initial search resulted in 2,881 items. To include only relevant studies in the final literature analysis and to exclude duplicates, we used the online software package Covidence. After excluding duplicates, 2,144 studies remained that might provide empirical findings on the topics investigated. Figure 1 describes how we screened and identified the relevant literature. The initial screening, based on title and abstract, was independent, but then the authors discussed items with conflicting outcomes. This first screening resulted in 1,841 items being excluded. The 303 articles remained were also each screened in more depth by at least two of the authors. Again authors first screened independently, but then discussed articles with inconsistent results. Items with willingness to pay methodology and meta-analysis were excluded; however, we reviewed the papers identified in these meta-analyses. Also, studies that turned out not to be empirical and where no text was available, were excluded from our research. The final set of relevant studies employing empirical approach was 80 publications from the systematic literature review, including 5 studies from the grey literature, trying to cover all the empirical GI literature published until the end of February 2020.

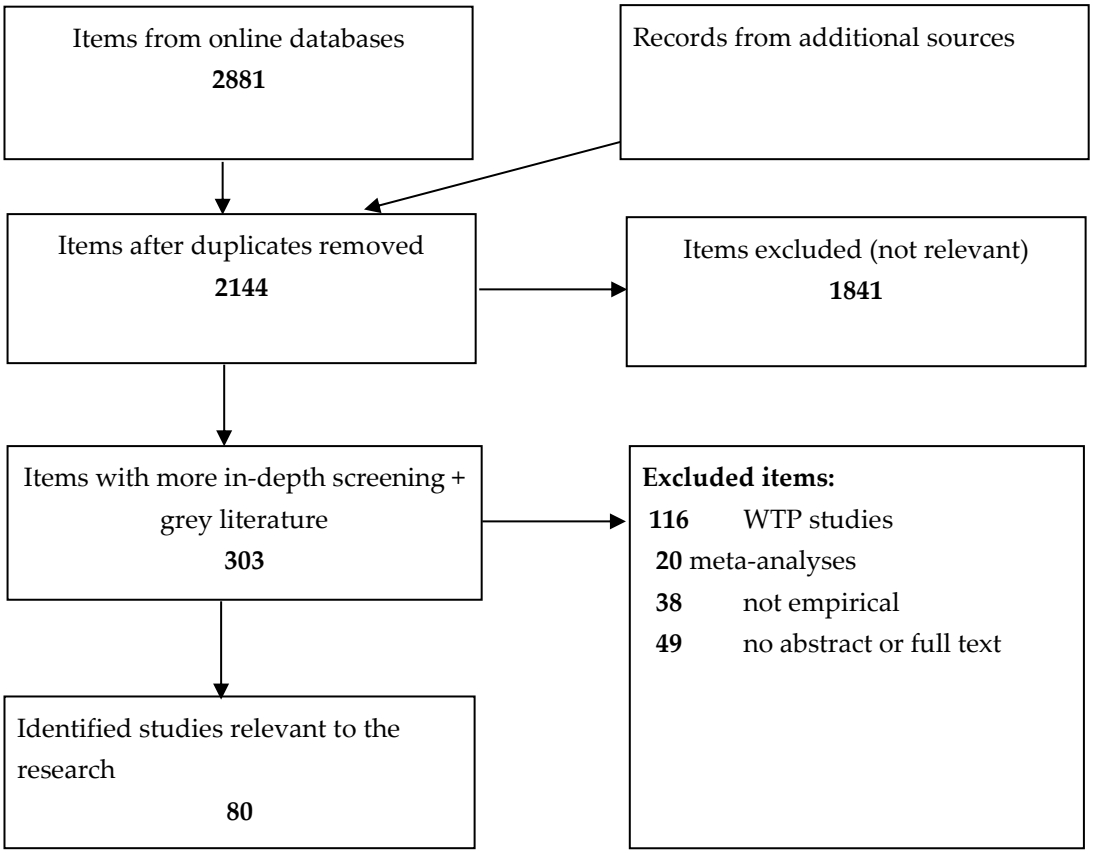

Figure 1. Pathway of the systematic literature review.

Figure 2 indicates the empirical GI studies by their year of publication. There is a clear growing tendency of such studies in recent years, as more than the third of the publications were published after 2017.

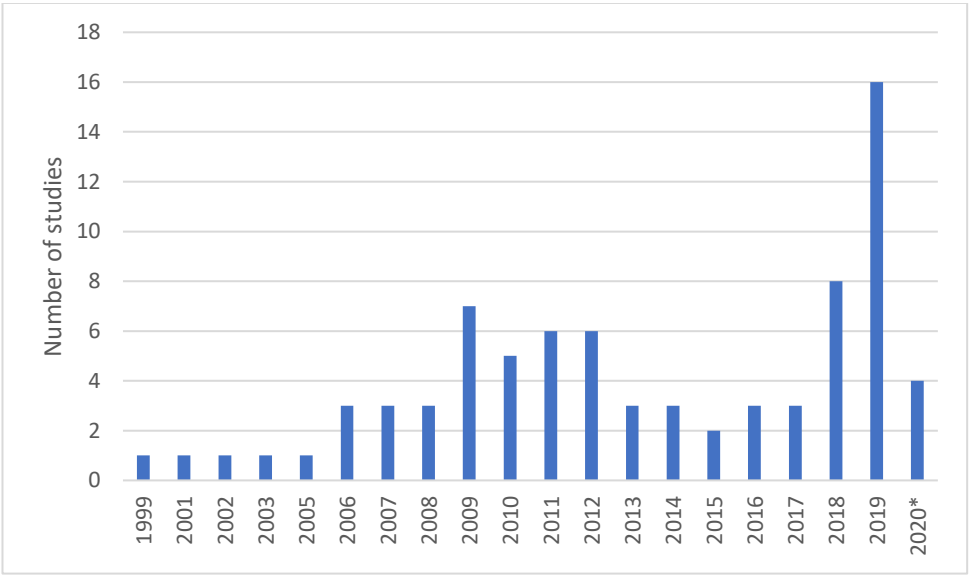

Figure 2. Empirical GI studies identified in our study, by year of publication.

* Our collection covers studies available at the end of February 2020.

Figure 3 indicates the topics of the articles identified. Obviously, a paper can focus on more than one topic relevant to this study. The numbers clearly indicate that research on GIs is very much about trying to measure the economic importance of the sector and the number of papers about impacts on regional prosperity is quite limited.

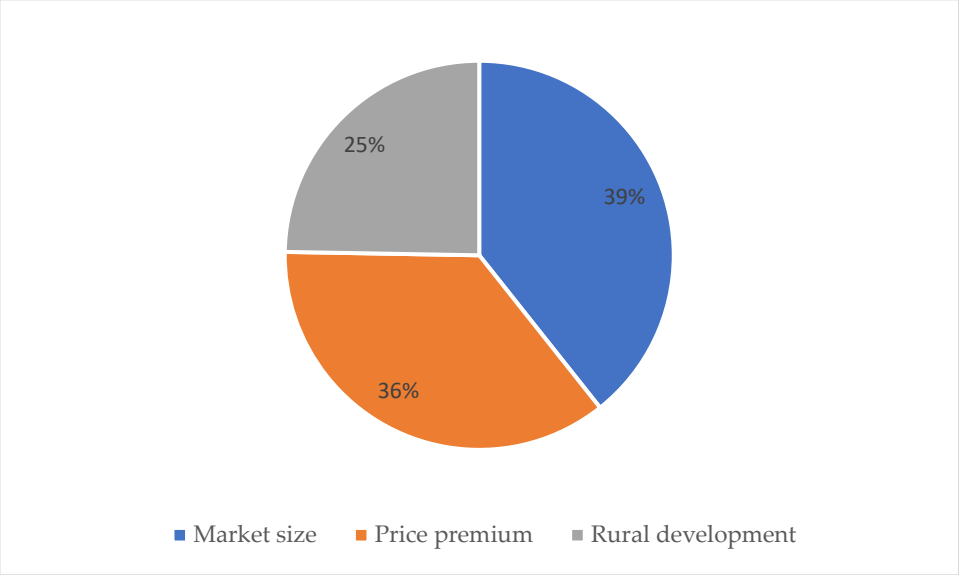

Figure 3. Topics covered by empirical GI studies.

Most of the studies investigated Italy, France and Spain, the primary beneficiaries of the EU GI system. Several extra-EU countries were also often studied, in the Americas in particular (Figure 4).

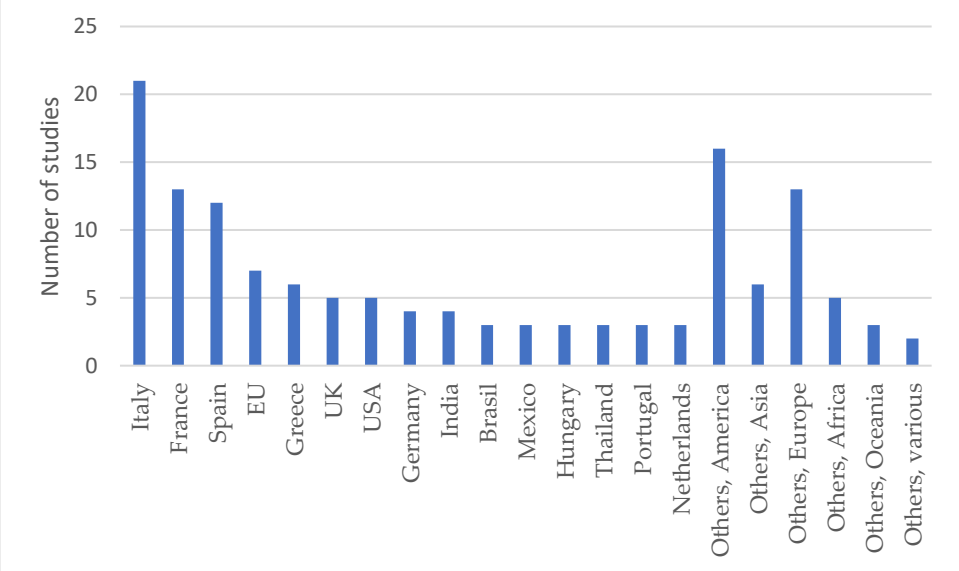

Figure 4. The territorial focus of empirical GI studies.

Researchers mainly focused on the empirical investigation of GI food products, as 73% of the papers covered GI food products. Wines and spirits together were the topic of 17% of the papers, while the rest of them covered various product lines.

3. Results

3.1. Grey literature and centralised datasets

One of the most comprehensive reports is conducted by the London Economics [25]. Undertaken for the European Commission (EC), this report highlighted "the lack of comprehensive data on the number of PDO and PGI producers, the size of the agricultural land devoted to PDO/PGI production, the value and volume of production and the value of sales" and noted that this was "a serious constraint to the monitoring and evaluation of the scheme at national and EU level" (p. 254).

The authors of the London Economics report suggest that the number of registered GI products can describe market size. This could however be misleading, as the number of registrations can be influenced by factors such as national procedures and incentives, country-specific institutional characteristics, different social-cultural contexts, the depth of variety within a particular product group etc. There will also be substantial differences between registered GIs in the volume of output, its value and the number of producers. According to the report, the number of GI products is highest in the Mediterranean EU Member States, also with significant market for these products. The report also highlighted the concentration of GI registrations in particular food categories, "Fruit, vegetables and cereals", "Cheeses", "Fresh meat (and offal)", "Oils and fats/olive oils" and "Meat-Based Products" represented more than 80% of the total number of registrations. It is clear that GI labelling either works better or appeals more to producers, in some product lines than in others.

Another major data sources are the contracted reports conducted by AND-International and published in 2008 and 2019 [8,26]. These reports analyse all the four GI regimes (agricultural products and foodstuffs, wines, aromatised wines and spirits). Both primary (direct and indirect surveys) and secondary (centralised datasets) data were included, but it is clear that for some areas only educated guestimates were available. This underlines the problem of the lack of available datasets on GIs again.

Based on the results of the AND-International reports we can assume that the market share of the GI products (all the four regimes, excluding Traditional Specialty Guaranteed foods) in 2017 was around 7% with a sales value of EUR 74.76 billion. GI wines had the highest share in the GI market with 51%, followed by the food products (35%) and spirit drinks (13%), while the market of aromatised wines was hardly measurable (around 0,1%). Compared to the first report (with latest data of 2010) the total sales value of the GI products increased by 37% on an average (an increase of 33%, 65% and 27% and among wines, foods and spirits, respectively). This remarkable growth was mainly caused by the increased number of new GI products; however, the growth of French, Italian and Spanish wines and French spirits was also determinative. The reports also found extreme concentrations. Among wines, 90% of the EU28 sales volume and 95% of the EU28 sales value in 2017 came from France, Italy, Spain, Germany and Portugal. In case of agricultural products and foodstuffs, PGI products had 58% share, and only 42% of GI foods sold had a PDO label, while more than half of these GI products came from only three EU member states (Italy, Germany and France). Among foods, a few product categories had significant shares: cheeses (36%), meat products (16%), beers (13%), fresh meats (12%) and fruits, vegetables and cereals (8%) were the five most important categories, altogether representing 85% of the total GI foods. A huge concentration was also identified. For example, out of the 235 GI cheeses, the Italian, French and Dutch products represented 82% of the total sales value. The GI spirit market was highly dominated by three products representing 90% of the total market (Scotch Whisky, Cognac and Irish Whisky). In 2017, the share of GI products exported had reached 42% of the total sales with 20% of intra-EU markets (e.g. Switzerland) and 22% of extra-EU markets (mostly USA, China and Singapore). The majority of the exported European GI foods came from France, Italy and the UK and was pulled by a very few GI products (e.g., Scotch whisky).

Regarding price premium, the AND reports calculated value premiums, using ex-factory and wholesale prices, compared to similar products without GIs and weighted by the GI sales volume. On average, they found 107% value premium for EU GI products, with a slight decrease compared to the 114% identified for 2010. The authors underlined the importance of French products and wines, as their contributions to the total value premium is higher than expected. Also, they calculated a higher value premium for processed products than raw products.

The Areté report [27] conducted between the two above mentioned AND-International reports, confirms their general results based on their few selected cases. The authors found remarkable price premiums for most of their 13 GI case studies, though with extreme variability in the extent. For GI agricultural raw materials, the price premium was limited but significantly higher for PDO than for PGI products. They also found that the producers of the final product usually had more than 70% of total retail value (and also higher gross margins). This also implies that the primary producers' share is more limited (though this is almost the same for both GI and non GI value chains) and therefore the farmers benefit less than retailers from GI labels.

As an initial step of the research we have also inspected the official databases of the European Commission dedicated to the GI system. eAmbrosia [28] is now the official register of GI products recognised by the European Union. However, this online database is limited to technical information (milestones of the GI products' registration, product descriptions etc.) and neither empirical nor market data are provided.

EUROSTAT [29] is the official EU statistical database and only collects very basic data on grapes for wines with geographical indication. According to the latest dataset, in 2016, 72% of total grape producing area was dedicated to produce grapes allowed for PDO or PGI wine production, representing 1.2% of the total EU utilized agricultural area.

The European Commission's Farm Accountancy Data Network (FADN) is aimed to measure the income level of EU agricultural holdings and the impact of the EU Common Agricultural Policy [30]. In its publicly available dataset there is no centralized data available on the impact of geographical indications.

3.2. Academic literature

3.2.1. The market size of GI products

Regarding the academic literature, only a few studies gave quantitative data on the size of the market. After introducing these few studies, we cover several related aspects: interaction between price and quantity, export and import, institutional issues, wine related studies and trademarks.

Arfini and Capelli [31] measured concentration in the Italian GI sector, but also explored data on the size of the market. Although Italy has the most GI registrations (PDO and PGI together) in the EU, just 15 products generated 90% of the entire Italian PDO turnover.

The most important GI products were cheeses and processed meat products, with substantial differences in average turnover. In general, firms producing PGI products had higher values than those producing PDO products. Regarding market destination, PDO products are mainly sold domestically (86%) and other EU markets (8%), while the PGI products exported are sold in more distant markets (e.g. 43% olive oils shipped with PGI labels were sold in extra-EU markets).

Even among well-known GI foods, there are remarkable differences in terms of the size of the market and the value chain. E.g., the Italian Parmigiano Reggiano PDO cheese industry processes the milk from 300,000 farmers (in contrast, the first Brazilian GI cheese Serro is produced only by around 100 dairy farmers [32]) and an annual 3 million wheels of cheese are made by 393 dairies (of which 60% is a cooperative), the Spanish Ternasco de Aragón PGI fresh lamb meat is produced by many large cooperative groups but distributed by only 3 enterprises (of which 66% is a cooperative) [33].

In 2007, the Portuguese GI food market was estimated to have a EUR 70 million sales value, dominated by very small producers. Only about two-thirds of GI product was sold in the real market, the rest being bartered [34].

The real market performance of PDO cheeses in Italy was estimated by Galli, *et al.* [35], who examined 11 varieties in 2008. On average, a PDO cheese in Italy had EUR 50 million turnover with an average production of 6,232 tons. Substantial differences existed between products, and only three of the selected varieties exported more than 20% of their total production.

Also, Italian PDO cheese and olive oil was the subject of the ex-post assessment of Carbone, *et al.* [36]. Results showed that due to the better connection to the place of origin and therefore reaching niche market segments, smaller producers had better performance than the bigger ones. On the other hand, producers with lower-ranked products (based on the authors' multi-criteria analysis) usually use conventional distribution channels reaching broader markets with higher volume and turnover.

In Hungary, Jantyik and Török [37] used a mystery shopping approach and found a less than 1% market share of GI foods in the supply of the most dynamically growing discounters.

It is essential to measure the interaction between price and quantity to get a full picture of the potential market size. In our systematic literature review, we found only one study measuring price elasticity. Monier-Dilhan, *et al.* [38] compared French PDO and non-PDO cheese varieties, using home scan data from the period of 1998-2003. Based on their

results, the level of price elasticity of PDO cheeses is similar, or even higher than of non-PDO cheese. The authors also suggest little price substitutability between these products (PDO and non-PDO); however, they were all in possession of several trademarks, which might also influence reputation.

Several studies focused on the export-related performances of GI products. Leufkens [39] found that EU GI policy has some impact on trade: PGI has a trade-creating effect in general, while in case of PDO, only alcoholic products can expect better export performance. On the contrary, the empirical results suggested that PDO food products and PGI wines instead create trade-diverting effects. Other empirical results show that GIs play a more significant role in international trade when the importer has no GI protected product in the same product category [40]. For the European cheese industry, Balogh and Jámbor [41] found a high level of intra-EU exports, as 80% of the cheese exported by EU member states are sold in another EU member state. Regarding GI, they found that countries exporting cheeses with PDO label have a comparative advantage over other countries without GI cheeses.

Belletti, *et al.* [42] investigated the most exported Tuscan GI products and found that for small scale producers it could be considered as a marketing tool, however, in general, GI is often used as a tool for defending the existing market positions. Among the selected products, olive oils were the most export-oriented. PDO olive oils were targeting the intra-EU markets, while ones with PGI label were usually exported outside of Europe, mainly to the USA. The results also indicated that exporting firms with their own trademarks had less interest in PDO or PGI labels.

Török and Jámbor [43] focused on the European ham trade and found that GIs have a trade affect as exporting countries in possession of PDO/PGI labelled ham had a higher level of comparative advantage.

In Canada, for the cheese market Slade, *et al.* [44] found that GI-related restrictions might benefit not only the producers/exporters of the GI labelled products but also local/domestic cheeses without GI, as additional information on GIs might stimulate consumption for all cheeses.

Only limited research investigates (potential European) GI labelled *imports*. For Thai GI fruit and coffee products, Wongprawmas, *et al.* [45] highlighted that the European market is already an important export destination. Although the Thai government set up their GI system to certify high quality level, results suggest that these products can expect increasing market positions, but that a GI label alone would not guarantee success.

Another Asian study focused on the GI tropical fruit durian in Malaysia [46]. Authors found a significant increase in market share; however, due to the small size of producers and to the lack of an institutional organisation, currently, there is no opportunity of attracting export markets. Ghana is among the few African countries certified to export honey to the EU market; however, the export so far is not remarkable. Beekeepers of Ghana, therefore, would like to follow the example of the Oku White honey, which has received the African PGI label, resulting in increasing sales and prices, together with exports to the EU [47]. In Chile, neither the national GI labels nor the public certification trademark is widely used among the producers; therefore they cannot meet their original expectations to increase market share and to reach export markets [48]. Indian GI rice Udupi jasmine is entirely sold in the domestic market, and experts think that e-commerce might strengthen the position of this traditional food outside of the producing region [49].

