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Working Paper

"When helping the small hurts the middle": Beer excise duties and market concentration

Working Papers in Economics and Finance, No. 2014-05

Provided in Cooperation with:

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Suggested Citation: Loretz, Simon; Oberhofer, Harald (2014) : "When helping the small hurts the middle": Beer excise duties and market concentration, Working Papers in Economics and Finance, No. 2014-05, University of Salzburg, Department of Social Sciences and Economics, Salzburg

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WHEN HELPING THE SMALL HURTS THE
MIDDLE: BEER EXCISE DUTIES AND
MARKET CONCENTRATION

SIMON LORETZ AND HARALD OBERHOFER

WORKING PAPER No. 2014-05

WORKING PAPERS IN
ECONOMICS AND FINANCE

"When helping the small hurts the middle"

Beer Excise Duties and Market Concentration¹

Simon Loretz² and Harald Oberhofer³

1. Introduction

During the last decade the beer market has been in the focus of the media, largely because of spectacular mergers between the big players. The formation of Anheuser-Busch InBev created the world's largest brewing company with a global market share of approximately 20 percent. There are consistent of a super merger between Anheuser-Busch InBev and SABMiller.⁴ This consolidation process in the beer market has triggered substantial interest as to how concentrated the market will eventually get and what the key driving forces behind the market concentration are. Technological changes and advertising have been identified as driving forces of increasing market concentration.

In this chapter we argue that beer excise taxes also have a significant influence on the market concentration. Taxes and levies on beer are not a new phenomenon, but rather are amongst the oldest sources of governmental revenue. The availability of other forms of taxation, most notably income taxation and broader consumption taxes such as e.g., the value added tax, has significantly reduced the need to raise revenues via beer excise taxation. However, mostly due to health concerns the taxation of alcohol in general and beer in particular has been on the raise again. This is also reflected in the decision of the European Union (EU) to introduce a minimum excise duty on beer. While the minimum tax is set low enough not to be binding for the vast majority of the member states, the directive of the EU results in a comparable excise tax system. Therefore the variation in the implementation through the different member states provides a neat framework to analyze the impact of beer excises on the market structure. The large disparity in the level of beer excises in the EU has an indirect influence on the market structure because it can change the global market position of the large players. In consequence the propensity to be a target of an international merger or acquisition can be driven by the level of beer excises.

Furthermore the EU introduced a provision for a possible reduction of the beer excise for small and independent breweries.⁵ If member states decide to implement this into their national tax rules, this implies that there should be a direct impact of excises taxes on the market structure. The fact that smaller breweries can face up to 50 percent less excise taxes works like a subsidy and should significantly increase their competitive position, increase their market share and

¹ This is a draft version for a chapter in an upcoming book entitled "Beer, Brewing and Pubs: A Global perspective", edited by Iganio Cabras, David Higgins and David Preece.

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⁴ The analysts at Credit Suisse (see CNBC, 2011) already pointed to this possibility. More recently the Economist (2014) discussed the potential super mergers.

⁵ See the Council Directive 92/84/EEC of 19 October 1992.

thereby reduce market concentration. However, the way the reduction in the excise taxes has been implemented, may as well result in a more concentrated market, if the medium sized breweries are deciding to reduce their output to benefit from the lower excise burden. Similarly the market can become more concentrated if the increased competition from small and independent breweries drives the medium sized breweries out of business resulting in a polarized market structure only leaving very large and very small competitors in the market.

To test how beer excise taxation affect the market structure we collect a unique dataset of beer excise tax rates in the 28 EU countries plus 11 other major beer drinking nations and the corresponding provisions for reduced rates for small independent breweries. We combine this dataset with information about market shares and data from mergers and acquisitions (M&As) to empirically estimate the influence of beer excises on the market structure in the beer market. First we estimate the impact of the overall level of beer excises on the recent waves of international M&As and hence the indirect impact on the market structure. Secondly we assess the direct impact of a more progressive - in the sense of stronger reductions for small breweries - beer excise system on market concentration.

Our results confirm that large international mergers dominate the changes in the market structure. These in turn are influenced by the overall level of beer excises. Theoretically the influence of the level of beer excises on the attractiveness of a potential target company is indeterminate. On the one hand higher excises make the location, and in consequence a company with a strong dependence on the home market less attractive. However, at the same time the high level of excise duties could reduce global competitiveness of the local companies and therefore make them vulnerable take-over candidates. Evidence suggests that the latter effect dominates and that countries with higher levels of beer excises end up with a larger share of the beer market controlled by big international brewers. Concerning the direct effect of lower excise taxes for small breweries we find mixed results for the impact on market concentration. While anecdotal evidence suggests that the rapidly increasing number of small breweries could be partially due to the lower excise tax burden, there is also evidence that the overall concentration increases due to the largest breweries gaining market shares. This is particularly evident in countries with a high overall level of excise taxation. Or, in other words, where the absolute subsidy to the small companies is larger and therefore more likely to adversely affect the medium-sized breweries.

