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Factors Influencing Competitiveness in the Global Beer Trade

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Received: 8 July 2020; Accepted: 22 July 2020; Published: 24 July 2020

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 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.

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

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

$$\mathrm{SRCA} = (\mathrm{B} - 1)/(\mathrm{B} + 1) \tag{2}$$

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.

$$\begin{aligned}\mathrm{SRCA} = \alpha + \beta_1 \mathrm{logBarleyprod_{ij}} + \beta_2 \mathrm{logFDI_{ij}} + \beta_3 \mathrm{logPop_{ij}} + \beta_4 \mathrm{logGdppc_{ij}} + \beta_5 \mathrm{logBeerprod_{ij}} \\ + \beta_6 \mathrm{pccon_{ij}} + \beta_7 \mathrm{eumember_{ij}} + \beta_8 \mathrm{gibeer_{ij}} + \beta_9 \mathrm{tuv_{ij}} + \varepsilon_{ij}\end{aligned} \tag{3}$$

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:

Hypothesis 1 (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]).

Hypothesis 2 (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.

Hypothesis 3 (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.

Hypothesis 4 (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].

Hypothesis 5 (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], ref [26] therefore we expect that the number of GI beers registered in the EU system is positively related to comparative advantages.

Hypothesis 6 (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 β < 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) < . . . < 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 $\widehat{S}$ (t) = 1 if t < t(1)):

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

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.

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 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: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

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 Fanelli [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).

Table 10. Summary of the results.

H1	*Higher factor endowments increase comparative advantages*	rejected
H2	*Size and income level of the population positively correlate with comparative advantages*	rejected
H3	*Quantity of beer production and consumption of the domestic market increase comparative advantages*	confirmed
H4	*EU membership positively correlates with comparative advantages*	confirmed
H5	*Geographical indications are positively related to comparative advantages*	confirmed
H6	*Exporting quality beer fosters comparative advantages*	rejected

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.

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.

Author Contributions: Conceptualization, Á.T., L.J., and Á.S.; methodology, Á.T.; software, Á.T.; validation, Á.T.; formal analysis, Á.T., L.J., and Á.S.; writing—original draft preparation Á.T., L.J., and Á.S.; writing—review and editing, Á.T., L.J., and Á.S.; visualization, Á.T. and L.J.; supervision, Á.T.; funding acquisition, Á.T. All authors have read and agreed to the published version of the manuscript.

Funding: This paper was supported by the János Bolyai Research Scholarship of the Hungarian Academy of Sciences, by the ÚNKP-19-4-BCE-01 and ÚNKP-19-3-I-BCE-134 New National Excellence Program of the Ministry for Innovation and Technology, and by the National Research, Development and Innovation Office projects of FK124800 and PD124791 "Economical and Social Impacts of Food Quality Schemes and Short Food Supply Chains in Hungary" and by the National Research, Development and Innovation Office Project No. 119669 "Competitiveness of Agriculture in International Trade: A Global Perspective".

Conflicts of Interest: The authors declare no conflict of interest.

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