Several studies focused on GI-related institutional issues. Based on the Spanish beef market Bardají, *et al.* [50] found that geographical origin and designation of origin are not among the top priorities for retailers. However, as their consumers care about these logos, they sell GI labelled products.

The well-known PDO Parma ham ("Prosciutto di Parma") was the subject of research of Dentoni, *et al.* [51]. In-depth interviews indicated remarkable heterogeneity among ham producers, with smaller producers in favour of strict PDO regulations (in terms of controls and standards). In contrast, large scale producers – often producing many non-GI products as well – would prefer more flexibility and would favour of the establishment of a PGI labelled ham. So far, this latter initiative has not happened.

Kizos and Vakoufaris [52] studied the olive oil supply chain of a Greek island. Among small producers, they recorded a high level of self-consumption (up to 29%). Although Greece has a longer GI tradition, the vast majority of the olive oil produced in Lesvos Island is sold in bulk, and only a very small part (less than 1%) marketed with GI labels.

Using value chain analysis, Tregear, *et al.* [53] inspected the case of a Hungarian onion with a PDO label. Onion is mainly sold as a raw material; therefore, onion producers need to capture higher margins and access to bigger markets. They found that market orientation is essential, especially for small producers. Also, diversification might be another way for higher value-added. In practice, it would mean cooperation with other sectors (tourism and hospitality, in particular) that might have a positive impact on the market situation of this product.

Considering the case of the few Baltic GI products, Bardone and Spalvēna [54] identified a growing interest in producing and consuming traditional foods in rural tourism in both Latvia and Estonia. Here these quality labels are part of the rural tourism and preserve cultural heritage.

Corsican clementines have always targeted a niche market, as they could never compete with Spanish products sold in huge quantities. However, mainly due to the PGI registration of this clementine only allowed to be sold with leaves (indicating the freshness of the product), shipments have started growing again after decades of struggling [55].

Many papers investigated the market size of GI wines. Some studies give exact numbers for specific wine GIs, as wine and vine statistics are usually quite comprehensive in the EU member states (e.g. in Germany, Mosel GI wines represents the 10% of the total German wine production [56]). In Brazil, De Mattos Fagundes, *et al.* [57] found that GI registration can stimulate the market performance of the producers. In the GI region of Vineyard Valley, the number of wineries has more than doubled following GI registration.

Agostino and Trivieri [58] investigated the export performance of quality wines produced in selected regions of France, Italy and Spain. In these countries, the share of the selected wines in the total wine export is high, and has significantly higher prices, compared to ordinary table wines. Also, these high-quality wines have higher export values usually sold in rich importer countries (mainly in Western-Europe and East-Asia). The authors identified differences as French wines benefit more from the GI label than do their Italian and Spanish competitors, both in terms of market share and price level.

The same authors [59] tried to estimate the market performance of Mediterranean wines (PDO, PGI and non-GI) in the BRICS countries (Brazil, Russia, India, China and South Africa), using a bilateral export model. Their results showed that PDO wines have a high market value due to the high prices received mainly by French wines, while PGI wines have only a moderate price premium.

In the case of Tuscan wines, participating in food quality schemes (PDO, PGI, organic) might increase the number of distribution channels, targeting different markets [60].

With a broader context of wines and other alcoholic products, several empirical findings also exist. Teuber [61] investigated a GI apple wine of Germany, both from the supply and the demand side's perspectives. According to the producers, protection against free-riders and imitations, together with the prevention against price erosion, were the main

reasons for the GI registration. From the consumers' side, the research showed low awareness of the PGI labels, and that consumers tend to pay more for such GI labelled apple wines as they would like to support the local economy. For fruit spirits distilled in Central-Europe Török and Jámbor [62] indicated weakening comparative advantages, especially after the EU accession of these countries after the millennium. Though several Mediterranean GI spirits (grappa, in particular) are prospering, many of the selected Central-European fruit spirits lost their European market despite their GI recognition.
Finally, Drivas and Iliopoulos [63] gave specific attention to the interaction between trademarks and GI labels and found a strong correlation between them. Based on data from 13 European countries, they found that both are mainly used for differentiation, particularly when accessing new markets.

3.2.2. The price premium of GI products

Results from studies investigating price premiums of GI foods differ significantly; therefore, it is essential to keep the location and the product type in mind when interpreting them. First, the attitudes of European consumers are presented briefly, then value premiums in different sectors' and value chains' are described. The end of this sub-section is dedicated to coffee and wine, where substantial price premiums are more frequently found for premium products.
Van Ittersum and colleagues, in three studies [64-66] tested consumers' preferences for PDO/PGI products. Based on their findings for 13 protected products from 6 European countries, they found that consumers interested in local foods are willing to pay a price premium for a GI product. They also found that low levels of recognition and awareness of these systems among European consumers limit the added value of GI labels [66]. In 2001, they tried to estimate the direct effect of PDO labels on regional food preferences for Italian olive oil. They found that region of origin and the PDO label have different influences but mainly for a specific group of consumers. People living in the product's region of origin are directly influenced by the region of origin but not by the PDO label itself. Using conjoint analysis, they found an association between higher price and higher quality, but they did not report exact measures of price premiums nor of the proportion of consumers willing to pay these. In his PhD dissertation, van Ittersum [65] summarised his results on GI price premiums saying that consumers' relative attitudes to regional

products significantly influenced the premium they were willing to pay relative to competing products. Similar findings were found later with a Pan-European study [67].

Santos and Ribeiro [68] investigated the GI market for olive oil and cheese in Portugal. They calculated a price premium of 22-30% for three olive oil products, while for cheese 12-23% for two of the four cheeses examined. For the other two cheeses there was no price premium.

Although country of origin labelling (COOL) generally lies beyond the scope of GI policy, we thought it useful to include one US study that indirectly addresses some GI issues. We did this because of the lack of data on US consumer attitudes to products with specific geographical attributes. Carter, *et al.* [69] report on 3 US case studies: Vidalia onions, Washington apples and Florida orange juice. They tried to test the success of COOL as a marketing tool and found no evidence that it leads to long-term price premiums. They found that in some cases, product differentiation was not an option because of the characteristics of the product. To benefit from regional attributes, strong control over supply and market entry is required, and this is almost impossible to achieve when the production area is large. Last but not least, they found that advertising and promotion contribute to sales success, but is often not affordable and sometimes legally prohibited.

Hassan and Monier-Dilhan [70] tried to study competition between different types of quality labels. Using a database about the daily food purchases of 8,000 French consumers in 2000, they studied six products with labels such as organic, PDO, PGI, and Label Rouge and several trademarked products. They found a price premium for all the products sold with only a quality label (PDO, PGI, organic or Label Rouge). But if the quality label was accompanied by a trademark it had less value in all the cases except the dry-cured ham.

Belletti, *et al.* [71] calculated the effects of certification costs on the value chains of a PGI olive oil, a PGI beef and a PDO cheese, all from Italy. They found that both the benefits of the GI label and the associated indirect costs differed between products. Besides the direct costs of certification and the more expensive inputs, they identified several indirect costs (e.g. adaption of firm structure, organisation, production process, cost of bureaucracy) and found that these depend highly on how strict the registered code of practice is. This had the consequence that the profitability of these products relies on the form of the regulations.

Bardají, *et al.* [72] compared two varieties of beef (PGI and non-PGI) in the Navarra region of Spain. Based on monthly wholesale beef prices between 1996 and 2006, they found that PGI beef received a price premium of 7% on average, and had more excellent price stability. They also found that the GI product was better able to withstand crises (e.g. BSE) as consumers' trust was less affected.

In their guide for geographical indications, Giovannucci, Josling, Kerr, O'Connor and Yeung [1] included several case studies from different countries. They identified price premiums up to 115-145%, but not all products were able to achieve any premium. Some generalisations from these studies are that price premiums can only be achieved over the longer term and that not all specialty products will be able to achieve a price premium based on GI labelling.

The distribution of value-added among supply chain actors was the focus of a study by Roselli, *et al.* [73]. They investigated an Italian PDO olive oil (Terra di Bari) which represented 15% of the national PDO olive oil market in 2006/2007. By 2009 the Italian olive oil market faced a severe crisis of falling prices. Terra di Bari oil had a price premium ranging from 10% to 15% compared to non-GI olive oils, but among all Italian PDO olive oils, it was among the cheaper ones (with prices 39-55% lower than average). Regarding the distribution of this price premium, they found that within the value chain, the primary producers (the olive farmers) benefitted least from the PDO certification. The extra profit gained from the GI went to the bottling companies and distributors. Although olives suitable for PDO production are more marketable, prices are only slightly higher than for other olives. For Terra di Bari oil, the price premium is collected at the higher level of the value chain (olive mills, packers and brokers). The farmers did not seem to gain any financial benefit from the GI.

Penker and Klemen [74] analysed the costs of EU GI registration and maintenance, using the examples of an Austrian PGI ham and PGI horseradish. They included both direct costs and indirect costs and tried to link them to indirect benefits such as social capital building, intensified cooperation with other rural sectors, higher awareness of and compliance with quality standards. They found that PGI ham, which had a larger output, could afford to subcontract the GI registration process. As a result, the registration costs could then be financed directly by EU funds. This gives larger groups of producers a clear advantage over smaller groups both in terms of costs and time required.

Vakoufaris [75] tried to identify the socio-economic and environmental impact of a PDO cheese produced in Lesvos island, Greece. Comparing a non-PDO cheese that is a close

substitute and is made in the same region by the same producers, they found that the PDO milk producers and cheesemakers do not receive any premium price. Supermarkets, however, gained a slightly higher price. They also found that the price of PDO certified milk was often lower than average generic milk prices in Greece.

Iraizoz, *et al.* [76] tried to estimate the overall profitability and efficiency of the PGI beef sector in Spain. Using the EU's Farm Accountancy Data Network (FADN) dataset, the results show that PGI production is more profitable in the Spanish beef sector. Regarding efficiency, non-PGI farms have better technical efficiency scores, while the PGI-farms are better in scale efficiency.

Some studies have tried to calculate GI price premiums for rice in India and Thailand. For India, Jena and Grote [77] found that the production of Basmati rice was more profitable than non-Basmati varieties but less than the production of sugarcane. For Thailand, Ngokkuen and Grote [78] found that GI producers of Jasmine rice had higher bargaining power than non GI producers. This potential impact on prices was found to be due to cooperation between GI producers not to a direct effect of GI registration. In a comparative study of India and Thailand, Jena, *et al.* [79] found a positive effect of GI adoption on the welfare of rice producers, especially in terms of reducing rural poverty. There was, however, no evidence of any GI impact on consumer prices. This lack of an evident price premium calls into question the benefits of GI production in these cases.

Though food discounters in Hungary target price-sensitive consumers, the limited number of GI foods available in their product portfolio is sold with a remarkable price premium, 43% on an average, compared to their closest substitutes [37].

Investigating online sales of fresh produce on the South-Korean market, Lee, *et al.* [80] declared that indicating GI label as an extrinsic product characteristic might positively influence the sales and the price of the products.

Albayram, *et al.* [81] studied what determines consumers' attitudes towards local and/or GI products in respect of a local and a non-local GI olive oil, both from Turkey. Their results demonstrate that consumers' decisions are highly affected both by the quality and by origin. Where both products are labelled as GI, attributes like brand, package and origin become important. They found that respondents preferred local to non-local GI products because they considered local GI products better in terms of both reputation and quality. It was apparent, however, that the higher price paid for the local GI oil was because it was local not because it was a GI.

For French mountain cheeses (both PDO and PGI varieties) Lamarque and Lambin [6] found a price premium for the GI producers of the milk used to produce the mountain cheese. The dairy farmers producing for the PDO cheese gained 41% higher prices, while the PGI milk producers received only 21%, compared to the non-GI average French farm-gate milk prices.

While there are few systematic studies comparing price premiums for quality products between different food and drink categories, there are a priori reasons for thinking that consumers are willing to pay a higher premium for wines, and perhaps for coffee, than they are for other food products.

Coffee is an important product for many small countries, and several have established geographical indications for their coffee, to build a reputation and enter the growing global specialty coffee market. In Honduras Teuber [82] used internet auction data with a hedonic pricing model and regional dummies. During the first two years, there was no evident impact of the GI label on the price of Marcala coffee. Latin, South-American and Ethiopian coffees were studied by Teuber [83] using a hedonic price model. Data showed that single-origin coffees gain price premiums of between 20 and 58%. The results suggested that while the country and region of production is essential, these attributes are less important than the sensory quality attributes for prices achieved at online coffee auctions.

Wines have the biggest GI market world-wide. There is also reason to suppose that consumers might be willing to pay a higher premium for quality wines than for other agricultural products. It is therefore worth looking separately at the price premium evidence for wines.

The US wine market was often investigated in terms of origin. Bombrun and Sumner [84] analysed the price determinants of wines in California between 1989 and 2000. Of the 125 different appellations, they found that 64 had significant price influencing power. For instance, the well-known Napa Valley wines had an average +61% price premium because of the appellation, compared to standard "California" wines. Costanigro, *et al.* [85] also tried to estimate the link between the name (origin), reputation and price premiums for California wines. Based on a dataset of 9,261 observations from *Wine Spectator* between 1992 and 2003 they found that for more expensive wines, the specific names and labels are more valuable than for the cheaper ones. All wines also benefit from collective names. Schamel [86] investigated relative prices in the US market for wines produced both in and outside the USA to determine the value of the producer

brands/trademarks and geographical indications. The results identified origin as important. On average top quality wines from New World producers outside the USA never exceeded the prices of average quality wines from the Napa Valley. On the other hand, the top brands from France or Italy had higher prices than the top US brands. This was interpreted as meaning that Old World wines still possessed a higher regional reputation in the US market.

In their study of the Portuguese GI market, Santos and Ribeiro [68] include not only wines but also olive oil and cheese. Using a sample collected from three different types of retailers, and hedonic price function estimation, they found a statistically significant price premium of between 26% and 46% for three of the six wines. In respect of the other three wines, they found price premiums of 1-14%, but these results were not statistically significant.

In both of their papers, Agostino and Trivieri [58,59] analysed the price and volume effects of GI labelling for wines from France, Italy and Spain. They found that in rich importing countries, all three origins have a value premium, caused by both price and volume effects. The price premium was highest for French wines and somewhat lower for Italy and Spain. Similar outcomes are reported for the BRICS markets, indicating that the GI price premium exists not only in rich but also in emerging markets. In the latter study, the French PDO premiums remain the largest, and significantly higher than the Italian and Spanish premiums.

Finally, using historical data for selected French wines, Haeck, *et al.* [87] found that GIs have a determining role on prices of some Champagne wines; however, this was not the case for wines from Bordeaux or Champagne.

3.2.3. The impact of GI products on rural development

One of the initial goals of EU GI policy is to promote regional prosperity by improving farmers' income and retaining rural population in less-favored or more remote areas [2]. Many studies state that, for lower-income countries, GI policy has been promoted as an important avenue for raising producer incomes and to promote rural socio-economic development [e.g., 32,47,77,88]. In this sub-section, we review the empirical results from studies that considered the impact of GI products on regional prosperity.

Most of the studies we found were case studies with little hard data. They focused on issues such as institutional arrangements and how differences in these affected the likelihood of any increased income remaining in the original product area.

Through a case study of three Tuscan products (PGI olive oil, PGI beef and PDO sheep cheese) Belletti, Burgassi, Marescotti and Scaramuzzi [71] tried to identify the possible effects of GI products on rural development. They highlighted that the most crucial goal is to attach any higher GI income to the GI producing area, rather than further down the value chain. A critical issue is, therefore, what is the direct impact on the income level of the GI farmers and the indirect effect on local employment. Additional regional benefits can be gained by attracting consumers to the producing area so that there are positive spill-over effects from other actors in the local system. In this way, the production of GI foods can interact positively with tourism and handicraft production. They also point to positive non-economic effects from the presence of a GI supply chain, such as maintaining traditional production methods and encouraging social interaction. Based on the example of other well-known Italian and Spanish GI product Arfini, Cozzi, Mancini, Ferrer-Perez and Gil [33] highlighted the level of externalities associated with public goods. In case of the Parmigiano Reggiano PDO cheese and Ternasco de Aragón PGI lamb meat, these public goods can be identified not only at the value chain level but also at the territorial level. Cei, *et al.* [89] tried to assess the effects of GIs in Italy on the NUTS3 level. They found that a higher number of GI schemes causes a higher level of value-added, thus possibly it fosters rural development in these regions.

Tregear, *et al.* [90] took a multi-country approach, looking at two Italian (fresh fruit and processed meat) and one British (cheese) product. They examined the role that regional food qualification schemes play in rural development. They found that when local institutions try to involve too many actors in developing the GI regulations, there is a risk of losing the distinctive local characteristic. This is because accommodating many actors with different expectations results in too permissive a code of practice. Where this happens, there is a looser connection between the GI product and the region of origin. Overall, they concluded that policies such as GIs need to be considered as part of an extended territorial strategy. The success of the GI element depends on a mix of actors and motivations.

Williams and Penker [91] conducted 25 in-depth interviews with large retailers and stakeholders directly involved in producing and or marketing Jersey Royal and Welsh

Lamb. The study identified only indirect impacts on rural development, finding outcomes such as increased transparency and fairness due to GI regulations.

Tequila is a Mexican GI first registered in 1974 and is not only the oldest Mexican GI but also perhaps the most well-known non-European GI. Issues related to the product description were investigated by Bowen and Zapata [92], using several rounds of semi-structured interviews with agave farmers, tequila producers and distributors, government officials, and leaders of farmer associations. The authors found that the sole production requirement was geographic boundaries. They found that because the boundaries covered a very large area, including territories without any tradition and without the required biophysical conditions for cultivating agave, over time the link between the production locality and quality has been eroded. The GI was not recognised in the USA and Canada until 1994, and not until 1997 in the EU. Since then demand for tequila has grown, and traditional agave cultivation and artisanal tequila production has been replaced by modern, industrialised techniques operated by large (international) companies which have entered the market. The expansion of the tequila market thus resulted in a substantial shift in control and ownership, accompanied by concentration, industrialisation, and standardisation. Local actors have lost their influence on tequila production, resulting in economic insecurity among farm households dependent on agave production.

In their multi-criteria analysis of 11 different Italian PDO cheeses, Galli, Carbone, Caswell and Sorrentino [35] also looked at rural development issues. In assessing rural development, they considered factors like the share of production sold on local and regional markets and the presence of local events for the promotion of PDO products. They found that products with good market performance such as Pecorino Romano and Gorgonzola had high exports and increasing market share. But this was associated with a low contribution to rural development (and also low bargaining power and limited product differentiation). In contrast, small PDO producers of Robiola di Roccaverano, Murazzano and Raschera, with strong production traditions it had much better outcomes in terms of their contribution to rural development.

By analysing the value chain of GI olive oil in Lesvos island, Kizos and Vakoufaris [52] highlighted that a GI label could help smaller producers achieve higher incomes as they have relatively more freedom in choosing between supply chains. On the other hand, large bottlers have to cooperate and satisfy international retailers, so for them, the GI label does not necessarily lead to economic success. As a consequence, there is less association between large bottlers and regional prosperity.

Similar to the case of tequila, Bowen and De Master [93] found that how a GI system was introduced could be harmful to heritage-based food systems. With their comparative fieldwork in France and Poland, they investigated several cheeses (Corsican cheese and Comté from France, Oscypek cheese from Poland) and the multifunctional quality initiatives in the Polish Narew River region. Their most significant finding was that by pursuing extra-local markets, the production processes changed and started losing their former characteristics of regional distinctiveness. They found differences between the three cheese cases. For Comté, heritage and tradition were integrated into a code of practice that benefited small scale local producers. For the other two cheeses, they found that extra-local actors played a larger role. This led to the introduction of so-called "invented traditions" designed to maximise commercial profit - but these were not part of the local production system. Overall, they suggest that GI initiatives can be a good tool for rural development provided special attention is given to the social-organisational context when setting up the code of practices.