The remainder of this chapter is organized as follows. Section 2 presents a short review of the literature on the market structure of the brewing industry. Section 3 discusses the situation of the beer excise taxes in Europe, how they are shaped by European legislation and presents some case study evidence on how the level and structure has affected the market structure in Austria and Germany. Section 4 discusses the main empirical results of our empirical investigation, while Section 5 concludes.

2. Previous literature

The beer industry has attracted the attention of the academic literature for a prolonged period of time and this short literature review primarily aims at embedding the current research within the literature, rather than providing an exhaustive literature review. Most of the early studies concentrated on the US brewing industry. In an early influential contribution Horowitz and Horowitz (1965) start from the observation that the beer market in the United States was stagnating and experienced a dramatic increase in market concentration at the same time. Investigating the role of technological change they derive a minimum efficient size of 100

thousand barrels and conclude that economies of scale are the main driving force for the dramatic increase in market concentration. A number of authors including Elzinga (1971), Scherrer (1973), and Tremblay (1987) followed in estimating minimum efficient scales for the brewing industry. Tremblay et. al (2005) bring together an number of these estimates and show that the minimum efficient scale has increased substantially over time.

The reasons behind the economies of scale in the brewing industry have also been subject to extensive research. Greer (1971) emphasized the role of advertising and product differentiation as an important force of the market structure in the US beer market. Sutton (1991, 1999) model endogenous fixed costs as the key determinant for the industry structure while Bresnahan (1992) discusses the role of advertising in this context. More recently Nelson (2005) and George (2009) investigate the role of advertising for the market structure of the US beer market.

Demand side factors which shape the market structure in the beer market also have been subject to extensive research. Estimating the elasticity of demand for beer Horowitz and Horowitz (1965) use excise taxes as proxy for the beer price, which indirectly (already) links beer excise taxes with the market structure. Also Hogarty and Elzinga (1972) estimate the demand for beer and find that excise taxes do significantly affect consumption behavior. For further research on the demand for beer and price formation in reaction to the market structure see Lynk (1984, 1985) and Tremblay (1985).

Another strand of the literature specifically focused on M&A activities in the beer market. Again, early contributions are based on the US brewing industry only, e.g. Tremblay and Horton. Tremblay (1988), for example, investigates the main determinants of acquisitions in the US beer market. More recently Pinkse and Slade (2004) also investigate M&As in the UK beer market. In addition to the UK beer market it is mainly the German beer market which has gained some attention from the academic literature. Gourvish (1994) compares the differences in market concentration in the US, the UK and German beer market. While concentrating on the role of technological change, Gourvish (1994) also mentions the differences in the taxation of beer. Similarly Adams (2006) compares the market concentration in the beer market in the US and Germany and also discusses the role of reduced excise taxes and focuses in particular on small breweries. However, he concludes that taxes are most likely not the most important driving force for overall market concentration, since the advent of a large number of microbreweries is insufficient to reverse the trend in market concentration in the US.

The role of micro-breweries in the market concentration in the US brewing industry is central to Tremblay et al (2005). They find, while the macro brewery sector had the well-known substantial increase in market concentration, the micro-brewery sector grew dramatically between 1977 and the mid 1990s. The fast growth in the number of breweries was followed by a shakeout in the late 1990s. Horvath et al. (2001) are specifically analyzing the industry shakeout in the US brewing industry and find that mass exits can be largely traced back to previous mass entries. The mass entries in turn are explained by a delay in the entry decision to gather more information. This empirical stylized fact is also consistent with the findings for many industries stating that the overall number of firms remains relatively constant while a lot of entry and exit might still occur (Geroski 1995).

Finally Pough et al (2001) investigate the impact of the introduction of reduced beer excise tax rates for small breweries in the UK. Specifically accounting for the strong concentration in the distribution they conclude that lower beer excise tax rates will benefit small breweries mostly in the short run. In the longer run, they expect the number of small breweries to increase, but not their profits because the monopsonistic distribution network will appropriate the increased profits.