Another comparative study tried to assess the role of institutional policies supporting quality food labels using the example of a Mexican sausage (without GI) and the Spanish Iberian Ham (in possession of several PDO labels) [94]. Authors found that that differences in geopolitical context resulted in disadvantages for the Mexican sausage as they could not achieve the GI recognition. In contrast, the Iberian Ham, supported by the EU GI policy, has reached substantial development, as the PDO ham producers became very successful in terms of entrepreneurial vision, capacity building in local actors, heritage preservation and self-employment

A positive correlation between GIs and regional prosperity was identified by Ngokkuen and Grote [78]. They analysed the impact of GI adoption on household welfare and poverty reduction among Jasmine rice producers in North-East Thailand. Based on a cross-sectional survey with 541 Jasmine rice producer families (180 GI certified farms and 361 non-GI farms), they found a significant and positive effect of GI certification adoption on household welfare and poverty reduction. They found GI producers to have significantly higher consumption expenditures (both annual and monthly) and a lower incidence of poverty (using national and regional poverty lines). GI farmers also owned considerably more land, productive assets and vehicles. The education level of the household head was higher, and GI farmers generally had more social capital (were a member of cooperatives, participated in village meetings, accessed information on GIs and followed good agricultural practices). However, the authors highlighted a major

limitation of their research – that as the adoption of GI certification was endogenous. The different outcomes for GI and non-GI farmers could not be interpreted as *caused* by the adoptions of GI processes. Despite this, they argued that the positive household prosperity outcome was a pure effect of the GI certification adoption. Similar results were found for India: Jena and Grote [77] found that the adoption of Basmati rice had increased household welfare.

In the case of the Malaysian fruit durian, the GI helped to build up its own terroir and to preserve agro-diversity together with local identity. These were also helpful in promoting a touristic brand for durian orchard owners [46]. Similar results were found in Latvia and Estonia, where the local GI foods are part of rural tourism. Therefore, the EU quality labels help in the promotion and the preservation of these cultural heritages [54]. In Croatia, the existence of olive oils with protected geographical indications enables additional recognition of the olive oil producing region; thus, GIs can heavily contribute to the olive tourism developments [95].

For Indonesian GI coffee Neilson, *et al.* [96] found only a little evidence that current GI schemes of Indonesia have tangible economic benefits for the producers and the producing region. This is mainly due to the lack of supportive local institutional settings on a strategic level. However, some intangible benefits can be identified, mainly the promotion of the sense of regional pride and cultural identity, but this hardly results in achieving rural development outcomes.

A case study of the Nicaraguan GI cheese Queso Chontaleno highlights problems that are common in many developing countries [88]. The introduction of the Queso Chontaleno GI also meant more competitive pressure on the local production system. In South America, the introduction of such GIs has often been found to benefit mostly the local elite and not farmers or cheese producers. In the Queso Chontaleno case, international organisations assisted with the GI registration, but traditional producers were not really involved, so the code of practice did not reflect their interests. For example, there were no provisions for institutionalising the link between product and *terroir*. Mancini suggests that for a GI to contribute positively to regional prosperity, three factors are essential. First, it is crucial to set up proper quality standards to define the method of production. Second, it should be clearly stated how the GI valorises the producing area (the *terroir*). Third, there should be a strong collective organisation to foster cohesion among GI producers.

The case of the Brazilian cheese Serro with an indication of provenance also showed that the recognition of a GI might stimulate territorial development goals; however, it has many limitations in several aspects and results heavily depend on other factors. GI is most of all a tool for territorial development that can encourage cooperation between actors in rural areas [32].

In Japan, among GI farms producing Tonburi, Tashiro, *et al.* [97] differentiated the effects based on their time horizon. In the short term, GI registration might contribute to the spread of cultural capital among farmers; however, over a long term, GI and the associated traditional ecological knowledge negatively affects production maintenance and landscape management.

Lamarque and Lambin [6] investigated what GIs can do for the prosperity of marginal mountain areas in France. They compared a PDO, a PGI and a non-GI cheese using farm surveys. Their results showed that high standards for the GI cheeses are associated with more extensive agricultural practices, especially in the case of PDO farmers, though the differences between PDO and PGI farmers are minor. In this way, the GI schemes can indirectly contribute to retaining population in these regions, as extensive agricultural practices are more labour-intensive.

Based on the case of Hungarian PDO onions Tregear, Török and Gorton [53] found that the impact of such a nascent GI on the prosperity of the producing area is very limited. To meet regional development expectations, the building of effective networks with regional actors external to the value chain (outside of onion production and distribution) is crucial. Although the onion is deeply embedded in the local culture (e.g. onion themed attractions like onion themed spa and cultural centre) and this PDO variety is well known in Hungary, the PDO onion struggles to become the basis for a "basket of goods" rural development strategy. The reputation of this product is appreciated only locally and in Hungary.

4. Discussion

Our research highlights the fact that there is only very limited relevant empirical economic data available on the impact of GI policy. In the EU this lack is particularly evident. A major reason is that the EC has not yet set up any comprehensive dataset to evaluate and improve GI policy - so far, there is no EU-wide data collection about the production and the markets of PDO and PGI products. The available official database

eAmbrosia (integrating the former DOOR, E-BACCHUS and E-SPIRIT DRINKS databases) is a simple registration database with no economic data. In the EU, the FADN system collects accountancy microdata on agricultural holdings reporting harmonised information at three levels: region, economic size and type of farming. However, the design of the data collection does not effectively measure the impacts of GI production. The centralised EU FADN dataset is a summary of the results of national surveys that are not entirely the same, and only a few (e.g. the Italian and Hungarian) collect data on GIs, mainly about whether the selected farm is producing any GI product. In some of the Mediterranean EU countries, with the most significant GI production, specific initiatives exist to gather national market data (e.g. the Italian Qualivita). However, on the whole, we can conclude that there is a lack of statistics on the EU GI sector, even though other European food quality schemes (organic production, in particular) are supported with centralised data collection and through EUROSTAT (the EC's Directorate-General providing statistical information) easily accessible datasets are available.

The most fundamental issue is how large the market for GI foods might actually be. This, of course, depends critically on the consumers' willingness to pay for these (higher quality) goods. Due to methodological problems and lack of systematic data, we did not include WTP studies in this particular review. But the available data do show that the most important GI market is the internal market of the EU. Nonetheless, despite the well-known European commitment to food quality, GI labelled products form only a minor part of total EU agri-food production (7% in 2017). There are a few GI products with both significant market size (domestic and export) and remarkable market share, but these are a small set of all registered GI products and are concentrated in only a few countries, mainly in the Mediterranean EU countries.

What the limited available studies so show is that there is considerable heterogeneity between different GI products and between the outcomes for similar GI products in different regions. Consequently, it is difficult to determine if there are specific types of product, or specific places, where GI labelling is more likely to achieve a price premium. This hinders the effective development of GI policy on the ground. Based on the available data it is not possible to recommend where an investment in GI labelling will generate a good return. Certainly, many wines achieve premiums related to quality. But there is as yet no clear evidence as to whether the higher premiums observed for wines translate across to foods. There are suggestions that regional coffees can obtain good premiums, but there are many cases where efforts to achieve such premiums by using GI labelling

for a coffee has not (or at least not yet) been successful. There are also suggestions that a small number of meats and cheeses with global distribution chains, may also achieve valuable premiums.

If one cannot know when a GI label will achieve a higher price for a product, how can one know the impact of GI labelling policy on farmer prosperity? The studies available do show that farmers can achieve higher prices – but they also show that this is not a certainty. They show that there are higher costs associated with producing GI products – intrinsic costs in producing a higher quality product and indirect costs associated with complying with the GI regulation. But the empirical studies that address the issue of the impact of GIs on net producer income are insufficient to say when, where and how this might occur. One issue they do point to, however, is that it cannot be assumed that any higher net income will flow to primary producers rather than to actors higher up the value chain.

The studies we have found point to a possible pattern where PDOs usually gain higher price premiums than PGIs and products with higher value-added also generally gain higher premiums. There were, however, exceptions to this pattern. It was also reported that when different quality labels are attached to a given product (especially a GI label and a trademark), the value of the GI label can be low as consumers prefer and/or are more aware of other quality cues.

Given the lack of clear data on market size, price premium and impact on net producer income, it is not surprising that the material on the role of GIs in regional development is thin when it comes to hard data. Obviously, some criteria need to be met if GIs are to contribute positively to regional prosperity: there must be higher net producer income, and this must attach to the farmers or processors located nearby.

Also, there are other mechanisms that could enhance any positive regional development impact of GIs. One of the most important indirect impacts can be on regional employment. If the labour needed for a GI product is significant – as it can be for traditional and labour-intensive production methods – then a GI can make a positive contribution to regional prosperity. However, care needs to be taken that this does not simply perpetuate low wages associated with traditional agricultural methods. Employment generation needs to be accompanied by reasonable incomes.

Positive spill-over effects from other actors in the local system can also be important, for example, where there are synergies between GI food production, tourism and even handicraft production. In many regions, a particular regional brand is used across a range

of product types and indeed across industry sectors. How regional branding inter-relates with GI labelling needs more study.

On the other hand, as several papers found, attempting to increase local income by accessing extra-local markets can result in negative effects on regional prosperity. One conclusion is that great care needs to be taken in designing and implementing a GI strategy for a product. The GI code of practice can play an important role via identifying the right geographical boundaries and practices to ensure a vital connection between the product and the production area. To turn the yields from GIs into regional prosperity requires consideration of all these factors.

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6.2. Relationship between Hungarian consumers and EU geographic indication labels[4]

Based on descriptive statistical analyses, two-sample proportions tests, and binomial logistic regression analysis, the paper examines consumers' awareness, knowledge, trust, and the frequency of their purchases in Hungary in terms of the European Union's geographical indication labels. According to the results, the awareness of such labels is showing an increasing tendency in Hungary but it is still low compared to Western and Southern European countries. Only a small proportion of Hungarian consumers know what these labels really mean, and their knowledge does not directly affect their willingness to purchase. Trust in the system of geographical indication labels, however, has a significant impact on the demand for such labelled products.

Key words: Geographical indication, Food label, Awareness.

When purchasing food, consumers only have information about some of the characteristic of the products (such as color, texture) before buying it. Some particularly important food characteristics (mainly taste) are only experience after purchase, when the product is consumed, while other significant parameters (such as health effects, quality and origin of raw materials used) cannot be ascertained even after food consumption. – they must trust the information available about the products. Based on these, most of food products can be considered experiential goods, or even product of trust (*Anania–Nisticò* [2004]). In order to mitigate the harmful effects on consumers of information asymmetry, which is well-known in economics and is particularly common in food sector, it is necessary to introduce various regulations which assure consumers of the quality of the products they want to buy. All this is most often appears to consumers in the form of a food label, which certifies that the product has been produced in accordance with certain rules and at the same time guarantees a higher level of quality. (*Zago–Pick* [2004]).
Geographical indications are an important part of the European Union's food quality policy (*Grunert–Aachmann* [2016]), which has been regulated at Community level since

[4] Áron Török; Zalán Márk Maró; Lili Jantyik 2019: A magyar fogyasztók és az európai uniós földrajzi árujelzős élelmiszercímkék viszonya, STATISZTIKAI SZEMLE 97 : 6 pp. 546-567. , 22 p. (2019)

1992. Based on the regulations, which was modified several times, in force since 2012 in the current form, the following 3 product types can be distinguished:
PDO (Protected Designation of Origin): it is used to designate agricultural products and foodstuffs whose main characteristics and quality are mainly since the product originates in a specific geographical environment and all stages of its production take place in the defined geographical area.
PGI (Protected Geographical Indication): is used to designate agricultural products and foodstuffs whose characteristics, reputation or other characteristics are essentially attributable to their geographical origin and at least one stage of their production is linked to the defined geographical area.
TSG (Traditional speciality guaranteed): agricultural products or foodstuffs made from traditional ingredients or prepared in the traditional way.[1]

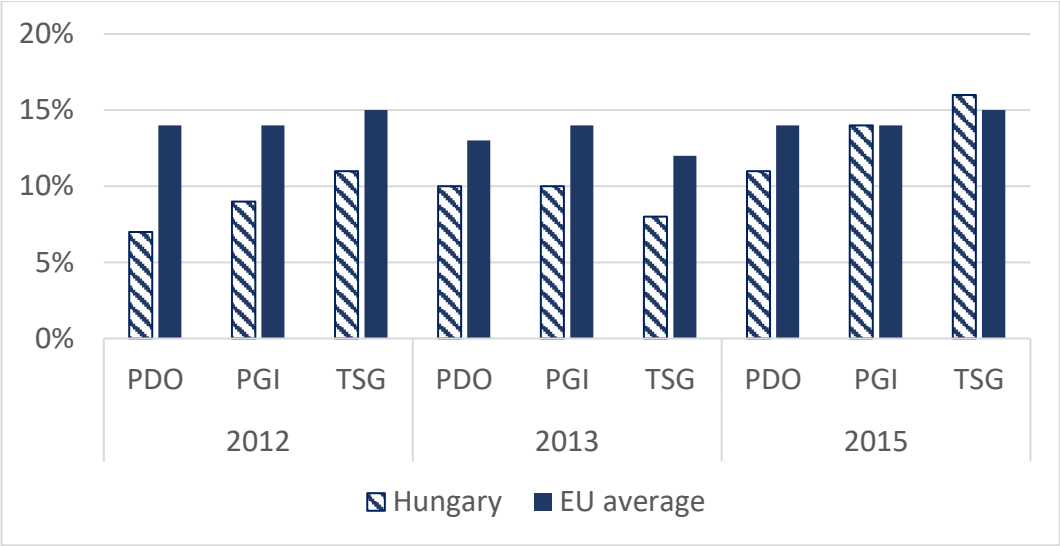
The EU logos (different for the 3 product types) on the packaging makes it possible to distinguish the products with the listed marks, in addition, the name of the given product registered in the system can only be used if the product complies with all regulations (for example, Gyula sausage PGI). Throughout the system's more than a quarter-century history, the number of GI products has grown steadily, at the end of 2018, there were 1,438 products in the European Commission's DOOR database, 635 (PDO), 744 (PGI) and 59 TSGs. The number of products registered from Hungary is 6, 8 and 1, respectively, but the Hungarian agricultural policy intends to increase the number of these products, another 15 Hungarian agricultural products and foodstuffs are currently awaiting approval. (See Appendix F1. table.) Even though these products are also important to the EU's trade policy (see among others *Engelhardt* [2015]), furthermore in Hungary there has been a separate Program for the Protection of Origin (currently known as the Geographical Indications Program) at the initiative of the Ministry of Agriculture; the relationship of European consumers, and especially Hungarian consumers within Central and Eastern Europe, with this system is still an unexplored area. The aim of this study is to show how well Hungarian consumers know these labels, how much they trust them, how well they are aware of the meaning of the labels, and how often they buy such products. In order to achieve this goal, the following chapters present the characteristics of European consumers based on previous research and surveys, the criteria for the consumer survey and analysis carried out, followed by the results of the survey. We conclude our study by drawing the most important conclusions.

1. Literature review

Several international studies deal with the European Union's food quality policy, including geographical indications. Most studies (including surveys for the European Commission) analyze how well-known these labels are among consumers. The results show a significant variance, the awareness highly dependent on which food (for a given product or in general) and for which country is being tested.

The highest awareness rates were obtained from a Greek general (Tsakiridou et al. [2011]) and an Italian cheese and ham survey (Arfini [1999]). While the former had 70 percent and the latter had 80 percent of respondents who knew the PDO label. In most surveys, the share of those familiar with labels ranged from 20 to 30 percent (*Aprile–Gallina* [2008], *Fotopoulos–Krystallis* [2001], [2003], *Philippidis–Sanjuan* [2003In a Spanish study of 400 participants, about a special bean (Urbano et al. [2008]), the PGI label achieved 37% awareness. In the survey of *Vecchio–Annunziata* [2011]) 34% of participants were able to name at least one PDO product. Nearly 50% of label awareness was found: *Platania–Privitera* [2006] (43%), *Fontes et al.* [2012] (44%), and *Botonaki–Tsakiridou* [2004] (49%). In contrast, few consumers recognized the labels in the Czech Republic, where 3% of respondents could only identify PDO products, 4% of PGI products and 6% of TSG products. (*Velčovská* [2012]). *Bryła* [2017] examined the awareness of 10 different labels among Polish consumers. The results showed that the awareness of food quality labels is generally low, this is especially true for PDO (16.3%) and PGI (12.5%) labels. Based on these, it can be concluded that in southern European countries (mainly France, Italy, Greece and Portugal) most consumers are familiar with geographical indications, while in the northern and eastern parts of Europe the awareness is much lower. At the same time, the EU average is also rather low (14–15%), and typically the previous Hungarian results lagged even this, although they showed an improving trend. (See Figure 1.) The most important results of previous consumer surveys examining label knowledge (also) are presented in Appendix F2.

Figure 1. Recognition of individual geographical indications in Hungary and the EU



Comment. The years indicate the date of data collection, which may differ from the year of publication of the results. Here and in the following figures and tables: PDO - Protected Designation of Origin; PGI - Protected Geographical Indication; TSG - Traditional specialty guaranteed.

Source: Own editing based on data from the European Commission [2012, 2014, 2016].

In addition to the awareness of labels, it is also important to know how (exactly) consumers know the meaning of each logo and what message the label carries. Based on the literature (e.g. Grunert – Aachmann [2016]), we can distinguish between subjective and objective knowledge. In the case of subjective knowledge, the respondents believe that they know the meaning of the labels, in this case, we can say on the basis of a self-declaration about each consumer whether they know it. *Fotopoulos–Krystallis–Anastasios* [2011] found that only one in five Greek customers say that they are aware of the meaning of PDO.

Based on a similar survey conducted in three major Italian cities, 37.4% of Italian respondents said they had a good or excellent knowledge of the PDO label (*Vecchio–Annunziata* [2011]). In a survey around Athens subjective knowledge of both PDO and PGI labels was examined and there was a large difference between them for the first label was known about 70% of the respondents and the other about 40% (*Likoudis et al.* [2016]).

In the case of objective knowledge, precise definitions can be used to measure whether respondents really know the meaning of the geographical indication system created by the EU. *Aprile–Gallina* [2008] n Milan and Naples, respondents responsible for

purchasing were tested to see how many of them can choose the correct 3 from the 12 statements, which indicates the exact definition of PDO and PGI. The results showed very little knowledge, as for both labels, the rate of those who were able to accurately determine the meaning of the two labels was 3%. A similar result was obtained by Fotopoulos – Krystallis [2001] for the case of a Greek PDO olive oil: only 3.4 percent of respondents were able to accurately define the meaning, while in another survey of the same authors about a PDO apple 5.8% of the respondents gave a correct answer (*Fotopoulos–Krystallis* [2003]). In a previous study involving 5 European countries (van Ittersum et al. [1999]), the authors found that an average of 17.2% of French, Greek, Italian, Dutch, and British respondents were able to accurately determine PDO, while 13.6% was the result for the PGI label (the only correct one had to be selected from 4 definitions).

Based on the research so far, it can be clearly determine that, European consumers are not really familiar with these labels, nor do they understand the exact meaning of PDO and PGI labels given by the European Commission, although the results depend on how objectively and "rigorously" the measurement was made.

In addition to awareness, several previous studies have examined the issue of trust. In the case of food, trust is essential, since it is a product of trust. In the case of geographical indications designed to reduce information asymmetries, consumer confidence is a key determinant of whether they buy such products. In addition, the use of reliable and credible certifications allows producers to differentiate products, increase quality and the presence of certain product features that are difficult to identify, even though experience (*Gracia–de-Magistris* [2016]). *Hocquette et al.* [2012] In the French food market, examination of the various quality certifications showed that trust in the PDO label was the highest, as 85.8% of the French population found such products to be reliable. In Italy, 41.5% of respondents found the PDO and PGI logos to be completely trustworthy (Giving a value of 4 or 5 on the 5-point Likert scale). The research also highlighted the important connection, consumers who were familiar with labels found them completely reliable. (*Vecchio–Annunziata* [2011]). Studies in the Czech Republic have also shown that, knowledge of PDO and PGI labels is low, and this also greatly influences the level of trust in labels (*Velčovská* [2012]). Czech respondents considered national labels to be the most reliable and credible in 2012 (Klasa, Czech organic and Regional label); in the case of PDOs and PGIs, on the other hand, 96 per cent of respondents did not respond to the question about the reliability of the labels, in connection with their low awareness. The

remaining 4 percent of respondents did not find PDO and PGI labels reliable either, since the average for both logos on the 4-point scale (where 1 was reliable and 4 was unreliable) was 2.67 (*Velčovská* [2012]). *Velčovská–Del Chiappa* [2015], *Velčovská–Sadílek* [2014] concluded that from the Czech market, the confidence in EU and global labels was weaker than in the Czech national label. It should be noted, however, that in this case also, there was a high rate of respondents who were unable to answer this question because they were either unfamiliar with the PDO and PGI labels or unaware of the meaning of the logos. On a 5-point (1 unreliable, 5 reliable) Likert scale, the PGI had an average of 3.22 (78 percent of respondents did not respond) and the PDO had an average of 3.1 (76.8 percent of respondents did not respond) in terms of trust. It is important to mention that only 7.2 percent of respondents chose the 4 or 5 confidence level for the PDO logo and 8 percent for the PGI logo. This is particularly problematic because that consumers' purchasing decisions depend on the reliability and credibility of each food quality label.

Gender, age, place of residence, and highest level of education have a significant impact on the level of trust in GI products or the purchase of foods bearing such a label. In five European countries (France, Greece, Italy, the Netherlands, the United Kingdom), an average of 1,000 consumers were interviewed using a questionnaire, and the results showed that older people, those with higher incomes and customers living close to the place of production they prefer to buy and consume products with the PDO and PGI labels (*van Ittersum et al.* [1999]). *Fotopoulos–Krystallis* [2003] established for Greek Zagora apples bearing the PDO label, 90% of the customers of the product are women, their average age is 42 years and they belong to the higher social and income groups. Similarly, several studies have concluded that PDO and PGI-labeled products are preferred by older, higher educated, higher-income and typically small-town and rural consumers. (for e.g. *Botonaki–Tsakiridou* [2004], *Cilla et al.* [2006]).

In Hungary, to our knowledge, just a few research has been done on this topic of geographical indications so far. *Szakály et al. [2014]* based on a survey of 1,000 Hungarian consumers found that for consumers, place of origin is the second most important characteristic of food, as well as those local/regional origins increase consumer’s trust. In a survey conducted in 2010, none of the respondents spontaneously identified any EU geographical indication as a food quality label, and in the assisted survey, the 4.5% recognition of the PGI label was the lowest of the 12 certifications examined (PDO and TSG labels were not examined in that study).

Overal, although these are decades-long systems, awareness of EU GIs is low across Europe, and shows significant differences between countries, with higher awareness rates in the EU's Mediterranean Member States. So far, no country-specific, comprehensive survey has been conducted in Hungary on this topic, but based on the results of the Eurobarometer, it can be stated that the rate of Hungarian consumers are typically below the European average. An examination of trust is indispensable for learning about the subject, as the purpose of the EU's GI scheme is only to be achieved when consumers trust these markings and also buy products bearing such labels.

2. Material and method

Based on the literature review, it can be stated that consumer surveys can provide a suitable starting point for a deeper study of the issue, which also allows the econometric analysis of the most frequently examined criteria in the Hungarian consumer sample. The data used in the study is therefore derived from an online consumer survey conducted in the second half of 2017, which was conducted within the framework of the Strength2Food H2020 international research (in 6 other European countries besides Hungary), with the involvement of the international market research company LighSpeed Research. The surveyed consumers were divided into two groups according to the questions asked. While the questions on the PGI label were addressed to both groups, the questions on the PDO label were addressed only to Group 1 and the questions on the TSG label only to Group 2.

Table 1 summarizes the key characteristics of the respondents. After the data cleaning, we processed 875 responses from the data of the Hungarian survey conducted with the involvement of more than 1,000 people, as we disregarded the responses of those with non-permanent residence in Hungary and those not responsible for food purchasing decisions. Regarding the representativeness, it can be stated that in the case of gender and age the sample is almost representative, however, while in the case of residence the respondents from the village are under-represented, in the case of the highest education the higher educated are over-represented. The latter can best be explained by the online format of the survey. The results obtained can therefore be evaluated in the light of these representativeness characteristics. However, it is important to note that a significant part of the presented literature is also not considered to be fully representative of the observed

population, only surveys by the European Commission and some studies (eg Fotopoulos – Krystallis – Anastasios [2011] or Bryła [2017]) considered an exception.

Table 1. *Key characteristics of the respondents of the survey, 2017*

Characteristic	Group 1 (PGI and PDO questions)	Group 2. (PGI and TSG questions)	Hungarian CSO census, 2011
Total respondents / Population (persons)	514	505	9 937 628
Respondent involved (persons)	444	431	–
Average age (years)	41,12	42,77	41,39
Gender (percentage)			
Female	50,45	50,35	53,52
Male	49,55	49,65	47,48
Residence (percentage)			
Village	19,59	21,11	30,53
Small Town	38,96	36,89	34,35
Big City	41,44	42,00	35,13
Highest level of education (percentage))			
Elementary school 8th grade or lower	2,25	3,02	31,73
Grammar school, vocational high school, vocational school, other non - higher education	53,61	58,24	51,31
College, bachelor's degree	30,41	27,84	10,10
University, master's degree, PhD	13,74	10,90	6,68

Source: Own editing based on Strength2Food H2020 survey and Hungarian CSO [2013] data.

It can be clearly seen from the literature review that the most frequently examined criteria of food quality systems is related to knowledge (awareness of the related label and meaning content). As the information asymmetry-reducing effect of food certifications is closely related to trust in a given system, we also examine this and test the willingness to buy, which is crucial for practical relevance, by how well one is considered a regular customer for certified products.

In addition to descriptive statistical analyzes and two-sample ratio tests, we used binomial logistic regression to find answers to the question of what in the case of Hungarian consumers can explain trust in a given certification and the regular purchase of marked products. Based on all this, the models are structured as follows:

$Pr(trust\ in\ the\ quality\ system = 1) = F(\beta_0 + \beta_1\, know\ the\ label + \beta_2\, know\ the\ meaning\ of\ content + \beta_3\, Gender + \beta_4\, Age + \beta_5\, Residence + \beta_6\, Highest\ level\ of\ education)$, and

$Pr(Regular\ customer = 1) = F(\beta_0 + \beta_1\, know\ the\ meaning\ of\ content + \beta_2\, trust\ in\ the\ quality\ system + \beta_3\, Gender + \beta_4\, Age + \beta_5\, Residence + \beta_6\, Highest\ level\ of\ education)$.

Table 2. *Variables and their values included in the models*

Variables	Values
Trust in the quality system	1, if the respondent considers the label to be reliable, otherwise 0.
Regular customer	1, if the consumer has purchased such a product in the 2 weeks prior to the survey, otherwise 0.
Know the label	1, if the consumer is familiar with the label, otherwise 0.
Know the meaning of content	1, if the respondent was able to select at least one of the ten statements that correctly defines the label, otherwise 0.
Gender	1, if the respondent is a woman, otherwise 0.
Age	Age of the respondent.
Residence	Place of residence of the respondent (municipality / city / city).
Highest level of education	Respondent's highest level of education (primary school grade 8 or lower / grammar school, vocational secondary school, vocational school, other non-tertiary education / college, bachelor's degree / university, master's degree, PhD).

3. Results

Overall, the study seeks answers to the following questions:

– How well known are the labels of EU GI products among Hungarian consumers, and how well do they know their meaning?

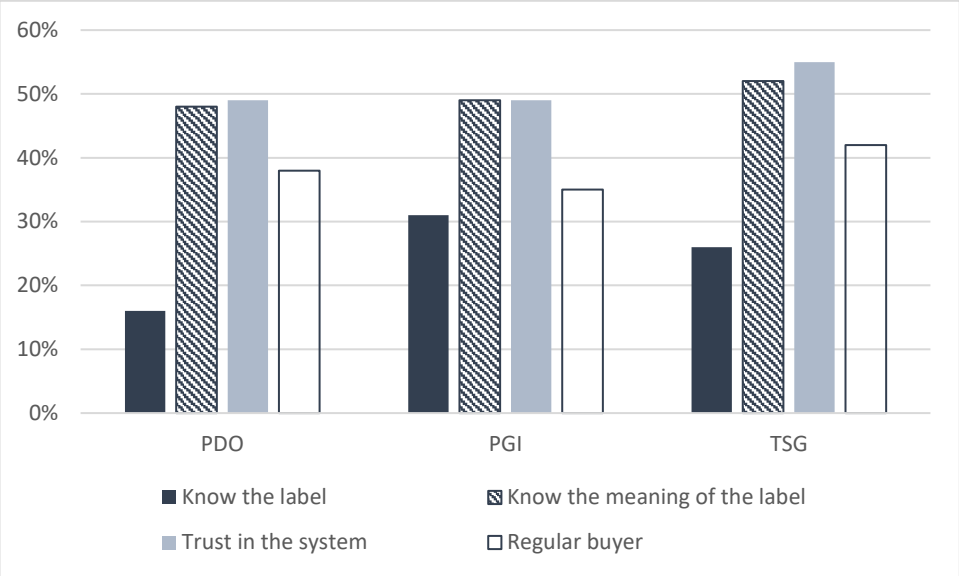
– What is the level of trust in case of these labels and what influences that trust?

– How often do consumers buy products with such certifications and what affects this?

3.1. Awareness of each label

In the case of food quality labels, it is important how well consumers know the logo and the meaning, because in the absence of these we cannot consider the purchase to be conscious. Figure 2 illustrates the most important criteria associated with each label, highlighting trust, and the frequency of purchases that determine economic viability.

Figure 2. The most important criteria associated with each label



The ratio of those familiar with the labels was highest for the PGI product (31%), followed by TSG (26%), while the PDO was only known by 16%. However, there was a positive shift in the awareness of all three labels compared to previous surveys (see Figure 1), but the ratio is still very low.

Nearly half of the respondents (PDO 48%, PGI 49%, TSG 52%) were able to associate the correct meaning with the given label. Here, however, it should be noted that in the study we used an approach called "weak definition" in the literature, i.e., if the respondent indicated at least one correct statement, that consumer was considered to be familiar with the meaning of the label. If we consider the "strong definition" also often used in previous studies - that is, consider the respondent to be familiar with the meaning only if they have marked all the correct statements - the proportions are much lower (2%, 1% and 3% respectively), as in other surveys.

In terms of trust in the PDO system, almost half of the respondents trust the PDO (49%), PGI (49%) and TSG (55%) labels, while the proportion of regular customers who also purchased a product with such an indication) is lower, at 35-42%.

The interrelated pairwise correlations of the presented criteria were checked by two-sample ratio tests (see Tables 3–6). Based on these, we were able to draw several clear conclusions.

In all three cases, the ratio of those who knew a logo was significantly higher who were also aware of the meaning (for example, 75% for the TSG label compared to 44%). So, anyone who recognizes the logo is more likely to be aware of the concept of protection of origin. (See Table 3.)

Table 3.

Relationships between the meaning and knowledge of the label

Variable	PDO			PGI			TSG		
	Do not know the label	Know the label	*z*-value	Do not know the label	Know the label	*z*-value	Do not know the label	Know the label	*z*-value
Know the meaning of the label	44,24 %	69,01 %	–3,83***	41,53 %	66,31 %	–6,79***	44,48 %	74,56 %	–5,52***

Comment *** $p < 0{,}01$.

As in the studies before, Table 4 shows that knowledge of the system contributes greatly to consumer trust. This is particularly noticeable for TSG products, as the level of trust among those who were aware of the content of GI was close to 63%.

Table 4.

Relationships between trust and meaning

Variable	PDO			PGI			TSG		
	Do not know the meaning	Know the meaning	*z*-value	Do not know the meaning	Know the meaning	*z*-value	Do not know the meaning	Know the meaning	*z*-value
Trust in the quality system	36,14%	60,68 %	–4,96***	39,63 %	57,53 %	–5,00***	45,24 %	62,91 %	–3,44***

Comment. *** $p < 0{,}01$.

Interestingly, however, knowledge of the meaning of the GI labels did not directly affect whether someone was a regular customer of that product. (See Table 5.) Although it is

not statistically possible to state that there is a significant difference between those who know the meaning and those who do not, the rate was higher for those who do not know the meaning of the PGI.

Table 5.*Relationships between regular shopping and meaning of the label*

Variable	PDO			PGI			TSG		
	Do not know the meaning	Know the meaning	*z*-value	Do not know the meaning	Know the meaning	*z*-value	Do not know the meaning	Know the meaning	*z*-value
Regular customer	29,41 %	42,11 %	–0,90	36,36 %	33,82 %	0,36	34,78 %	44,59 %	–0,83

At the same time, the issue of trust is clearly crucial, as in the case of PDOs, there were almost four times as many consumers who trusted the system as those who regularly bought these products. (See table 6.) In the case of PGI, the difference was the smallest, but even here it was significantly higher.

Table 6.

Relationships between regular shopping and trust

Variable	PDO			PGI			TSG		
	Do not trust in the label	Trust in the label	*z*-value	Do not trust in the label	Trust in the label	*z*-value	Do not trust in the label	Trust in the label	*z*-value
Regular customer	11,11 %	43,48 %	–1,83**	28,57 %	37,33 %	–1,12**	20,00 %	48,05 %	–2,26**

Comment. ** $p < 0,05$.

3.2. Factors that determine trust

Binomial logistic regression was used to examine each connection in more detail, in addition to the previously analyzed criteria, we include the sociodemographic parameters most frequently examined in the previous literature (gender, age, place of residence, highest level of education). Several additional results can be established using previous ratio tests.

Knowledge of logos contributes greatly to the development of trust, because if someone knows the label, they have more than three times the chance to trust them for all three product types, while in terms of meaning, the chances of this are lower, but still almost double. There is no significant difference in the development of trust between men and women and with different educational backgrounds, however, the role of age is significantly decisive for the TSG label: if someone is one year older, they are on average 2.6 percent more likely to trust the label. In terms of place of residence, however, it can be established, that someone lives in a more urban environment, the less trust develops in them. (See table 7.) Overall, therefore, consumer education is most needed to build trust in GIs, as those who (recognize) the labels on food packaging and / or are aware of what PDO means, they treat these products with much greater confidence.

Table 7.

Factors determining trust in case of EU geographical indications

Variable	PDO	PGI	TSG
Know the label	3,384*** (1,030)	3,063*** (0,502)	3,316*** (0,876)
Know the meaning of the label	2,432*** (0,516)	1,765*** (0,270)	1,799*** (0,410)
Gender	0,891 (0,190)	1,091 (0,166)	1,093 (0,243)
Age	1,002 (0,00797)	1,008 (0,00578)	1,026*** (0,00886)
Residence	0,674*** (0,0983)	0,780** (0,0799)	0,768* (0,114)
Highest level of education	1,212 (0,143)	1,024 (0,0856)	0,887 (0,111)

Comment. Odds ratios, standard errors in parentheses. * $p < 0,1$, ** $p < 0,05$, *** $p < 0,01$.

3.3. Factors determining regular shopping

The viability of GI schemes is largely determined by the willingness of consumers to purchase products bearing such logos. (See table 8.) Like the ratio tests, the logistic

regression also supports that knowledge of the meaning of the labels alone does not contribute to regular shopping in a statistically undetectable way. Trust is more crucial: although the result is not significant for the PDO, but in the case of TSG, whoever trusts the quality system is more than seven times more likely to buy products bearing such a mark on a regular basis. In terms of trust, gender also proved to be decisive for both PDO and TSG: women become much fewer regular customers, among them, the chances of this are less than a third compared to men. In terms of age, the older a consumer is, the less likely they become a regular customer (however, the result is not significant for PDO), while residents of rural, smaller settlements are more loyal buyers of PGI products. Like the development of trust, the highest level of education has no detectable effect here either. The high frequency of purchases is mostly determined by trust among Hungarian consumers.

Table 8.

Factors influencing the regular purchase of EU geographical indications

Variable	PDO	PGI	TSG
Know the meaning of the label	1,629 (1,138)	0,897 (0,303)	1,078 (0,619)
Trust in the quality system	5,233 (6,103)	1,889* (0,730)	7,664*** (5,587)
Gender	0,310* (0,212)	0,617 (0,201)	0,283** (0,140)
Age	0,975 (0,0257)	0,954*** (0,0116)	0,966* (0,0183)
Residence	0,463 (0,224)	0,648* (0,145)	0,717 (0,229)
Highest level of education	0,694 (0,278)	1,133 (0,200)	0,642 (0,173)

*Comment. Odds ratios, standard errors in parentheses * $p < 0,1$, ** $p < 0,05$, *** $p < 0,01$.*

4. Conclusions

Although the awareness of geographical indications in Hungary shows an increasing trend - the higher rates described in this study compared to previous surveys prepared for the European Commission - it can still be considered low, especially compared to consumers in Western and Southern Europe. It is even more striking that only half of the surveyed consumers know the meaning of the labels at least approximately (and precisely only 1 to 3 percent). At the same time, it should be emphasized that knowledge of the meaning does not directly affect the frequency of purchasing products with such logos in Hungary. Nevertheless, trust significantly determines customer behavior for products with the PDO, PGI and TSG logos. Knowledge and accurate understanding of geographical indications can make a significant contribution to building and maintaining confidence in the system.

In our research, the awareness of the PGI and TSG labels ranged from 25 to 31 percent, but in the case of PDOs, it reached only 15 percent. Compared to previous European results, labels are much better known (up to 70-80%) in the Mediterranean part of Europe (*Arfini* [1999], *Tsakiridou et al.* [2011]), however, they are about the same as the European average (*Aprile– Gallina* [2008], *Fotopoulos–Krystallis* [2001], *Philippidis–Sanjuan* [2003]. Another interesting fact in the surveys of the European Commission [2012, 2014, 2016] the aweareness of PDO labels in Hungary is almost the same (11%), but the awareness of PGI and TSG labels (14 and 15%, respectively) lags significantly behind the rate of our present research. Thus, the awareness of the labels among Hungarian consumers is lower than among Western and Southern European consumers.

Examining the meaning of the labels, we concluded that those who know the logo are, not surprisingly, more aware of geographical indications. Nearly half of the respondents were able to match the exact meaning content to the PDO, PGI and TSG labels based on the "weak" approach we used (indicating at least one correct answer). These rates are higher than in 1999 (around 15%) in France, Greece, Italy, the Netherlands and the United Kingdom (*van Ittersum et al.* [1999]). If we use the "strong" approach (marking all correct answers), then the rates of Hungarian consumers (2, 1 and 3 per cent, respectively) are close to the European average (*Aprile– Gallina* [2008], *Fotopoulos–Krystallis* [2001], [2003]).

In terms of trust in the system, half of the Hungarian respondents (both PDO and PGI 49, TSG 55 percent) trust the logo. This rate is higher than the Italian respondents (Vecchio – Annunziata [2011]), but lower than the French (Hocquette et al. [2012]). Interestingly, trust in EU labels is much weaker in the Czech Republic than in Hungary, where

respondents have much more confidence in Czech national labels (over 95 percent trust) than in geographical indications (less than 10 percent trust) (*Velčovská* [2012], *Velčovská–Del Chiappa* [2015], *Velčovská–Sadílek* [2014]). In general, therefore, it can be stated that in Hungary - based on our research - trust in the quality system is stronger than the European average - especially in Central and Eastern Europe.

Comparing the results related to sociodemographic factors with the international results, it is obvious that among Hungarian consumers, men tend to be regular customers of products with PDO / TSG logos, although according to previous research, women were more likely to buy products with such a label. (*van Ittersum et al.* [1999]). The Hungarian results also contradict the literature in terms of age, because in Europe the older a consumer is, the more likely to buy a product with a geographical indication (*Botonaki–Tsakiridou* [2004], *Cilla et al.* [2006], *Fotopoulos–Krystallis* [2003], *van Ittersum et al.* [1999]), while in Hungary, age has a positive effect on trust in certification, it is negatively related to the frequency of purchases. At the same time, both the results obtained on the Hungarian sample and the results of previous research agree that the inhabitants of rural areas are typically more loyal consumers of PDO, PGI and TSG certified products.

At present, confidence in EU food quality labeling products is highest among rural consumers who recognize the certification label on packaging and / or know the meaning of the scheme. And the regular buyers of such products are mostly the younger rural men who trust the system. At the same time, it is important to note that the sample used for the analysis - due to its previously presented bias - cannot be generalized to the entire Hungarian population, however, from the point of view of representativeness it fits into the previous research on the topic.