3. Beer excise taxation and the beer market in Europe

This section discusses the legal regulations with regard to beer exercise taxation within EU member countries and its potential implications for the development of the European beer market. For this purpose we first present the main regulations on minimum beer excise taxation (Section 3.1) as well as the possibility to offer reduced rates for small breweries (3.2). Furthermore, we present data on the European beer markets and highlight structural differences in the demand for beer (3.3). Finally, we provide two case studies on the development of the Austrian and German beer market, thereby discussing the potential effects of EU's beer excise taxation regulations (3.4).

3.1. Minimum beer excise taxation

Excise duties on beer can take on various different forms and tend to be quite technical in nature. The first basic distinction is whether the excise is ad valorem or specific. For example, in the EU the minimum excise tax for beer is defined in a specific way, namely at EUR 0.748 per hectoliter/degree Plato or ECU 1.87 per hectoliter/degree of alcohol of the finished beer product. The minimum tax is defined with respect to the strength of beer, which reflects that the EU encourages beer excises which are progressive in the strength of the beer. For the purpose of this paper we need to define a typical beer in order to make the different tax systems comparable. Specifically we use the value 4.8 percent of alcohol, respectively 12 degree plato, which corresponds to a minimum beer tax burden of EUR 8.976 per hectoliter. In terms of a pint this translates into a minimum tax burden of about 5 euro cents.

Figure 1 displays the beer excise taxation for a typical beer and across all EU-28 member states. It also compares the most recent figures for 2014 with beer excise taxation in 2003. First of all, this figure points to heterogeneous preferences on beer excise taxes as one of the so-called sin taxes. Especially the Scandinavian member states, such as Finland, Sweden and Denmark collect the highest beer excise taxes. They are joined by the United Kingdom and Ireland which rank among the Top 4 in terms of the beer tax burden. With approximately EUR 140 per hectoliter beer that contains 4.8 percent of alcohol, Finland charges 15 times the minimum required beer excises taxes.

At the other end of the distribution, countries such as Bulgaria (EUR 9.20) and Germany (EUR 9.44) only collect beer excises taxes that are marginally above the minimum required by EU legislation. In 2014, Austria ranks 15th among 28 member states with a beer excise tax burden of EUR 24 per hectoliter of a typical beer. Comparing both sides of the distribution, for one pint of an average beer Finland charges an excise duty of 70 euro cent while Germany only charges 5 euro cent for the same amount of beer.

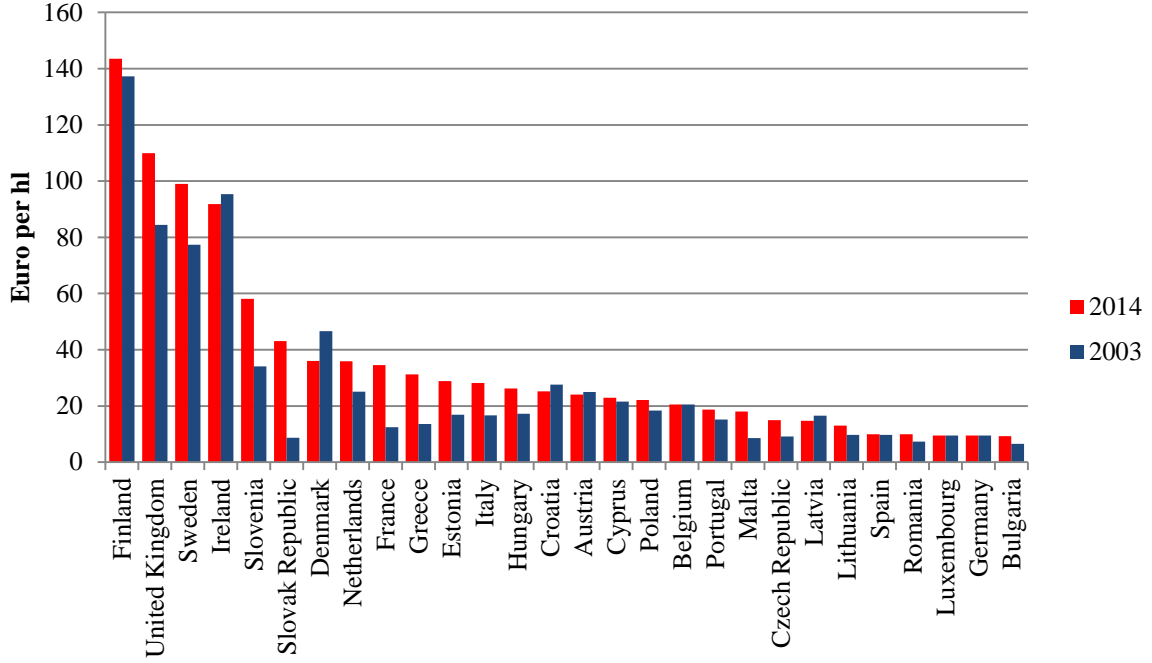


Figure 1: Beer excise tax burden in EU28 for a typical beer with 4.8 percent of alcohol,
(Source: EU excise duty tables)

Comparing the number for 2014 with 2003 it turns out that five countries lowered the beer excise taxes including, Ireland, Denmark, Croatia, Austria and Latvia. Another group of three countries did not at all change their beer excise tax burden (i.e, Belgium, Luxemburg and Germany). Spain only slightly increased its taxation by EUR 0.24 per hectoliter. The remaining 19 member states all increased their beer excise taxation over time where the largest increases (in absolute values) are observable in Slovakia, the United Kingdom and Slovenia. The corresponding changes amount to EUR 34.37, EUR 25.58 and EUR 24.00, respectively.

3.2. Reduced rates for small breweries

The second aspect of the EU legislation we are particularly interested in, is the possibility of a reduced beer excise rate for small and independent breweries with a yearly output of less than 200,000 hectoliters. The maximum allowed reduction is 50 percent. Consequently we want to construct a measure for the reduction which reflects the extent to which the member states make use of the allowed reduction for small breweries. Therefore we define our measure of progressivity θ_i as follows. Denote the excise duty which is applicable in country i for a brewery with an output of x hectoliters as τ_{ix} and the excise duty for a brewery with an output of 200,000 hectoliters or more as $\tau_i^{200,000}$. Then relating the excise tax which is applicable at the various output levels to the excise tax for large companies yields our progressivity measure

$$\theta_i = 2 \left(1 - \frac{\sum_{x=0}^{200000} \tau_{ix}^x}{\sum_{x=0}^{200000} \tau_i^{200000} x} \right).$$

If a country imposes the same excise tax rate for all breweries regardless their output level, the value of the fraction will be unity and our measure for progressivity will be zero. At the other extreme if a country would lower the excise burden by 50 percent for all companies below 200,000 hectoliters, the fraction would take the value of 0.5 and θ_i would be equal to one. Hence our measure of progressivity can be interpreted as the percentage of the maximum allowed

reduction granted to small and independent breweries. Not very surprisingly the value for our progressivity measure ranges from zero, i.e. a country is not allowing for any reduced rates for small breweries, to unity for countries which make full use of the allowed reduction. Note, that since we in particular analyze the minimum beer excise introduced by the EU, we concentrate our analysis on countries which have a comparable system for beer excises. This unfortunately rules out some important beer markets like China, Mexico or Brazil which use an ad valorem beer tax.