Based on these, the use of EU food quality labels can achieve its purpose and provide mutual benefits for both producers and consumers if consumers know and understand their meaning; and, as a result of trust in labels and the quality system, they begin to give preference to products with the PDO, PGI and TSG logos in their purchases. Improving consumers' knowledge of GI food labels will and will play an essential role in this, as in the European Union, despite its introduction in 1992, only a small proportion of people still recognize these logos and understand the exact meaning of these labels. The Hungarian Geographical Indication Program can only bring results if not only the number of geographical indication products is increased, but also the resources devoted to expanding the knowledge of consumers, by which, in addition to knowledge and

familiarity, trust can also be strengthened, thus contributing to the success of the geographical indication system in Hungary. The attitudes of Hungarian consumers towards food quality programs should continue to be monitored, especially with regard to the implementation of the said program, since the government initiative can only achieve its goal if the certifications of the increased number of Hungarian products with geographical indications are really known and understood by Hungarian consumers.

Appendix

Table F1.

The status of Hungarian agricultural products and foodstuffs in the GI system of the European Union

Name	Category	Status
Szegedi fűszerpaprika-őrlemény/Szegedi paprika	PDO	Registered
Kalocsai fűszerpaprika-őrlemény	PDO	Registered
Makói petrezselyemgyökér	PGI	Registered
Makói vöröshagyma; Makói hagyma	PDO	Registered
Tepertős pogácsa	TSG	Registered
Magyar szürkemarha hús	PGI	Registered
Szegedi szalámi; Szegedi téliszalámi	PDO	Registered
Csabai kolbász/Csabai vastagkolbász	PGI	Registered
Gyulai kolbász/Gyulai pároskolbász	PGI	Registered
Gönci kajszibarack	PGI	Registered
Szentesi paprika	PGI	Registered
Budapesti téliszalámi	PGI	Registered
Hajdúsági torma	PDO	Registered
Alföldi kamillavirágzat	PDO	Registered
Szőregi rózsató	PGI	Registered
Szilvásváradi pisztráng	PGI	Application submitted
Jászsági nyári szarvasgomba	PGI	Application submitted
Keleméri bárányhús	PGI	Application submitted
Gönci Kajszibarack	PGI	Application submitted
Nagykörűi ropogós cseresznye	PGI	Application submitted
Nagykun rizs	PGI	Application submitted
Budaörsi őszibarack	PGI	Application submitted

Őrségi tökmagolaj	PGI	Application submitted
Akasztói szikiponty	PDO	Application submitted
Újfehértói meggy	PGI	Application submitted
Rögös túró	TSG	Application submitted
Tuzséri alma	PDO	Application submitted
Szomolyai rövidszárú fekete cseresznye	PDO	Application submitted
Győr-Moson-Sopron megyei Csemege sajt	PGI	Application submitted
Balatoni hal	PGI	Application submitted

Comment. As of November 15, 2018.

Source: Own editing based on the European Commission's DOOR database.

F2. táblázat

Results of previous surveys on the awareness of geographical indications in the European Union, as published

Published	Category	Country	Methodology	Category: awareness (%)
Arfini [1999]	Cheese and ham	Italy	Survey	PDO: 80
Fotopoulos–Krystallis [2001]	Food in general	Greece	Conjoint analysis	PDO: 22
Fotopoulos–Krystallis [2003]	Apple	Greece	Focus group survey, conjoint analysis	PDO: 22
Philippidis–Sanjuan [2003]	Olive oil	Greece	Survey	PDO-PGI-TSG: 24–40
Botonaki–Tsakiridou [2004]	Wine	Greece	Survey	PDO: 49
Platania–Privitera [2006]	Ham	Italy	Interview	PDO: 43
Aprile– Gallina [2008]	Food in general	Italy	Survey	PDO: 30; PGI: 16; TSG: 4
Urbano et al. [2008]	Bean	Spain	Survey	PGI: 37
Vecchio–Annunziata [2011]	Cheese and ham	Italy	Survey	PDO: 34
Tsakiridou et al. [2011]	Food in general	Greece	Survey	PDO: 70
Fontes et al. [2012]	Beef	Portugal	Survey	PDO: 44

Velčovská [2012]	Food in general	Czech Republic	Survey	PDO: 3; PGI: 4; TSG: 6
European Commission [2012]	Food in general	European Union	Survey	PDO: 14; PGI: 14; TSG: 15
European Commission [2014]	Food in general	European Union	Survey	PDO: 13; PGI. 14; TSG: 12
European Commission [2016]	Food in general	European Union	Survey	PDO: 14; PGI: 14; TSG: 15
Bryła [2017]	Food in general	Poland	Survey	PDO: 16,3; PGI: 12,5

Comment. In the chronological order of publication of each survey result.

Source: Own editing based on the processed literature.

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6.3. Estimating the market share and price premium of GI foods – the case of the Hungarian food discounters[5]

Abstract: The food security of the European Union heavily relies on the food quality systems where Geographical Indications (GI) play an important role. European food is considered world-wide secure and high quality, therefore European food names and designations represent value that should be protected as intellectual property. Despite the importance of GIs in Europe, the availability of the related economic data is very limited and the only available comprehensive database (in case of GI foods the Database of Origin and Registration (DOOR)) details only some very basic and mainly administrative characteristics of such products. From an economic perspective, market size and price premium of these products are the most important in order to assess the economic sustainability of European GI foods. Empirical datasets describing these characteristics of GI products are scarcely available and can be collected only case by case.

Therefore, the purpose of this study is to estimate the market size for food products with geographical indications available in Hungary (excluding wines and spirits) and their price premium compared to their direct substitute products, based on empirical data. We conducted monthly mystery shopping for one year (January-December 2018) at three food discount stores (Lidl, Aldi, and Penny Market) operating in Budapest. We collected data on all the GI products available in the stores and their closest substitutes, then the dataset was subsequently analysed and compared to the main characteristics of the DOOR database. The reason for choosing the discounters is that these stores have expanded spectacularly in recent years and are mostly available to average consumers, both in Hungary and across Europe, and based on the main characteristics of this type of retail (limited product portfolio targeting price sensitive consumers), the data collected here can be considered to indicate the minimum level of market share and price premium.

Our results show that currently GIs have only limited importance in the Hungarian food market, in terms of both the number of products and their market share, as only a small number of such products appear in the food discounters' supply. As regards the premium achievable with consumer prices, the average price premium is remarkably high (43% on average), even in the case of discounters. Our empirical results also suggest that in

[5] Lili Jantyik ; Áron Török 2020: Estimating the Market Share and Price Premium of GI Foods—The Case of the Hungarian Food Discounters SUSTAINABILITY 12 : 3 Paper: 1094 , 15 p.

Hungary there is an opportunity to increase the importance of GI foods, both in terms of availability and market share. For Hungarian GI food producers and processors, the level of price premium achievable in discounters might be attractive enough to stimulate their presence in the market.

Keywords: Geographical Indication; PDO; PGI; price premium; market share; Hungarian discounters

1. Introduction

The quality of food is significantly determined by the place of production, which in some cases also ensures the reputation of the products. This attachment is recognized and regulated in almost all parts of the world as a form of intellectual property [1]. Globally, the European Union plays an important role in the system of protection of origin, which has defined the system of geographical indications at Community level under a *sui generis* regulatory framework since 1992 [2]. The European system of geographical indications (GI) distinguishes between two types of products: Protected Designation of Origin (PDO) and Protected Geographical Indication (PGI). The high quality of PDO is due to the fact that the production is completely linked to a specific geographical area, while in the case of PGI reputation derives mainly from the fact that at least a significant part of the production is linked to a specific location [3].

However, in many countries (e.g.: USA, Canada, Australia) GIs are treated as trademarks, and although this issue has been governed by multilateral agreements since the World Trade Organization's TRIPS Agreement, there is considerable disagreement over this topic between some countries and the European Union [4].

Although GIs have little influence on international trade agreements [5], these products play a central role for the European Union - not only in EU food quality policy but also in international trade [6]. For the von der Leyen Committee, which was formed at the end of 2019, will also be a key priority, as they are the depository of high-quality food that " is a key part of maintaining high food quality and standards and ensuring that our cultural, gastronomic and local heritage is preserved and certified as authentic across the world" [7].

Despite the importance of GIs being highlighted by the European Commission in several forums, the quantity and quality of data related to and available in the field is rather

limited (see [8] for details) and the lack of comprehensive data is a major problem impeding our understanding of the economic and social importance of geographical indications [9]. Only a little technical information is available from the official GI register of the European Commission (DOOR), and comprehensive market data from other sources is only available in the largest GI producer countries (e.g.: in Italy and France).

In order to understand the importance of GI foods, it is essential to get an overview of the market size and price premium for such products. The number of GI products available for an average consumer could highly influence their recognition and demand. On the other side, an important objective of GI policy is to increase net producer income. This could be achieved through the price premium these products can attract due to their higher quality. But production costs can also be higher, both to achieve higher quality and to conform to GI regulations (e.g. additional costs due to the GI requirements). Also, GI products compete with similar food products on the same market, therefore their prices relative to those consumers perceive similar is important. [8]

In 2015 the Hungarian government announced the Geographical Indications Programme, which aims significantly to increase the number of Hungarian food products with geographical indication recognized by the EU and to make better use of the opportunities offered by geographical indications for products already protected in this way [10]. By 2015, a total of 13 Hungarian agricultural and food products had been registered in the EU official register, and since then, one more product has been registered, while another 14 product registration applications are in process thanks to the government programme [11].

1.1. Market share of GI foods in Europe

Limited data on the actual market share of GI foods is available in the studies published so far. The official EU database (DOOR) does not provide this type of information, only detailing some basic descriptions (e.g.: registration process, product description, producer group). According to the DOOR database, most GI products come from Mediterranean EU Member States (in descending order: Italy, France, Spain, Portugal and Greece), and most of them are vegetables and fruits, cheese, processed or raw meat and olive oil [12].

Several studies have been prepared for the European Commission about the situation of GI products. They are quite old but since 2012 no comprehensive study has been released that includes empirical evidence for the whole EU GI market [8]. One of these studies

was conducted by London Economics [9], which found that Italy was the most interested in the system in terms of the number of producers and processors of GI products, accounting for 3.4% of farmers and 17% of processors. In France, 14.7% of farmers were PDO and 2.9% were PGI food producers. In terms of sales, in France, Germany, Italy and Spain, PDO/PGI products accounted for between 1% and 5% (around € 10 billion) of total food product turnover in 2008.

The report of AND International [13] gives an even more comprehensive picture, also delivered to the European Commission, using both primary and secondary data. GIs represented 5.7% of European food and beverage sales in 2010. The share of GI production in total food production was more than 10% only in France (14.5%). In Italy, Greece and Portugal this proportion ranged from 8% to 10%, while in the case of 15 Member States it was under 4%.

In 2010, 19.5% of all GI production was exported to markets outside of the EU, while 20.4% was sold within the EU but outside the producing country, and the most important market for these products is therefore the domestic customer of the country of production. Market studies in some countries show high levels of concentration: in Italy, out of nearly 300 GI products, only 15 (mainly cheeses and meat products) accounted for 90% of total production [14].

Tibério and Francisco [15] estimated the Portuguese GI market as being worth around € 70 million in 2007, but pointed out that only 68% of these products were actually sold on the market, the rest being used for own consumption or barter. Analysing the Italian cheese market, Galli, *et al.* [16] found large differences in both production and export: some large-market cheeses generated significant foreign sales, but domestic and local markets were overwhelmingly the destination of products with lower production volumes. Examining international trade, Leufkens [17] found that, in particular, PGI products have a positive effect on exports. A similar finding was made by Belletti, *et al.* [18] for Tuscan olive oils: in markets outside Europe PGI products were present, whereas in Italian and EU markets PDO products were more typical. In Hungarian case studies it is also highlighted that Hungarian GI products do not really travel far away and producers are mostly focusing on the domestic market [e.g.: 19,20,21].

Based on the above it can be stated that GI products are dominant only in some European countries, but their market share is not significant. Most of the products are sold domestically and it is mainly PGI products that are exported.

1.2. Price premium for GI foods in Europe

In addition to the market size of GI foods, our research also focuses on price premiums. Various studies have been conducted on this topic before.

In terms of methodology, questionnaires and interviews were most often used to find out whether consumers were willing to pay more for PDO/PGI labelled products. The results of these studies show that in most cases respondents were willing to pay a premium for PDO or PGI products [among others: 22,23-27]. However, the opposite is true in the study of Simioni and Bonnet [28], in their research on cheeses in France they concluded from panel data that consumers were unwilling to pay more for PDO labelled products.

Aprile, *et al.* [29] used experimental selection and a random logit model to determine how much Italian consumers are willing to pay for different quality labelled olive oils. The research found that consumers were willing to pay the highest price premium for the PDO label, followed by the organic label, then the term "extra virgin" olive oil, and finally the PGI label. Menapace, *et al.* [30] also examined olive oil using an elective model to map Canadian consumers' relationship with GI products. Using a discreet choice model and a multinomial mixed logit model, they found that both country of origin and GI labels are important, but Canadian buyers value the country origin information more than GIs. Vecchio and Annunziata [31] used an experimental selection based on appearance, price and origin in their Italian research to explore the knowledge of GIs in the ham and cheese industry and the willingness of consumers to pay extra. Despite there being a lack of knowledge of PDO and PGI labels, the results showed that nearly 58% of respondents were willing to pay a premium price of more than 20% for these products and another 27% of consumers are willing to pay a 10% extra price. Of those who knew the PDO label well, 37.5% were willing to pay a premium of up to 40%, and of those who were unfamiliar with these labels, 34.5% said they would pay a maximum of 10% willing to pay for these products.

The analysis of the consumer side shows that consumers are typically willing to pay more for GI products, but the size of the premium may show differences.

Based on the above, we aim to estimate the market size of food products with geographical indications available in Hungarian discounters (excluding wines and spirits) and their price premium compared to their direct substitute products, and thus empirically contribute to the literature which is rather incomplete in this regard.

2. Materials and Methods

In order to have real market data, we conducted monthly mystery shopping for one year (January-December 2018) at three food discount stores (Lidl, Aldi, and Penny Market) operating in Budapest, the capital of Hungary. Mystery shopping is a form of participant observation used for a long time for explanatory research [32]. This approach can avoid the potential weaknesses of interviewing and survey methods, first of all the discrepancy between real and reported behavior of consumers [33]. Mystery shopping is usually used for evaluating services (for example, Liu, *et al.* [34] evaluated restaurants, or Yaoyuneyong, *et al.* [35] hotels) because this method allows the researcher to see the services (and also the products) from the consumers' perspective. This kind of observation research has also other advantages over personal and/or mall intercept interviews, mainly in terms of cost- and time-effectiveness [36]. The low level of awareness of the EU GI system among Hungarian consumers indicated in previous studies (e.g.: [37] and [38]) also confirms that end consumer prices should be investigated through the participant observation of experts conducting mystery shopping.

In our research we tried to get an overview of the GI food related services of the Hungarian food discounters (in particular whether they have any GI foods on their selves) and also wanted to measure the price levels. In order to get comparable results, we visited the same store on the same day each month (every third Thursday of the month, since the promotional period begins in every chain on Thursday). First, we collected data on all the GI products available in the store and their closest substitutes.

In order to find the GI food's closest substitute, we used the following guidelines:

- first, we searched for a substitute product with almost the same physical characteristics (e.g.: for Italian PGI apple "Mela Alto Adige" we selected Hungarian idared apple),
- second, if the first option didn't exist, we searched for a substitute product with very similar characteristics (e.g.: for Dutch PGI cheese "Gouda Holland" we selected Austrian gouda cheese),
- third, if the first two options didn't exist, we searched for a substitute product from the same product category with similar characteristics (e.g.: for Greek PDO cheese "Feta" we chose Danish white cream cheese),

- in cases where the GI food had some very unique characteristics and no other products had a similar attribution, we chose no substitute product and that GI food was not included to our price premium calculations (e.g. no other cheese had similar characteristics like Italian PDO cheese “Grana Padano”; in particular there was no other hard, crumbly-textured cheese available).

Then we monitored their availability and special attention was given to price developments and the level of price premium was calculated as follows:

$$Price\ premium(\%) = \frac{Price_{GI} - Price_{NonGI}}{Price_{NonGI}}\ x\ 100$$

where $Price_{GI}$ is the price of the identified GI food and $Price_{NonGI}$ is the price of the identified GI food’s direct substitute, both measured in Hungarian Forint per kilogram, or in case of liquid foods (e.g.: olive oil) in Hungarian Forint per litre.

The resulting time series data were subsequently analysed. With the method presented, we managed to create a database of 816 observations for further studies and analyses.

2.1. Characteristics of discounters

Our research was carried out in discount stores operating in Hungary. The primary reason for this was that these stores have expanded spectacularly in recent years, both in Hungary and across Europe, making them accessible to the average consumer almost everywhere. According to a study by Hökelekli, *et al.* [39], more than half (51%) of UK shoppers visited a discount store in 2014, and over the previous two years, the number of consumers who have done their "main shopping" at a discount has more than doubled, from 5% to 12%. Aldi and Lidl were active in 28 European countries in 2016, with an average market share of 10%, but in Germany and Austria, for example, this figure was towards 35% and has been increasing since then [40]. In Belgium, a survey in 2013 showed that the discount stores possessed 42.6% of the food retail trade in the country [41].

Another impressive change in recent years was that discount stores have repositioned themselves, and they are no longer necessarily looking to be the cheapest store on the market. In the early years, the Albrecht brothers (the founders of Aldi and Hofer) decided not to follow the trend of diversifying their product range, but to continue to focus on a limited range in the Fast Moving Consumer Goods (FMCG) market since they can be

purchased in large quantities and sold at low prices. The rapid growth of Aldi, Lidl and similar discounters in Germany was promoted by the country's retail planning policy, originally developed in 1968, which protect small or mid-size retailers by limiting the size of out-of-town stores. Since 1986, grocery stores have in most places been limited to sales areas of about 800 m² [42]. In recent years, however, discounters have repositioned themselves and there is a new tendency: fresh goods, organic products, quality wines and high-quality private labelled products are available in a wide range of shops [43]. Discount stores offer fewer products, around 1,300-1,400 items, as opposed to the average 30,000 available in supermarkets [39], but the supply of these discounters is constant and changes less frequently than other types of stores. Another important feature of discount stores is that a significant part of their supply is private labelled product [41,44]. Discounters can have a better influence on the retail price of the private labelled products, which contributes to a different pricing strategy for discount stores [45]. Retailers prefer private labelled products because they usually have a higher gross margin on these products and can help them differentiate themselves from competitors as these brands are not available in other stores [46]. Several studies have investigated that the market for private label products was anti-cyclical, grew during the recession, but maintained its profitability even after the recession [46]. Private labelled products are expanding rapidly, with a market share of around 30% in 2014 [47]. In the study of Larson [46] the profile of potential buyers of private labelled products was identified. The author analysed the results of an online panel survey of 605 US participants with binary logistic regression. Based on these, he concluded that consumers of private labelled products are university-educated and hedonistic buyers. Gender, income, and time preference variables were significant, allowing retailers to target men, higher-income households, and people who focus on the present.

In terms of Hungarian food retailing, based on the number of stores, COOP, CBA and Real dominate the most. Among the discounters, Penny Market had the biggest number of sales units, with 218 stores, so it was the fifth largest in Hungary. At the end of 2018, the three discount stores had a total of 534 stores. At the same time, looking at the growth rate of stores over the past 10 years, we can see that all three discounters are among the most dynamically expanding chains. Aldi stores' number grew on average by more than 10% on an annual basis, while Lidl increased on average by 4.3% and Penny Market by 2.3% (see Figure 1).