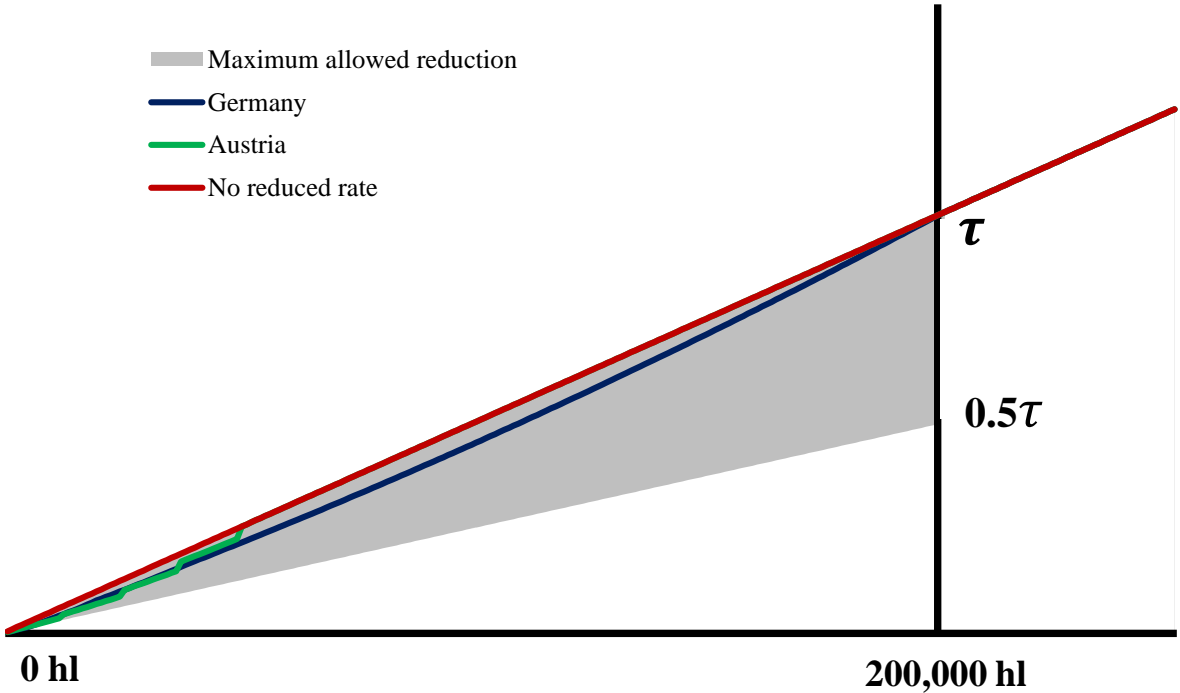


Figure 2: Illustration of the progressivity measure (Austria, Germany, maximum allowance),
(Source: own representation)

Figure 2 illustrates our measure of progressivity for Austria and Germany in comparison to the maximum possible reduction and the case of no reduction at all. The red line shows the case where there are no reduced rates for small breweries. This implies that the beer excise tax burden rises linearly with the excise tax rate τ . In 2014 seven EU countries are not making use of the possibility to lower the beer excise taxes (Croatia, Cyprus, Italy, Lithuania, Slovenia, Spain and Sweden). In contrast, the gray area illustrates the maximum possible reduction. In this case the beer excise tax burden rises with 0.5τ up to the output volume of 200,000 hectoliters. Currently five EU countries (Bulgaria, France, Greece, Malta, and Portugal) are granting this maximum beer excise tax reduction. The dark blue line in Figure 2 shows the progressivity of the beer excise taxes in Germany. For independent breweries below 200,000 hectoliters output the excise tax burden is gradually reduced to 56 percent of the standard rate. In contrast the green line shows the beer excise schedule for Austria. Here the reduction only starts for breweries with less than 50,000 hectoliters output. The reduction is increased in steps to a level of 60 percent of the standard rate. For some small output range the relative reduction in Austria is more generous than in Germany, but overall the reduction is more generous in Germany with 23 percent of the maximum allowed reduction compared to only 12 percent in Austria.

Table 1: Beer excise tax systems in EU28 member states, 2013

Country	Progressivity measure	Implicit average tax saving (Euro/hl)	Largest threshold in hl	Tendency
Austria	12%	1.50	50,000	Constant
Belgium	8%	0.78	200,000	Constant
Bulgaria	100%	4.60	200,000	Increased
Croatia	0%	0	0	Constant
Cyprus	0%	0	0	Constant
Czech Republic	51%	3.82	200,000	Constant
Denmark	8%	1.46	200,000	Increased
Estonia	1%	0.21	3,000	Increased
Finland	19%	13.54	100,000	Increased
France	100%	17.28	200,000	Increased
Germany	23%	1.09	200,000	Reduced
Greece	100%	15.60	200,000	Constant
Hungary	4%	0.52	8,000	Increased
Ireland	10%	4.58	20,000	Increased
Italy	0%	0	0	Constant
Latvia	5%	0.37	10,000	Increased
Lithuania	0%	0	0	Reduced
Luxembourg	91%	4.31	200,000	Constant
Malta	100%	9.00	200,000	Constant
Netherlands	15%	2.69	200,000	Increased
Poland	30%	3.26	200,000	Increased
Portugal	100%	9.33	200,000	Constant
Romania	85%	4.20	200,000	Increased
Slovak Republic	52%	11.22	200,000	Reduced
Slovenia	0%	0	0	Constant
Spain	0%	0	0	Constant
Sweden	0%	0	0	Constant
United Kingdom	8%	4.36	60,000	Increased

Table 1 summarizes the current beer excise tax systems in the 28 EU member states. The first column lists our measure of progressivity. The second column interacts the progressivity measure with the current level of beer excise taxation. This gives an indication about the absolute savings. For the case where the progressivity measure is 100 percent, this absolute saving is the discrete jump in beer excise tax burden for a company at the threshold. For the intermediate cases it reflects an output weighted average. France and Greece grant the largest reductions since they make full use of the allowed reduction scheme. Finland and the United Kingdom only make little use of reduced beer excise taxation. However, due to the high rate of the standard beer excise tax rate, the absolute savings are non-trivial. The fourth column gives further information about the largest breweries which will benefit from reduced taxation. Half of the EU member states do allow for some reduced excise tax burden up to the maximum allowed threshold of 200,000 hectoliter per year. Some other countries only reduce the rate for medium-sized breweries including the United Kingdom (with 60,000 hectoliter) and Austria (with 50,000 hectoliter). Hungary and Estonia only permit reduced beer excise taxation for very small breweries with a maximum annual beer production of 8,000 and 3,000 hectoliters, respectively.