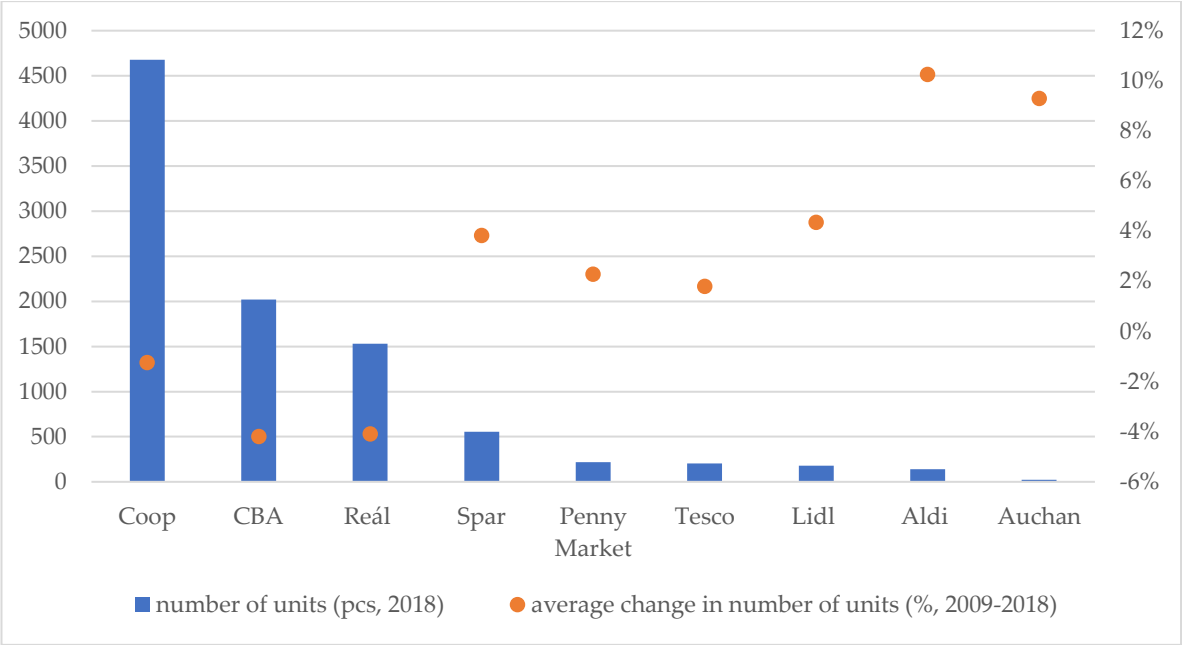

Figure 1. Food retail units in Hungary in 2018 and the average growth rate 2009-2018 (%). Source: Own compilation based on [48].

Considering the turnover, Tesco, Coop and Spar had the biggest turnover in absolute terms in 2018, but in terms of annual sales growth in Hungary, in the last 10 years, the discount stores increased the most. Aldi grew most dynamically, Lidl ranked second, but Penny Market also grew more than 5% between 2009 and 2018 (see Figure 2).

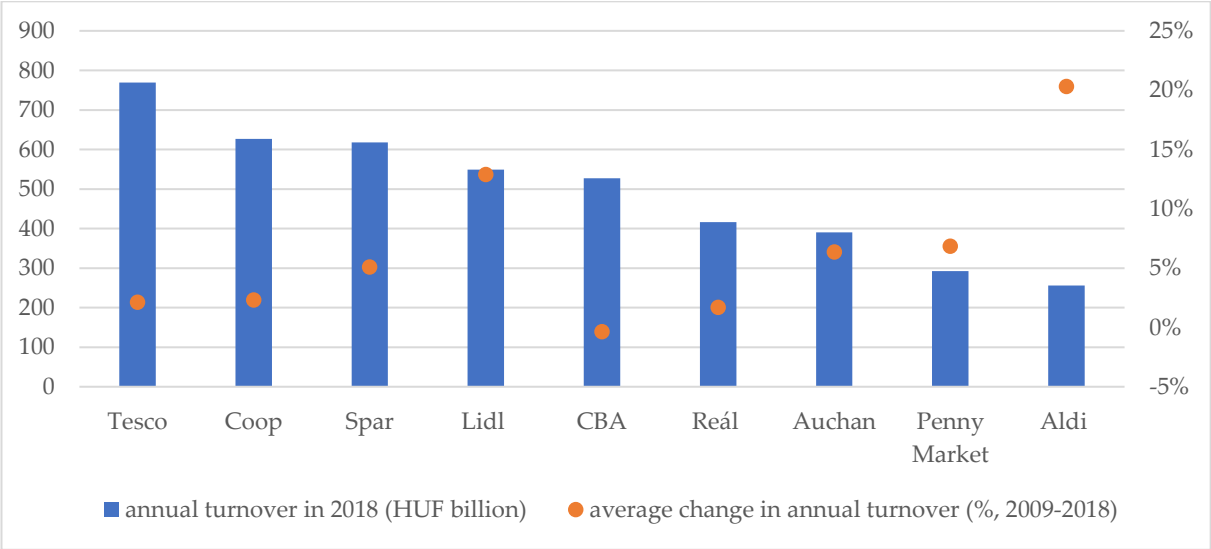

Figure 2. Annual sales of the food related FMCG sector in Hungary in 2018 (HUF billion) and average growth rate between 2009 and 2018 (%). Source: Own compilation based on [48].

From these data, we can see that discounters in Hungary are also following European trends, growing steadily and gaining more and more share in the retail sector.

Figure 3 clearly shows that while the number of stores in 2018 was only 6% of the Hungarian market covered by the dynamically growing discount stores, if we instead look at the turnover, it owned more than a quarter of the whole segment. From the data above we can see that by examining the Hungarian discounters we can get an excellent picture of the current processes describing the Hungarian food retail sector. These chains are mostly available to average consumers in Hungary and in Europe, and with the growth in their stores and sales, we can expect more and more customers to enter these stores, so they are expected to play an even greater role in retail. Our choice is also justified by the fact that according to the results of a recent consumer survey (Török, 2019), products branded with a national food quality label of Traditions, Flavours, Regions – which are considered to be the "preschool" of GIs – are mostly open to consumers who purchase their food primarily at discount stores and these consumers are also likely to become regular buyers of these products.

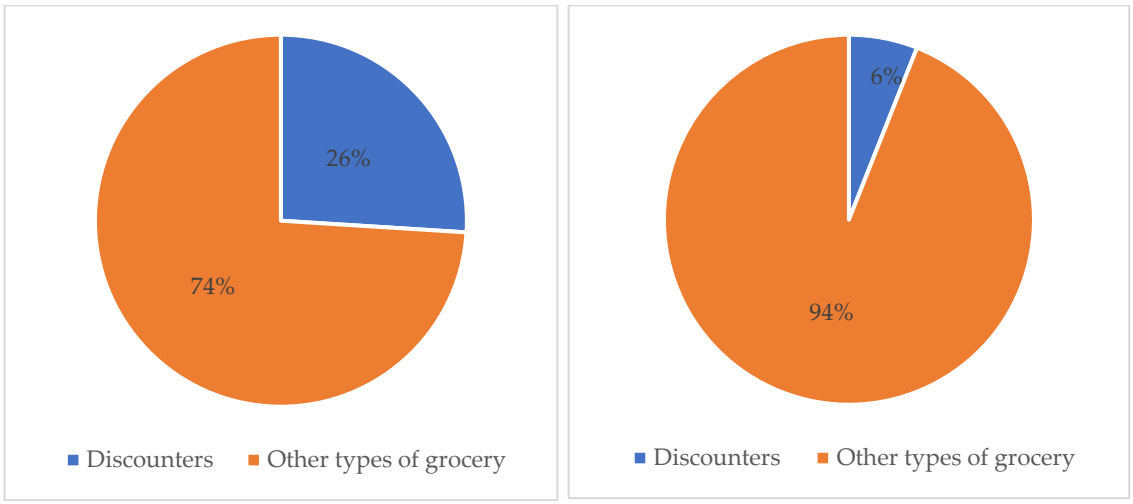

Figure 3. Sales (left figure) and number of sale points (right figure) of food related FMCG sector in 2018. Source: Own compilation based on [48].

In this study, we examine the retail availability and prices of GI food products in discount stores. Based on the characteristics of the discounts described above, we expect the results obtained here to allow us to estimate the characteristics of the Hungarian market in terms of both the minimum price premium (Hungarian food discount continues to target primarily price-sensitive consumers) and the minimum market size (the supply of the discounts are rather limited). Based on the literature and preliminary results, we expected

that the Hungarian GI supply of discounters would be rather scarce, with typically high levels of processed (cheese and meat) PGI products from the major South-European producing countries (Italy, France and Spain), followed by Hungarian and German products (all three investigated food chains are German owned).

3. Results

3.1. Market size in Hungary

Our observations based on mystery shopping show several clear results. First, the number of GI products available in Hungarian discounts is limited, with 8-16 GI products available in the basic food supply (see Figure 4). Second, the supply is quite permanent, and although only a limited number of products bears these labels, they are always available to consumers and are part of the basic product portfolio of chains. The number of GI products increased significantly only during thematic promotions, for example in the Aldi and Lidl supermarket chains, which organised special "Italian week". Third, it is important to note that the number of private labelled products is also significant for GIs, in the case of Lidl and Penny Market, whose share was 80-90%, while in Aldi it was only 50%.

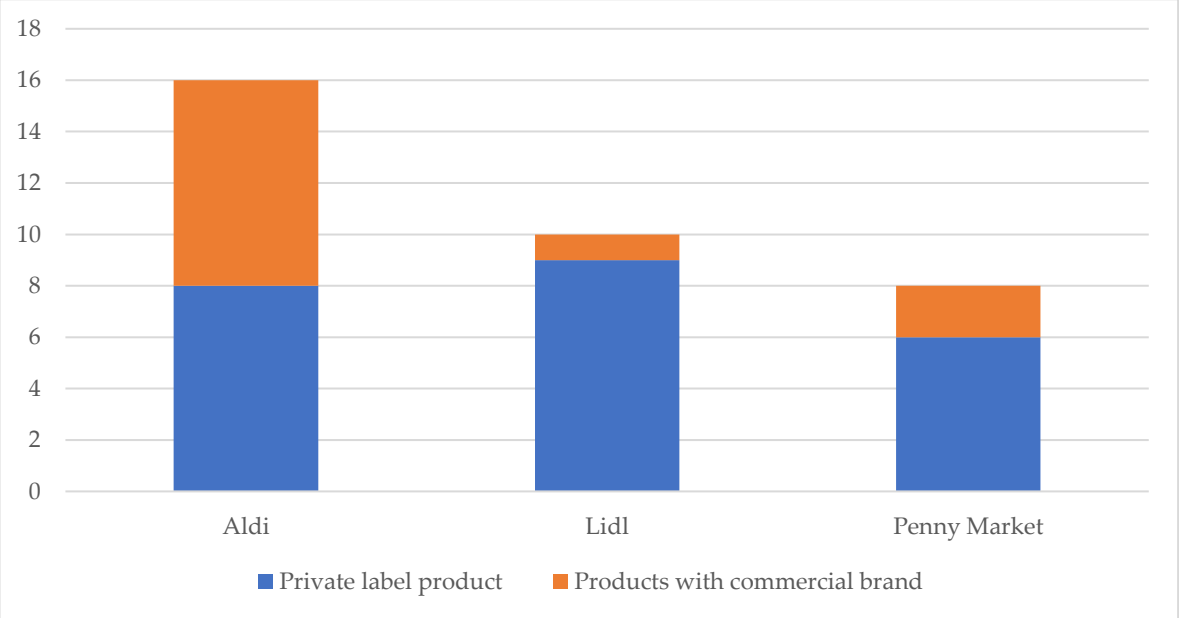

Figure 4. GI products available in the different food discounters (pcs). Source: Own editing.

Compared to the DOOR database, the supermarkets in question had a higher proportion of PDO products than PGI products, as opposed to the DOOR database, where it has just the opposite distribution (see Figure 5).

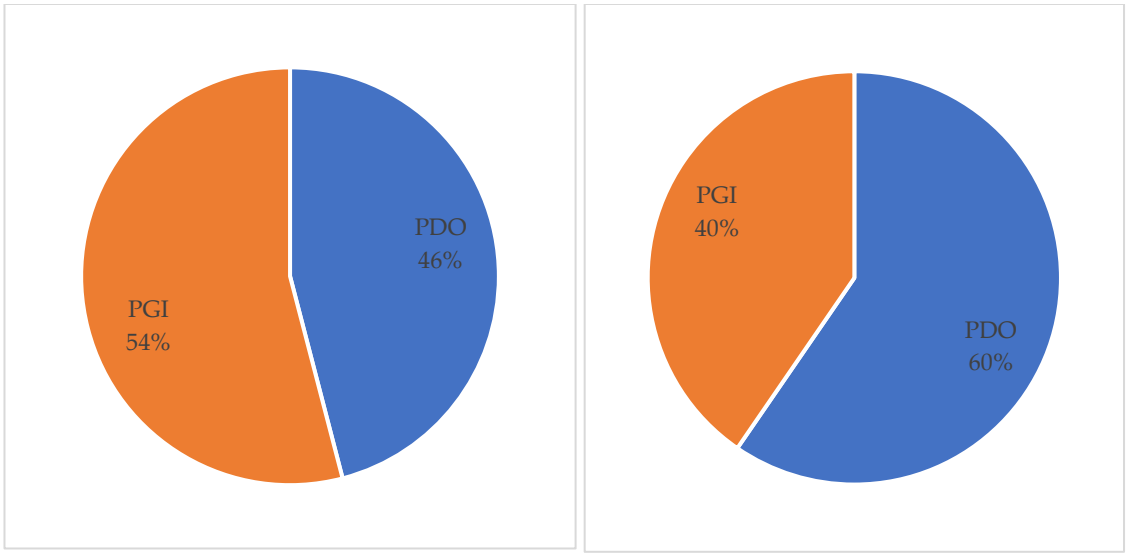

Figure 5. Comparison of the share of PDO and PGI products in the DOOR database (figure on the left) and in the Hungarian discounters (figure on the right). Source: Own editing.

The distribution of country of origin and food categories in the domestic discount stores compared to the DOOR database clearly shows first (see Table 1) that most of the available products (82%) are imported, and next, that both in the DOOR database and in Hungary, Italian products were found in the greatest numbers. At the same time, while French, Spanish and Portuguese products are present in large numbers in the DOOR database, these products are completely unavailable on the shelves of Penny, Lidl and Aldi in Hungary. Greek and German products also had a relatively large share in our country and not surprisingly, Hungarian products were in a much larger proportion (18%) than would be justified by their incidence in the DOOR database.

Table 1. GI foods by origin in the DOOR database and in the Hungarian discount stores, %.

Country	DOOR	Hungarian discounters	Difference
Italy	21	41	20
France	18	0	-18

Spain	14	0	-14
Portugal	10	0	-10
Greece	8	18	10
Germany	7	15	8
Hungary	1	18	17
Other	21	8	-13

Source: Own editing.

When analysing the supply by product categories, we can see that while in the DOOR database the category of fruits and vegetables contains the most products, in the Hungarian discounts the cheeses (50%) and processed meats (29%) dominate.

Table 2. GI foods by category in the DOOR database and in the Hungarian discount stores, %.

Category	DOOR	Hungarian discounters	Difference
Vegetables, fruits	28	3	-25
Cheese	17	50	33
Processed meat	13	29	16
Fresh meat	12	0	-12
Oils	10	9	-1
Pastries	6	0	-6
Spices	5	9	4
Other	10	0	-10

Source: Own editing.

3.2. Price premium in Hungary

There is also a significant difference in the average price premium for GI products (see Figure 6): Aldi had 29%, Penny Market 46% and the highest was in Lidl (54%). Overall, the average premium was around 43%, but it is important to note that only products which had an available direct substitute product in the same supply were included into our calculations. It should be emphasized that prices did not really change during the observations, only occasionally were these products featured at a lower price in the promotional offer. In the calculation of the price premium, the most representative prices for the 12 months have been used for both GI and substitute products. Although prices did not change, there was some variation in supply, month by month, but we did not exclude products that were not available for a month. GIs with unique characteristics

(e.g.: Grana Padano cheese) which there was no direct alternative were not included to our calculations.

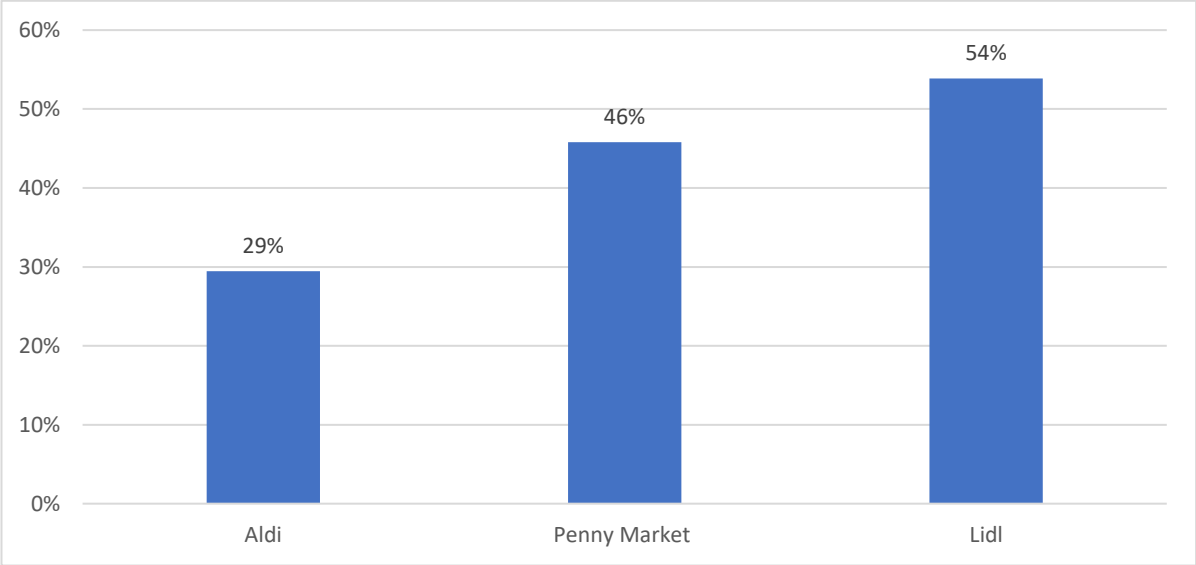

Figure 6. GI products' average price premium in the different discounters. Source: Own editing.

If we look at the PDO and PGI products separately in each of the discount stores (see Figure 7), we can see that while in Aldi there is no big difference in the average price premium for GI products, Lidl has a higher price premium (69%) for PDOs, while Penny Market has higher average for PGI (62%).

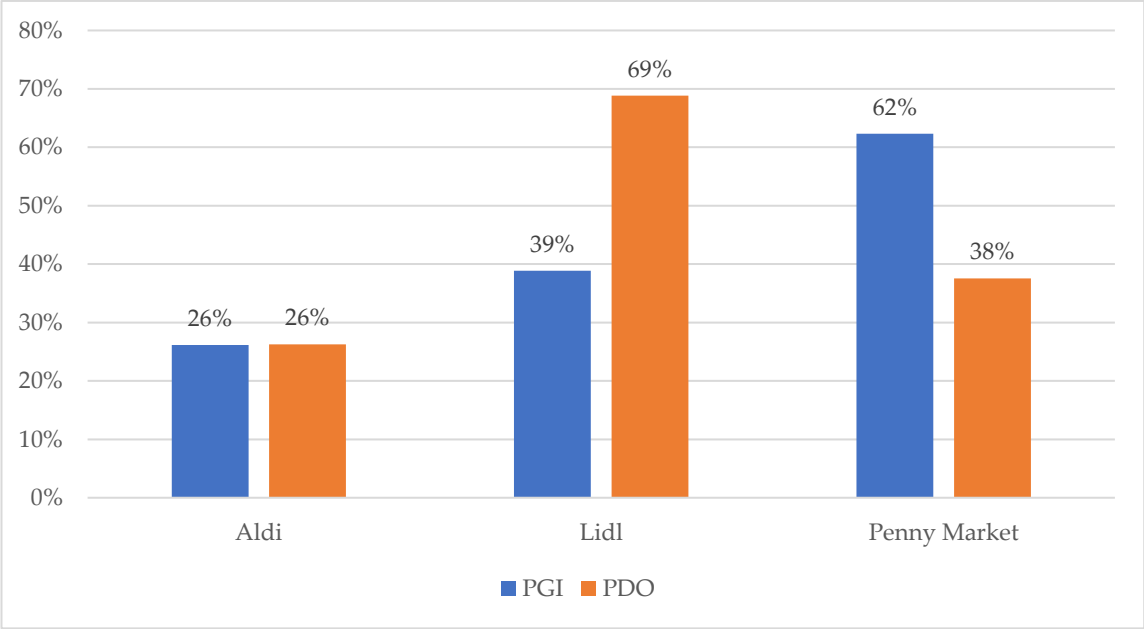

Figure 7. PDO and PGI products' average price premium. Source: Own editing.

By country of origin, the average price premium was highest for Greek and Austrian food (55%), but German and Hungarian products are also only a few percent behind (Table 3).

Table 3. Average price premium of GI food products depending on the origin, %.

Country	Average price premium
Italy	19
France	-
Spain	-
Portugal	-
Greece	55
Germany	47
Hungary	45
Other	55

Source: Own editing.

In terms of product categories (Table 4), spices realized the highest markup (111%), while vegetables and fruits ranked second highest with an average price premium of 55%. Other product groups available had similar average price margins (33-37%).

Table 4. Average price premium of GI food products depending on the food category, %.

Category	Average price premium
Vegetables, fruits	55
Cheese	33
Processed meat	37
Oils	33
Spices	111

Source: Own editing.

4. Discussion

It is clear from the literature and from the observed market processes of the last decade that the spread of discounters in the food retail sector has undeniably been remarkable both in Europe and in Hungary. In recent years, these types of stores have achieved the fastest growth in store numbers and sales, which is why the trends observed here can be

a good indicator of the Hungarian food retailing processes, even if the research on discounters is not representative for the whole industry.

Our results show that currently GIs have only limited importance in the Hungarian food market, both in terms of the number of products and their market share. Only a small number of this type of products are included in the food discounters' offer, and the number of GI products in each discounters was less than 1% (in terms of number of items) of their total food supply. At the same time, the fact that they have a limited supply and the majority of GI products available at discount prices are private labelled, all indicate that the products included in the supply are stable there. This also provides an opportunity for those current and future Hungarian GI products that can meet the strict delivery conditions required by the discounters.

If we consider the DOOR database as a benchmark, we can say that the proportion of PDO products is much higher in the Hungarian food discounters. This is also surprising because, according to Leufkens [17] and to Belletti, Burgassi, Manco, Marescotti, Pacciani and Scaramuzzi [18], international trade of PGI products is more common. This phenomenon may be explained by the fact that most of the limited supply is made up of those PDO products which international trade can be regarded as highly dominant (e.g.: Italian and Greek cheeses). Based on the origin of the products, the most of the food comes from imports, however, 18% of Hungarian products significantly exceed the share of Hungarian products in the DOOR database. Local sourcing becomes increasingly important for discounters, so the role of domestic GI products is also increasing. In addition to domestic products, Italian, Greek and German products are overrepresented. However, the 41% share of Italian products is not surprising given that Italy is the most important producer of GIs worldwide, while the high proportion of German products is explained by the fact that the examined discounters are all German-owned, which may influence their purchasing policies. However, the total shortage of products from other Mediterranean countries (France, Spain and Portugal) is surprising because they represent a large number of the products in the DOOR database [8]. It can be explained by the fact that the products of these countries are mainly focusing on their domestic markets and that access to price-sensitive foreign consumers is not a priority for these products. In terms of product categories, processed products (mainly cheeses and meat products) are significantly over-represented in the available supply, while fresh products (vegetables, fruit, fresh meat) play a marginal role or do not even appear at all. Logistic explanations may be the main reason for this: due to the additional cost of perishability, fresh GI

products are not really determinative for discounters. As regards the premium achievable in consumer prices, the average price premium is remarkably high (43% on average) in the case of discounters, which are focusing on reaching price sensitive consumers, indicating that there is a perceptible price premium for GI products in the Hungarian market. The difference between the individual discounters is significant, in Penny Market and Lidl, which sells most of GIs as private labelled products, average price premium is higher than Aldi which sells more commercial branded products. Our results are in line with those of previous literature, where they examined the premium price from the consumer side and found that consumers were willing to pay more for GI products [among others: 22,23-27]. Examining the relationship between the country of origin and the price premium, it can be pointed out that while most countries have a 45-55% mark-up, the price premium of the most important exporting Italian products is the lowest (19%). This also means that the price level of substitutes for Italian products is the closest to them, so Italian GI products have to compete with their prices. This also coincides with the fact that one of the lowest per product price premiums was found for GI cheeses coming from Italy, while for lower processed (though less available) vegetables the same value is much higher and the most significant premium is realized for spices according to our results.

It is important to consider the limitations of the study when interpreting the aforementioned results. Although food discounters represent key trends, they are not representative of the whole food retail trade. With the market size and price premium in the discounters, we can probably give an appropriate lower estimate for both of the attributes, since a food retailer with a much greater variety of supply and/or focusing on food specialties and less price sensitive customers may have a much higher share and price premium of GI foods. Therefore, the topic will require further research in the future involving other types of stores (e.g.: hypermarkets, online web shops) or involving discounters located in other countries, in order to gain a more comprehensive view of the GI food market.

5. Conclusions

Although GI foods play a key role in the European Union's food quality policy and in its international trade agreements, the data needed for a comprehensive analysis of the sector is very limited. The economic data available to investigate the role of GIs in Hungary is

also very limited. Therefore, the main purpose of the study is to estimate the market size of the sector and the price premium at consumer prices through the example of Hungarian food discounters. Through a 12 months long mystery shopping investigation involving three food discounter chains operating in Hungary, we created a database of 816 observations. Based on this analysis, the majority of GI products available in these discounters are imported (mainly Italian), with most products being private labelled and processed (cheese and meat) products. On one hand, this shows that the Hungarian GI food market is dominated by a few well-known Italian products while many domestic products are not available. On the other hand, GI foods are attractive enough for discounters to include them into their private labelled product portfolio.

The average price premium for GIs relative to their closest substitute products is 43%, which is particularly significant since discounters are traditionally aimed at price-sensitive consumers. Products from Italy and products with higher levels of processing had the lowest price premium, which also means that these products have to compete the most. These results could also encourage Hungarian producers to try to supply discounter chains where they can achieve more favourable prices, compared to generic substitutes.

All in all, our study shows that the number of GI products in the Hungarian food discounters supply is currently relatively limited, but at the same time it has a remarkable price premium. Based on this, we were able to provide a lower estimate of the market size and price premium for these products in Hungary, which is expected to be higher in the case of food chains targeting less price sensitive consumers of food retailing; however, this requires further research. Our results therefore enrich the limited empirical economic literature of the GI food sector.

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6.4. Factors Influencing Competitiveness in the Global Beer Trade[6]

Abstract: Beer is a widely produced, consumed, and traded alcoholic drink all around the world. This paper investigates the factors influencing competitiveness in the global beer trade on the macroeconomic level. To reach this aim, descriptive analysis and panel regression together with stability tests were used on the global beer market from 1998 to 2017. Results showed high concentration both in global production and trade, while except for the most competitive beer-exporting countries, the level of comparative advantages has significantly changed in these three decades. Based on the panel regression models, total beer production and per capita consumption, EU membership, and the number of beers with geographical indications have a positive impact on comparative advantages. In contrast, barley production, level of foreign direct investments, size of the population, GDP/capita, and high quality level of the beer export have a negative effect.

Keywords: competitiveness; beer; trade; geographical indication; beer consumption; barley production

1. Introduction

Beer is one of the oldest produced and most commonly consumed alcoholic drink all around the world. Since World War II, but in particular, during the last decades, the world market has been characterized by massive merger and acquisitions [1–3]. The greatest merger took place after 2004 when the largest Belgian and Brazilian breweries (Interbrew and Ambev) united into InBev. Not long after, there was another significant merger in 2008 when InBev and Anheuser-Busch formed AB InBev. Since then, AB Inbev continued the acquisitions and bought the shares of Mexico's Grupo Modelo, South Korea's Oriental Brewery, and SABMiller, becoming the leading brewing company of the world [4].

On the other hand, the market is also heavily shaped by the continuous change in consumers' preferences [5,6], therefore beer production has become an extremely

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competitive industry, in which almost all countries of the world participate. Through access to financing and production costs, economies of scale heavily influence the brewing industry. However, geographic distribution and the country concentration shows a regional bias due to either the higher barriers for regional entry of international competitors or the direct dependency of local industrial environments [7].

2. Literature Review

According to UN Comtrade [8] data, beer (made from malt) was the 171st most traded product globally in 2016, with a trade value of 13.8 billion USD. The top exporter was undoubtedly Mexico with its 27% share in total beer export, followed by three EU beer producers: the Netherlands, Belgium, and Germany with shares of 14%, 11%, and 9%, respectively. Beer import was even more concentrated: the USA alone represented 35% of global beer import, followed by France and the United Kingdom (5.5%), China (4.5%), and Italy (4.3%).

However, global beer production gives a different picture as the biggest beer producers are not the main exporters, indicating that domestic consumption plays a significant role in the beer industry. Based on the latest FAOSTAT [9] dataset available, 28% of global beer production was brewed in China, followed by the USA (the biggest importer, 13%), while 8% was produced in Brazil in 2014. The two main exporters, Germany and Mexico, only had market shares of 5.5%.

Several researchers have studied the beer industry from different points of views. For example, Fertő and Podruzsik [10] examined the pattern and driving forces of intra-industry trade (IIT) in the beer sector using relative factor endowments and the integrated Helpman and Krugman model. Their results showed a negative relationship between differences in capital-labor ratios and IIT, and between impacts of distance and IIT. The outcomes also confirmed the increasing role of IIT for beer products within the enlarged European Union. They also found that the vertical type of trade dominates over the horizontal type of trade. On the member states' level, Austria, France, Germany, Italy, and the United Kingdom report the highest levels of IIT. Olper, et al. [11] also examined the beer industry in the European Union. Using a theory-driven gravity equation, they found that the home bias in beer consumption is higher than in wine. The home bias in beer is widely attributable to the home market effect, which means the breweries are localized close to their consumers to minimize the high transport costs associated with

beer exports. The British market is also changing dynamically. The estimated price elasticities had additional consequences, especially the efficiency of U.K. customs and excise duties for on-trade draught beer and the imposition of a minimum price per unit of alcohol. According to the results, long-term beer demand is price-elastic [12]. Bieleková and Pokrivčák [13] used a gravity model to identify factors influencing the dynamics of international beer export. They found positive effects of the level of GDP of the importing country, cultural similarities, common borders, same language, and colonial links. Furthermore, they identified the trade-creating effects of the custom unions and signed free trade agreements. However, distance and "landlockedness," and the rise of population in importing countries are not in favor of beer trade.

Several trade-related studies exist which examine the trade agreement between the USA and Canada. Econometric analysis shows that it has a large impact on many American agricultural export categories: almost all consumer-oriented products, except wine and beer. According to the same study, American affiliate sales in Canada have stimulated American exports of consumer-oriented products and intermediate products [14]. Natsuko et al. [15] analyzed industry seller concentration, advertising, and price-cost margins for the U.S. beer brewing industry from 1950 to 2004. According to this study, industry advertising has been an important strategic variable, and the concentration of the brewing industry has risen dramatically in the last decades. However, competition has remained aggressive. They found empirical evidence for that the war of attrition contributed to low price-cost margins, even though industry concentration was high and increasing. The speed of convergence of industry concentration was not constant but varied with financial stress in the industry. Both advertising and rising scale economies led to increases in the steady-state concentration level in brewing, according to the authors.

In our study, we focused on the competitiveness of the beer industry on the international level. Thomé and Soares [16] used a very similar approach, examining the international competitiveness and market structure with the revealed comparative advantage, relative position of market, Hirschman–Herfindahl index, and net export index for the period of 2003–2012. Their results showed a high concentration for both the import and export markets: the United States of America dominates imports, while Mexico, the Netherlands, Belgium, and Germany dominate exports. The actors in the market structure could be identified based on exporters, importers, and importers and exporters, stressing their market position. Gorton et al. [17] also used the revealed comparative advantage (RCA)

to evaluate competitiveness for several food groups (including beer) produced in Bulgaria and in the Czech Republic in comparison with the EU15 in 1997. They found that none of the countries was competitive regarding most arable crops and dairy products; however, niche products such as jams (Bulgaria) and beer made from malt (Czech Republic) were more competitive. The authors explained these results by the use of EU domestic export subsidies and therefore cannot reflect real competitiveness.

Against this background, in our paper, we try to give a comprehensive picture of the factors influencing the global beer trade between 1988 and 2017. The paper aims to recognize the characteristics of the international beer trade on the country level, involving all the potential macroeconomic factors identified in the literature. In the second chapter, we introduce the methodologies used in our paper and the hypotheses to be tested. The results section first gives a descriptive analysis of the global beer trade, then expounds the outcome of the panel regression model and its duration tests. Section 4 discusses the results, while the last part of the paper concludes.

3. Materials and Methods

In our study, we examined the comparative advantage using the index of symmetric revealed comparative advantage (SRCA), calculated for all countries exporting beer between 1988 and 2017. The original index of revealed comparative advantage connected by Balassa [18] explains the revealed comparative advantage or disadvantage index of exports to reference countries by comparing a given country's export share in its total export, in correlation with the focus country's export share in its total export.

$$B_{ij} = \left(\frac{X_{ij}}{X_{it}} \right) \Big/ \left(\frac{X_{nj}}{X_{nt}} \right) \quad (1)$$

where X means export, i indicates a given country, j is for a given product, t stands for a group of products, and n for a group of countries. It follows that the revealed comparative advantage or disadvantage index of exports to reference countries can be calculated by comparing a given country's export share from its total export, in correlation with the focus country's export share in their total export.

The Balassa index is often criticized because it neglects the different effects of agricultural policies and exhibits asymmetric values. Different state interventions and trade limitations distort trade structure. At the same time, the asymmetric value of the

Balassa index (B index) reveals that it extends from one to infinity if a country enjoys a comparative advantage. Still, in the case of comparative disadvantage, it varies between zero and one, which overestimates a sector's relative weight. Vollrath suggested three different specifications of the revealed comparative advantage to eliminate the disadvantages of the Balassa index, the detailed description of which can be found in Vollrath [19].

To treat the asymmetric value problem of the Balassa index, Dalum et al. [20] transformed the B index, creating the revealed symmetric comparative advantage (RSCA) index as a linear transformation of the Balassa index (B), where

$$SRCA = (B - 1)/(B + 1) \quad (2)$$

The RSCA ranges between −1 and 1, with values between 0 and 1 indicating a comparative export advantage, and values between −1 and 0 indicating a comparative export disadvantage. Since the RSCA distribution is symmetric around zero, potential bias is avoided [20].

To identify the factors influencing the competitiveness of beer trade, we also ran a panel regression model with variables explained in Table 1, responding to all of our hypotheses. We applied a panel-data linear model by using feasible generalized least squares and linear models.

$$SRCA = \alpha + \beta_1 logBarleyprod_{ij} + \beta_2 logFDI_{ij} + \beta_3 logPop_{ij} + \beta_4 logGdppc_{ij} + \beta_5 logBeerprod_{ij} + \beta_6 pccon_{ij} + \beta_7 eumember_{ij} + \beta_8 gibeer_{ij} + \beta_9 tuv_{ij} + \varepsilon_{ij} \quad (3)$$

Table 1. Variables included in the panel regression calculations. RCA: revealed comparative advantage; SRCA: symmetric revealed comparative advantage; FDI: foreign direct investment; DOOR: Database of Origin & Registration.

Variable	Remark	Source	Expected Sign
SRCA	dependent variable, normalized RCA index	own composition based on World Bank data	NA
logBarleyprod	logarithm of the barley production	FAOSTAT	+

logFDI	logarithm of FDI income measured in current USD	World Bank	+
logPop	logarithm of the population	World Bank	+
logGdppc	logarithm of the GDP/capita	World Bank	+
logBeerprod	logarithm of the beer production	FAOSTAT	+
pccon	per capita beer consumption	World Health Organization	+
eumember	dummy variable, = 1 if the given country was the member of the European Union in the given year	European Commission	+
gibeer	number of beers with geographical indications in the DOOR database in the given year	European Commission	+
tuv	unit value of the beer export	FAOSTAT	+

Source: own composition.

In our investigation, we set up several hypotheses to test with the panel regression model, as follows:

H1: *Higher factor endowments increase comparative advantages*

Higher factor endowments of a country might lead to higher comparative advantages based on the higher number of resources available. For example, Török and Jámbor [21] found that factor endowments are positively related to the competitiveness of the European ham trade. For beer, besides water, barley is the most important input; therefore, we expect that countries producing more barely are more competitive in the beer trade. On the other hand, trade and foreign direct investments (FDIs) correlate, as suggested by many authors (e.g., [22–25]). In the global beer industry, mergers and acquisitions played an important role in the last decades: multinational beer producing companies have merged and bought up national companies. We expect that the high level of FDI might have a positive influence on a country's beer-related competitiveness, however, in other food industries, we can also find different results (e.g., for the EU cheese market [26]).

H2: *Size and income level of the population positively correlate with comparative advantages*

Besides a large domestic market, the size of the population might positively influence the level of competitiveness of beer trade, which has been found for other sectors before (e.g., [27]). Furthermore, beer expenditures rise with aggregate expenditure, generating a higher domestic market [28]. In general, a higher level of GDP/capita results in a higher level of competitiveness (e.g., Fathy [29], Muryani, Sari, and Landiyanto [27], and Balogh and Jámbor [26]), however Jambor and Babu [30] and Matkovski et al. [31] concluded that in most regions GDP per capita is negatively related to agricultural competitiveness. As beer is a processed food product with a high level of added value, we expect that purchasing power positively correlates with beer trade.

H3: *Quantity of beer production and consumption of the domestic market increase comparative advantages*

We expect that the bigger the domestic production is, the higher the SRCA index of a beer exporting country is. Moreover, historical and traditional links to beer production and consumption are often accompanied with a higher level of per capita beer consumption (e.g., the Czech Republic, Ireland, Germany, and Belgium), and these countries are traditionally the dominant players of beer trade. Therefore, we expect that a high level of per capita consumption positively correlates with competitiveness.

H4: *EU membership positively correlates with comparative advantages*

The internal market of the European Union is significant per se, and many of the member states are highly interested in the beer trade. Therefore, trading among the member states without any barriers might influence the competitiveness of beer trade, as found earlier by Buturac et al. [32] for the Croatian food industry in general and by Balogh and Jámbor [26] for the EU cheese market. In addition, the EU market itself has great similarities across many of the member states in terms of per capita and off-trade consumption of beer [33].

H5: *Geographical indications are positively related to comparative advantages*

Products whose quality and/or reputation is highly influenced by their geographical origin are usually accompanied by geographical indications (GIs). Currently, the globally most

significant GI register of the European Union contains 22 beers from 5 different countries. In the European GI food production, beers (mainly from Germany and the Czech Republic) play an important role [34], and the share of beers in the total sales value of agricultural products and foodstuffs under GI was 15% in 2010 [35]. In general, the presence of GIs in the exporter country positively affects its export performance [36,37], [26] therefore we expect that the number of GI beers registered in the EU system is positively related to comparative advantages.

H6: *Exporting quality beer fosters comparative advantages*

Countries exporting beer of higher quality, resulting in higher unit values, might reach more competitive positions compared to those specialized in mass product export. Regarding beer standards, the German Reinheitsgebot is the oldest still-active food law [3]. It was also found that for beer (together with wine and coffee and other transformed artisanal food), in the advanced industrialized economies, there are movements toward both quality production and consumption [38].

Besides calculating the RSCA index, much of the literature suggests that their stability and duration should be measured as well. In analyzing the stability of the RSCA index, a regression was run on the dependent variable, RSCA index at time t_2 (for sector i in country j), which was tested against the independent variable—the RSCA index in year t_1 (3).

$$RSCA_{ij}^{t2} = \alpha_i + \beta_i RSCA_{ij}^{t1} + \varepsilon_{ij} \quad (4)$$

where α and β are standard linear regression parameters, and ε is a residual term. If $\beta = 1$, then this suggests an unchanged pattern of the RSCA between periods t_1 and t_2, meaning there is no change in the overall degree of specialization in the global beer trade. On the one hand, if $\beta > 1$, the existing specialization is strengthened, meaning that a low level of specialization in the initial period leads to less specialization in the future, which is called β divergence [39]. On the other hand, if $0 < \beta < 1$, commodity groups with low initial B indices grow over time, which is called β convergence [39]. However, if $\beta < 0$, a change in the sign of the index is shown.