3.3. Beer markets in Europe

In this Section we briefly present the main characteristics of the beer markets with the EU 28 member states. According to Table 2, the largest beer consuming country in Europe in absolute numbers is Germany with a beer market of almost 90 Million hectoliters. A distant second is the United Kingdom with beer market approximately half as big. At the other end of the (absolute) size distribution are some of the small Baltic States like Estonia with only 1.3 million and Latvia with 1.5 million hectoliters, respectively.⁶

The ranking of the beer markets changes substantially, once one looks at the consumption per capita. Now the Czech Republic tops the list with a per capita consumption of 147 liters of beer in 2013. Germany still ranks very high with a per capita consumption of 112 liters, followed closely by some smaller countries like Austria and Estonia. At the other end of the per capita consumption are the traditional wine drinking countries like Italy (27 liters per capita), France (29 liters per capita) and Greece with 31 liters per capita.

The remainder of Table 2 gives a first impression about the structure of the beer markets by providing the name of the biggest brewery in each beer market and its corresponding market share. To give a more precise indication about the fragmentation of the beer market the last two columns also report the biggest selling beer brand and its corresponding market share. Starting with the biggest players in the various countries, there are a few interesting things observable. The by far biggest brewing group of the world, Anheuser-Bush InBev is only market leader in its home market Belgium. The other big brewing companies Heineken, Carlsberg and SABMiller are market leaders in more European countries. Carlsberg is market leader in its home country Denmark and in a number of surrounding northern and Baltic countries. In contrast Heineken and SABMiller dominate some central and eastern European countries. In terms of absolute market power Slovenia stands out with a market share of almost three quarters for Pivovarna Laško dd. Other very concentrated markets are Austria which is dominated by Heineken and the home markets of Anheuser-Bush InBev in Belgium and Carlsberg in Denmark. In all of these countries the leading brewing group served more than half of the beer market in 2013.

⁶ The beer markets in the smallest European countries Luxembourg, Malta and Cyprus are too small to be covered in the Euromonitor dataset.

Table 2: Beer market characteristics in EU28 member states, 2013

	Beer consumption in 1000 hl	Beer consumption per capita	Biggest Brewing company	Market		Market share
				share	Biggest beer brand	
Austria	9216.11	109.60	Heineken NV	56.46%	Gösser	21.82%
Belgium	9231.40	85.05	Anheuser-Busch InBev NV	52.48%	Jupiler	35.13%
Bulgaria	5527.75	74.14	Heineken NV	34.26%	Ariana	17.00%
Croatia	3430.61	82.71	Molson Coors Brewing Co	34.16%	Ožujsko	29.93%
Czech Republic	15186.30	147.01	SABMiller Plc	43.22%	Gambrinus	13.81%
Denmark	3500.58	61.53	Carlsberg A/S	50.10%	Tuborg	30.38%
Estonia	1358.25	102.17	Carlsberg A/S	36.67%	Saku	30.12%
Finland	4287.44	80.13	Carlsberg A/S	36.74%	Karhu	19.21%
France	18787.38	28.90	Carlsberg A/S	26.24%	Kronenbourg	21.83%
Germany	89967.67	112.81	Oettinger Brauerei GmbH	6.21%	Oettinger	6.21%
Greece	3473.19	31.13	Heineken NV	47.48%	Amstel	26.67%
Hungary	7205.61	73.33	Molson Coors Brewing Co	17.49%	Borsodi	16.90%
Ireland	4334.23	95.26	Diageo PLC	25.61%	Guinness	21.22%
Italy	16172.13	26.97	SABMiller Plc	19.83%	Peroni	12.72%
Latvia	1552.76	77.61	Olvi Oyj	18.34%	Cesus	11.01%
Lithuania	2681.96	97.63	Carlsberg A/S	30.96%	Svyturys	13.94%
Netherlands	11068.82	67.26	Heineken NV	38.49%	Heineken	21.24%
Poland	38194.98	101.00	SABMiller Plc	36.86%	Tyskie	12.74%
Portugal	4695.65	45.92	Unicer - Bebidas de Portugal, SA	37.24%	Super Bock	34.98%
Romania	18159.60	91.11	SABMiller Plc	30.45%	Timisoreana	14.08%
Slovakia	3903.57	72.96	SABMiller Plc	42.09%	Saris	14.02%
Slovenia	1529.03	73.93	Pivovarna Laško dd	73.95%	Union	28.27%
Spain	33696.29	73.75	Grupo Mahou-San Miguel SA	28.91%	Mahou	28.91%
Sweden	4798.56	50.48	Spendrups Bryggeri AB	24.38%	Norrlands Guld	14.94%
United Kingdom	43642.61	70.47	Molson Coors Brewing Co	17.53%	Carling	14.18%