However, as Dalum, Laursen, and Villumsen [20] point out, the $\beta > 1$ is not a necessary condition for growth in the overall specialization pattern. They argue that sufficient

conditions for specialization or despecialization need further analyses. If R is the correlation coefficient of the regression, then the pattern of a given distribution is unchanged when $\beta = R$. If $\beta > R$, then the degree of specialization has grown (leading to divergence). If $\beta < R$, then the degree of specialization has fallen (meaning convergence). Following Bojnec and Fertő [40], a survival function S(t) can also be estimated by using the non-parametric Kaplan–Meier product limit estimator, which pertains to the product level distribution analysis of the RSCA index. Following [40], a sample contains n independent observations denoted (ti; ci), where i = 1, 2, n and t_i is the survival time, while ci is the censoring indicator variable C (taking on a value of 1 if a failure occurred, and 0 otherwise) of observation i. Moreover, it is assumed that there are $m < n$ recorded times of failure. Then, we denote the rank-ordered survival times as $t(1) < t(2) < \ldots < t(m)$. Let n_j indicate the number of subjects at risk of failing at t(j) and let d_j denote the number of observed failures. The Kaplan–Meier estimator of the survival function is then (with the convention that $\hat{S}(t) = 1$ if $t < t(1)$):

$$\hat{S}(t) = \prod_{t(i)<t} \frac{n_j - d_j}{n_j} \quad (5)$$

4. Results

4.1. Global Beer Market and Trade

Table 2 shows the top 10 beer producer countries in three periods (1991–1998, 1999–2006, and 2007–2014, as the latest global dataset on beer production is available only until 2014) and their share of total beer production. The combination of the top 10 countries almost did not change during the examined periods. The only variation among the countries was that Poland replaced South Africa in the top 10 list. Within the list, however, there have been changes in the order. China took the leading position in increasing ratio over the years. Germany and Japan have reduced their share in world beer production, while Brazil and Mexico have greatly increased it. The total concentration of the top 10 countries did not change in the examined periods, and it was around 67–68%.

Table 2. Global beer production.

1991–1998		1999–2006		2007–2014	
Country	**Share**	**Country**	**Share**	**Country**	**Share**
United States	19.69 %	China	18.53 %	China	25.47 %
China	12.56 %	United States	16.01 %	United States	12.67 %
Germany	9.31%	Germany	6.98%	Brazil	6.78%
Japan	5.69%	Brazil	5.76%	Russia	5.06%
United Kingdom	4.83%	Russia	5.00%	Germany	5.00%
Brazil	4.80%	Mexico	4.55%	Mexico	4.64%
Mexico	3.86%	United Kingdom	3.89%	United Kingdom	2.51%
South Africa	2.15%	Japan	3.05%	Poland	2.11%
Russia	2.10%	Spain	2.03%	Spain	1.85%
Spain	2.06%	Poland	1.94%	Japan	1.77%
Concentration	67.05 %	Concentration	67.74 %	Concentration	67.87 %

Source: FAOSTAT [9].

In case we take a look at the global production on the company level, we can also observe clear tendencies. In recent years the most important change in the market was when AB InBev bought the second-biggest SABMiller in 2015; therefore, it is worthy of investigating years 2014 and 2016. After the merger, AB InBev's growth in the global beer market share was moderate due to the portfolio cleaning of the former SABMiller's brands, both alcoholic and non-alcoholic. On the other hand, the second Heineken could also realize 1% growth, and the Chinese China Res Snow Breweries became the third-biggest brewery in the world. In parallel, the share of the others grew from 48% to 56%, indicating a fierce competition of the global beer market on the company level (Table 3).

Table 3. Global beer production on the company level.

2014		2016	
Company	**Share**	**Company**	**Share**
AB InBev	21%	AB InBev	22%
SABMiller	10%	Heineken	10%
Heineken	9%	China Res Snow Breweries	6%
Carlsberg	6%	Carlsberg	6%
China Res Snow Breweries	6%	Other	56%
Others	48%		

Source: Anderson, Meloni, and Swinnen [3], Institute of Alcohol Studies [41].

Table 4 shows the top beer exporting countries in three periods (1988–1997; 1998–2007; 2008–2017) and their share of total beer export. In the last period, Mexico took first place from the Netherlands; however, the share of the top three countries in total exports has been continuously decreasing. This is also the case for the concentration of the top 10 countries; it has decreased from 80.78% to 75.49% in the examined periods; however, the ranking of the top 10 countries has almost not changed in these 30 years. Canada dropped out from the list, while Portugal appeared as a new entrant in the last period.

Table 4. Top beer exporters.

1988–1997		**1998–2007**		**2008–2017**	
Country	**Share**	**Country**	**Share**	**Country**	**Share**
Netherlands	22.71%	Netherlands	19.86%	Mexico	18.68%
Germany	13.50%	Mexico	17.60%	Netherlands	15.68%
United Kingdom	7.15%	Germany	12.43%	Germany	10.55%
United States	7.00%	Belgium	7.53%	Belgium	10.12%
Belgium	6.86%	United Kingdom	7.41%	United Kingdom	6.56%
Mexico	6.46%	Denmark	3.88%	United States	3.74%
Denmark	5.01%	Ireland	3.85%	France	2.98%
Canada	4.31%	Canada	3.40%	Ireland	2.63%
Ireland	4.00%	United States	2.92%	Denmark	2.55%
France	3.78%	France	2.67%	Czech Republic	1.98%
Concentration	80.78%	Concentration	81.54%	Concentration	75.49%

Source: World Bank [42].

Table 5 presents the top 10 beer importer countries in the same three periods and their share of total beer import. The United States has retained its leading position in the last 30 years, with a very high share of imports (34.67%, 41.80%, and 34.40%, respectively). The second country in the list is the United Kingdom, far behind, with 10.51%, 8.13%, and just 5.82% in the last period. The total concentration of the top 10 countries decreased by almost 8% from the period of 1997–2007 to the period of 2008–2017. Most countries were always on this list, although Japan and the Russian Federation have disappeared, while the Netherlands and Australia got onto the list in the last period.

Table 5. Top beer importers.

1988–1997		1997–2007		2008–2017	
Country	**Share**	**Country**	**Share**	**Country**	**Share**
United States	34.67 %	United States	41.80 %	United States	34.40 %
United Kingdom	10.51 %	United Kingdom	8.13%	United Kingdom	5.82%
Italy	7.17%	Italy	6.14%	France	5.34%
France	6.63%	France	5.34%	Italy	5.13%
China	4.40%	Canada	3.74%	Canada	4.74%
Germany	4.01%	Germany	3.29%	Germany	4.31%
Spain	3.29%	Spain	2.64%	Netherlands	2.58%
Japan	3.12%	Ireland	2.29%	China	2.47%
Russian Federation	1.88%	Netherlands	2.01%	Spain	2.26%
Canada	1.81%	Belgium	1.66%	Australia	2.18%
Concentration	77.48 %	Concentration	77.03 %	Concentration	69.23 %

Source: World Bank [42].

4.2. Competitiveness in the Global Beer Trade

The top 10 countries (with a minimum average of 10 million USD beer trade value) based on their SRCA index of beer production are highlighted in Table 6. In the last examined period, Namibia had the highest SRCA index, followed by Jamaica and Mexico. As SRCA indicates revealed comparative advantages with a value higher than zero, results suggest that the biggest beer exporters, Mexico and Netherlands in particular, have always had comparative advantages. On the other hand, these two countries, accompanied by Denmark and Croatia, were among the most competitive beer exporting countries in all three selected periods.

Table 6. Top SRCA indices, an average of the selected periods.

1988–1997		1998–2007		2008–2017	
Country	**SRCA**	**Country**	**SRCA**	**Country**	**SRCA**
Kenya	0.74	Namibia	0.93	Namibia	0.93
Netherlands	0.70	Jamaica	0.86	Jamaica	0.88
Denmark	0.68	Mexico	0.74	Mexico	0.77
Mexico	0.63	Netherlands	0.68	Kenya	0.76
Czech Republic	0.63	Denmark	0.61	Serbia	0.71
Ireland	0.60	Dominican Republic	0.60	Portugal	0.63

Dominican Republic	0.52	Serbia	0.57	Netherlands	0.63
Croatia	0.45	Ireland	0.50	Dominican Republic	0.60
Slovenia	0.43	Croatia	0.42	Croatia	0.59
Serbia	0.37	Czech Republic	0.39	Denmark	0.56

Note: only countries with beer export more than 10 million USD per year on average in the selected period.

Results of panel regression are summarized in Table 7. Both models provide solid results, and the vast majority of the variables are statistically significant (mostly with $p < 0{,}01$). The logarithm of the barley production, of the FDI, of the population, and of the GDP/capita and unit value of the beer export have given a negative value. In contrast, the other variables of total beer production and per capita consumption, EU membership, and the number of EU GI beers have a positive impact on this index.

Table 7. Results of the panel regression models.

	SRCA Xtgls	**SRCA Xtreg**
logBarleyprod	−0.012	−0.046
	(1.82) *	(3.83) ***
logFDI	0.002	−0.013
	(0.21)	(1.95) *
logPop	−0.143	−0.132
	(7.15) ***	(3.79) ***
logGdppc	−0.149	−0.007
	(6.46) ***	(0.29)
logBeerprod	0.117	0.129
	(6.64) ***	(6.17) ***
pccon	0.054	0.038
	(4.81) ***	(4.03) ***
eumember	0.278	0.059
	(8.41) ***	(1.88) *
gibeer	0.025	−0.007
	(2.18) **	(0.71)
tuv	−0.079	0.007
	(3.24) ***	(0.43)
_cons	1.851	0.984
	(7.07) ***	(1.90) *
N	1.491	1.491

Note: Standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

4.3. Stability of the Global Beer Trade

Our stability tests confirm that in general, trade patterns have significantly changed in the period analyzed. By increasing the number of time lags, β values significantly decreased, indicating that the pattern of revealed comparative advantage has converged, or in other words, low B values increased over time, while high values decreased. The β/R values also underpin these results (Table 8).

Table 8. Stability of the SRCA index between 1988 and 2017.

Lags	**α**	**β**	***p*-Value**	**R^2**	**R**	**β/R**	**N**
1	−0.0687	0.8290	0.0000	0.8433	0.9183	0.9027	3557
2	−0.0978	0.7367	0.0000	0.7721	0.8787	0.8384	3358
3	−0.1932	0.4992	0.0000	0.7320	0.8556	0.5835	3180
4	−0.2413	0.3882	0.0000	0.6899	0.8306	0.4674	3022
5	−0.3005	0.2378	0.0000	0.6331	0.7957	0.2988	2859
6	−0.2943	0.2623	0.0000	0.6048	0.7777	0.3373	2696
7	−0.3107	0.2218	0.0000	0.5910	0.7688	0.2886	2530
8	−0.3414	0.1512	0.0000	0.5767	0.7594	0.1991	2364
9	−0.3797	0.0486	0.0000	0.5531	0.7437	0.0654	2209
10	−0.3528	0.0827	0.0000	0.5539	0.7442	0.1111	2049
11	−0.3585	0.0583	0.0000	0.5299	0.7279	0.0801	1890
12	−0.3676	0.0828	0.0000	0.5250	0.7246	0.1143	1739
13	−0.3782	0.0465	0.0226	0.5012	0.7080	0.0657	1591
14	−0.3540	0.0727	0.0004	0.5023	0.7087	0.1025	1436
15	−0.3248	0.0819	0.0001	0.4941	0.7029	0.1166	1289
16	−0.3196	0.0659	0.0022	0.4739	0.6884	0.0957	1141
17	−0.2968	0.0721	0.0027	0.4525	0.6727	0.1072	999
18	−0.3046	0.0528	0.0350	0.4676	0.6838	0.0773	859
19	−0.3271	0.0684	0.0080	0.4969	0.7049	0.0971	727
20	−0.3513	0.0625	0.0236	0.5060	0.7113	0.0879	609
21	−0.3283	0.0957	0.0024	0.5106	0.7146	0.1339	491
22	−0.3087	0.0742	0.0298	0.5267	0.7257	0.1022	381
23	−0.2425	0.1972	0.0000	0.5701	0.7550	0.2612	292
24	−0.2169	0.2843	0.0000	0.6044	0.7774	0.3657	207
25	−0.2852	0.2816	0.0000	0.5835	0.7639	0.3686	146
26	−0.3285	0.1745	0.0146	0.5147	0.7174	0.2432	94
27	−0.2157	0.3974	0.0000	0.4453	0.6673	0.5956	61
28	−0.2955	0.3207	0.0046	0.3360	0.5797	0.5532	33

In further analyzing the changes of revealed comparative advantage in the global beer trade, its duration was estimated with the non-parametric Kaplan–Meier product limit estimator. As described earlier, equation 5 was run on our panel dataset and results confirm that the survival times of the revealed comparative advantage in the global beer

trade were not persistent over the period analyzed in general (Table 9). Survival chances of 97% at the start of the period fell to 0% by 2017, suggesting that fierce competition is existent in the global beer trade. However, the Netherlands, Denmark, Mexico, and Croatia—the only four countries that were among the beer exporters with the highest SRCA values in all of the selected periods—always had revealed comparative advantage in the beer trade.

Table 9. Kaplan–Meier survival rates for the SRCA index.

Years	Survival function	Netherlands	Denmark	Mexico	Croatia
1988	0.9987	1.000	1.000	1.000	1.000
1989	0.9957	1.000	1.000	1.000	1.000
1990	0.9919	1.000	1.000	1.000	1.000
1991	0.9870	1.000	1.000	1.000	1.000
1992	0.9798	1.000	1.000	1.000	1.000
1993	0.9700	1.000	1.000	1.000	1.000
1994	0.9563	1.000	1.000	1.000	1.000
1995	0.9398	1.000	1.000	1.000	1.000
1996	0.9217	1.000	1.000	1.000	1.000
1997	0.9007	1.000	1.000	1.000	1.000
1998	0.8800	1.000	1.000	1.000	1.000
1999	0.8561	1.000	1.000	1.000	1.000
2000	0.8276	1.000	1.000	1.000	1.000
2001	0.7987	1.000	1.000	1.000	1.000
2002	0.7688	1.000	1.000	1.000	1.000
2003	0.7376	1.000	1.000	1.000	1.000
2004	0.7047	1.000	1.000	1.000	1.000
2005	0.6720	1.000	1.000	1.000	1.000
2006	0.6390	1.000	1.000	1.000	1.000
2007	0.6053	1.000	1.000	1.000	1.000
2008	0.5696	1.000	1.000	1.000	1.000
2009	0.5345	1.000	1.000	1.000	1.000
2010	0.4974	1.000	1.000	1.000	1.000
2011	0.4586	1.000	1.000	1.000	1.000
2012	0.4172	1.000	1.000	1.000	1.000
2013	0.3729	1.000	1.000	1.000	1.000
2014	0.3247	1.000	1.000	1.000	1.000
2015	0.2682	1.000	1.000	1.000	1.000
2016	0.1970	1.000	1.000	1.000	1.000
2017	0.1132	1.000	1.000	1.000	1.000
Log-rank test		0.0000			
Wilcoxon test		0.0000			

5. Discussion

Similar to Thomé and Soares [16] but on a more holistic perspective, we also found a high level of concentration, both in production and trade. On the other hand, it is important to underline that the biggest beer producers (China and the United States, representing almost 40% of the global production) are marginal exporters, meaning that they are producing for domestic consumption. On the other hand, several countries with smaller domestic markets are specialized in beer export (Mexico and the Netherlands in particular), representing more than one-third of global beer export. The United States remained the most important beer importer (more than 33% of global import), suggesting that U.S. domestic production is far below the domestic demand. On the contrary, recently, the Chinese beer import has significantly decreased, indicating that Chinese beer demand is usually fulfilled with domestic production.

Our SRCA calculations have put some unexpected countries on the list of the most competitive beer-exporting countries. Similar reasons could explain why this phenomenon exists. First of all, we have to underline that all of these countries, except Croatia, are classified as beer-focused countries, based on their consumption volume intensity indices [28]. In the African countries, the colonial links have played an important role in beer production, and this cultural heritage fosters beer export [13]. In Namibia, high-quality brewing is a legacy of the Germans, and the Namibian beer is still produced according to the German Beer Purity Law, that secures the real high beer quality for centuries [3]. The majority of this high-quality product is exported, mainly to South Africa and over 20 other countries all around the world [43]. In Kenya, the first brewery was established in 1922 by British investors, and in recent years the biggest international beer companies have acquired local breweries, including Kenyan beers in the global market [44]. In the Caribbean, after rum, beer is the most produced, consumed, and exported alcoholic drink. Both Jamaica and the Dominican Republic have their world-famous national beer (Red Stripe and Presidente, respectively), and both brands have been acquired by one of the mega-breweries, including them in their international product (brand) portfolio [45,46].

Several countries in the Western Balkans are also on the list. In these countries, strong local brands with a remarkable reputation exist and are usually acquired by one of the big chains. Exports in high quantities exist, mainly to neighboring countries, which in this case belonged to the same country (Yugoslavia) until 1992. In Serbia, the Apatin brewery—covering half of the market—was a member of the StarBev until it was bought by Molson Coors [47]. The Croatian beer sector consists of seven breweries and is

traditionally export-oriented (remarkable sales to Bosnia and Herzegovina) [48]. Two major breweries have traditionally dominated the Slovenian beer market, and here the ownership remained national as the biggest brewery acquired the other, after a long battle with Interbrew [49]. To summarize, very high SRCA indices in small countries are either due to international acquisitions or remarkable export to regional markets, both resulting in relatively high export shares and therefore comparative advantages. This is in line with the findings of Zanotti, Reyes, and Fernandez [7], underlying the importance of regionality in the European beer market.

Regarding the hypotheses, based on the panel regression model providing significant results, several conclusions can be made (see the summary in Table 10). According to our model, we identified four factors positively influencing the level of comparative advantages in the global beer trade. The level of beer production might result in higher competitive positions, in the case of big producers with a relatively small domestic market in particular (e.g., the Netherlands and Belgium). We also found that exporters with high per capita consumption are usually more successful in beer export. Like in the case of many other food products, the EU internal market plays a dominant role globally, therefore being a member of this club fosters the competitiveness in the global beer trade. This is also in line with Bieleková and Pokrivčák [13] and Fanli [33]: the EU as a custom union and as a converging beer market has a trade-creating effect by itself. Furthermore, countries with traditional beer products the quality of which is closely linked to the place of origin, are usually with a higher level of comparative advantages as the number of registered beers with geographical indication positively correlates with SRCA indices (e.g., in the case of the Czech Republic and Germany).

On the other hand, many of our assumptions were rejected. Higher factor endowments do not contribute to higher comparative advantages. Water and barley are the inputs mostly required for beer production, and these commodities are easily accessible locally or through international trade. Though investments play a crucial role in companies' level in the beer industry (as it was discussed in many previous studies, e.g., [3,7,33,41]), in terms of international trade, this effect does not influence competitiveness. The size of the domestic market has a negative influence on comparative advantages, indicating that big producers focus more on their domestic market instead of exporting the products. This is in line with the fact that the biggest beer producers (e.g., China and the United States) play a minor role in international trade, and also that the Chinese China Res Snow Breweries became the third-biggest brewery of the world by 2016 [41]. As indicated

earlier in Table 6, among beer exporters with the highest comparative advantages, we found many developing countries (e.g., Namibia, Jamaica, and Mexico).

In contrast, rich countries, in general, import beer, therefore purchasing power and income level of the population in the exporter country is negatively correlated with export advantages. This was also proved by Holmes and Anderson [28], stating that beer expenditures rise with aggregate expenditure. Last but not least, exporting high quality and expensive beers might not result in higher comparative advantages, indicating that global beer trade is rather dominated by commodity-like beer products with lower unit values.

Table 10. Summary of the results.

H_1	***Higher factor endowments increase comparative advantages***	**rejected**
H_2	*Size and income level of the population positively correlate with comparative advantages*	rejected
H_3	*Quantity of beer production and consumption of the domestic market increase comparative advantages*	confirmed
H_4	*EU membership positively correlates with comparative advantages*	confirmed
H_5	*Geographical indications are positively related to comparative advantages*	confirmed
H_6	*Exporting quality beer fosters comparative advantages*	rejected

Our stability and duration tests confirmed that international beer trade, in general, is a highly competitive market as, in the examined 30 years, patterns in the comparative advantages significantly changed. However, the industry can be considered bipolar, as the countries with the highest level of comparative advantages were always competitive and are expected to remain in the future as well.

6. Conclusions

Global beer production is highly concentrated; the United States and China together represent more than one-third of the total production. The USA is also the most significant

importer, while China is producing mostly to the domestic market. Therefore, global beer export is highly dominated by several export-oriented countries: besides Mexico, mostly European countries.

While on the company level, the beer market is heavily influenced by mergers and acquisitions, this paper tried to analyze the global beer market and trade on the macro level. Based on the SRCA indices, the majority of the important exporters had revealed comparative advantages. However, some smaller countries had also outstanding performances, mainly due to historical reasons or specialization in regional exports. The panel regression models showed that to gain a high level of comparative advantage, the level of beer production, and the per capita domestic consumption, access to the EU markets and the production of high-quality, origin-linked beers matter the most. However, these comparative advantages can erode easily, except in the most successful beer exporters.

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