Notes: For Cyprus, Malta and Luxembourg are not covered in the dataset. Source: Global market information database by Euromonitor. Information is for 2013, to calculate the per capita consumption; we use the population number from the world development indicators from the Worldbank.

The two largest beer markets in absolute terms, the United Kingdom and even more so Germany constitute the opposite extreme. In both these countries the beer market is very fragmented with a market share for the biggest brewing company of only 6.21 percent in Germany and 17.53 percent in the United Kingdom. Finally, comparing the market shares of the biggest brand to the market shares of biggest brewing companies, one can see that the variation is much larger for the brewing groups. This indicates that there are more market forces at play than just consumer preferences, which should be reflected in the fragmentation of the beer markets in terms of brands. Differences in the number of brands owned by the brewing groups are also reflecting past M&A activities. These in turn, we argue in this chapter, might well be influenced by the level and structure of beer excise taxation.

3.4. How the EU influenced the beer markets in Austria and Germany

Most of the available county data reported above only aggregate the overall number of breweries but do not allow a distinction with regard to the size of the respective breweries. The brewery association in Austria and Germany's statistical office form a notable exception and provide a breakdown of breweries by the respective output levels. Accordingly, these data are most suitable for case studies on the impact of EU beer excise tax regulation on the structure of the brewing industry.

Figure 3 shows the development of the number of breweries in Austria according to their output level for the period 1984 to 2013. With respect to the taxation of alcohol in general and beer in specific there are several important dates over this period. Until the accession to the EU, the tax system for beer was relatively complicated. In addition to the specific beer excise tax (called Biersteuer), there was an ad valorem general alcohol duty (Alkoholabgabe) and an additional ad valorem beverage tax (Getränkesteuer). All three of the taxes added together and resulted in a relatively high tax burden on beers.

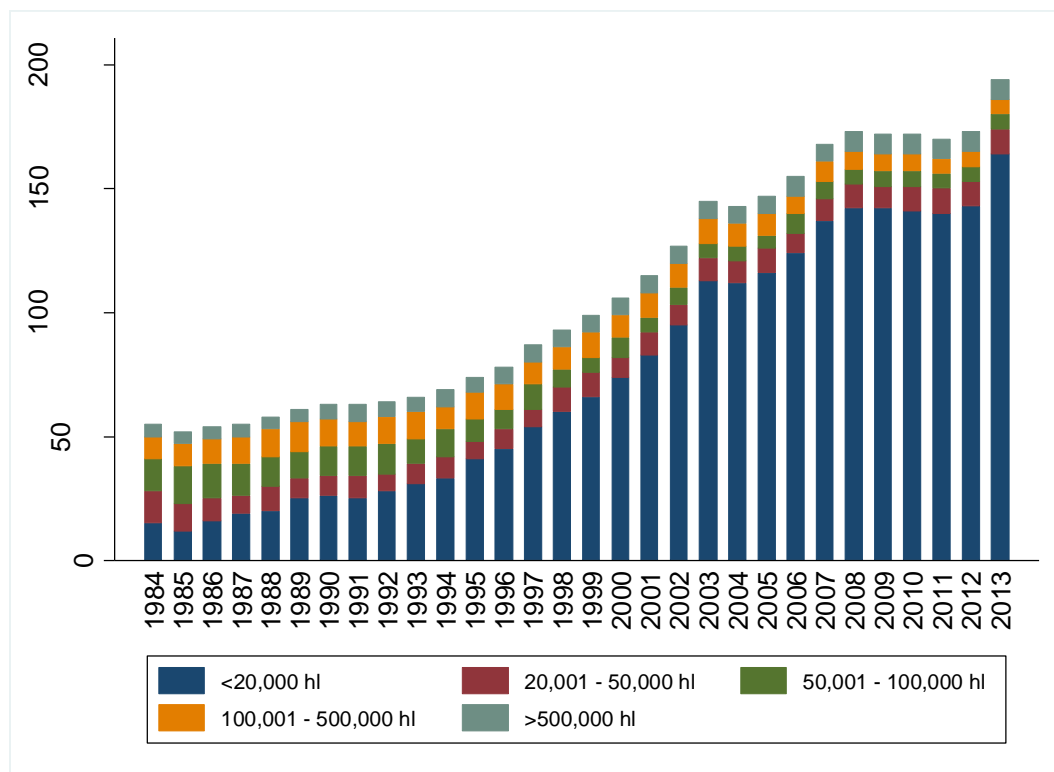


Figure 3: Number of breweries in Austria 1984-2010
(Source: Austrian Brewery Association)

Over the period observed in Figure 3, the key changes in the taxation of beer can all be linked to Austria's accession to the EU since they involved a restructuring of the tax system to comply with the *acquis communautaire*. In particular the beer tax law (*Biersteuergesetz*) of 1977, which imposed a beer excise of 83 Austrian Schillings per hectoliter of beer, already included provisions for reduced beer excises for the first 14,000 hectoliters produced. Starting in 1992 the beer excise was raised to 20 Austrian Schillings per degree plato to compensate for the abolition of the 10 percent alcohol duty. At the same time the provision for the reduced beer excise was changed to a 15 percent reduction for the first 10,000 hectoliters. Only three years later, in 1995 Austria joined the EU and the beer tax law was finally brought in line with the European Commission directive. This meant that the provision for the small breweries was changed to a system where independent breweries with less than 50,000 hectoliters of yearly output are granted a 10 percent reduction. Further, the reduction is increased to 40 percent in 12,500 hectoliter steps, implying a reduction to 60 percent for those with a yearly output of less than 12,500 hectoliters. The last major change in the taxation of beer in Austria was the abolition of the beverage tax (*Getränkesteuer*) of 10 percent on alcoholic drinks in the year 2000 which was compensated with an increase of the beer excise tax from 20 to 28.7 Austrian Schillings (approximately EUR 2.08) per degree plato hectoliter. The only subsequent change in the beer excise tax was the slight reduction to 2 Euros per degree plato hectoliter. This results in EUR 24 beer excise duties collected for a typical beer with 12 degrees plato as mentioned above.

Contrasting the changes in the beer taxation with the development of the number of breweries with different sizes, a number of interesting stylized facts can be discovered. The most noticeable trend is the large increase of small breweries with output levels below 20,000 hectoliters. One cannot derive any causal relationship in a graph, but the timing of the large surge of small breweries coincides very much with the change in the taxation for small breweries in 1995.

The second (less) stylized fact is the reduction in the number of medium sized breweries. In particular the group which just does not benefit from the reduced beer excises, i.e. those with an output level between 50,001 and 100,000 hectoliters, have witnessed a constant decline since the early 1990s. A possible explanation is that the medium sized breweries came under pressure from two sides. The large breweries dominate them with respect to production to an efficient scale, while the small breweries outcompete them in the niches because of lower variable costs as a result of reduced beer excise taxes. The latter effect will get stronger the higher the level of the beer excise tax is.⁷

The second country where we have reliable information about the number of breweries by size is Germany, as depicted in Figure 4. As a result of the reunification of Germany in 1991 there is no longer panel of the number of breweries available. Therefore, we are only able to show the development between 1994 and 2010.

Since this period is after the European directive for the minimum beer excise taxes came into force, there are hardly any changes in the beer excise taxation in Germany. Even more impressively the taxation of beer in Germany remained unchanged between 1952 and 1992, when it was altered to fulfill the requirements of the EU. Specifically, starting in 1993 the beer excise tax rate was increased from 15 Deutsche Mark per hectoliter (7.67 Euros) to 0.787 Euros per degree plato hectoliter. At the same time provisions for the reduced rates for the first 120,000 hectoliters were replaced with a progressive reduction for small and independent breweries below a yearly output of 200,000 hectoliters. The reduction increases stepwise up to

⁷ This point has also been raised quite prominently by the CEO of the Adnams brewery, see Pugh(2010).

50 percent for breweries with an output of 5,000 hectoliters or less. In comparison to the previous provisions this represents a more generous reduction which is now only applicable to the smaller breweries. The latest reform in 2004 reduced the progressiveness of the beer tax schedule by reducing the applicable beer excise for the smallest breweries to only 56 percent of the standard rate. Nevertheless it is safe to say that the German beer excise tax rate is comparably low and that the provisions for the small breweries are more generous than those in neighboring Austria.

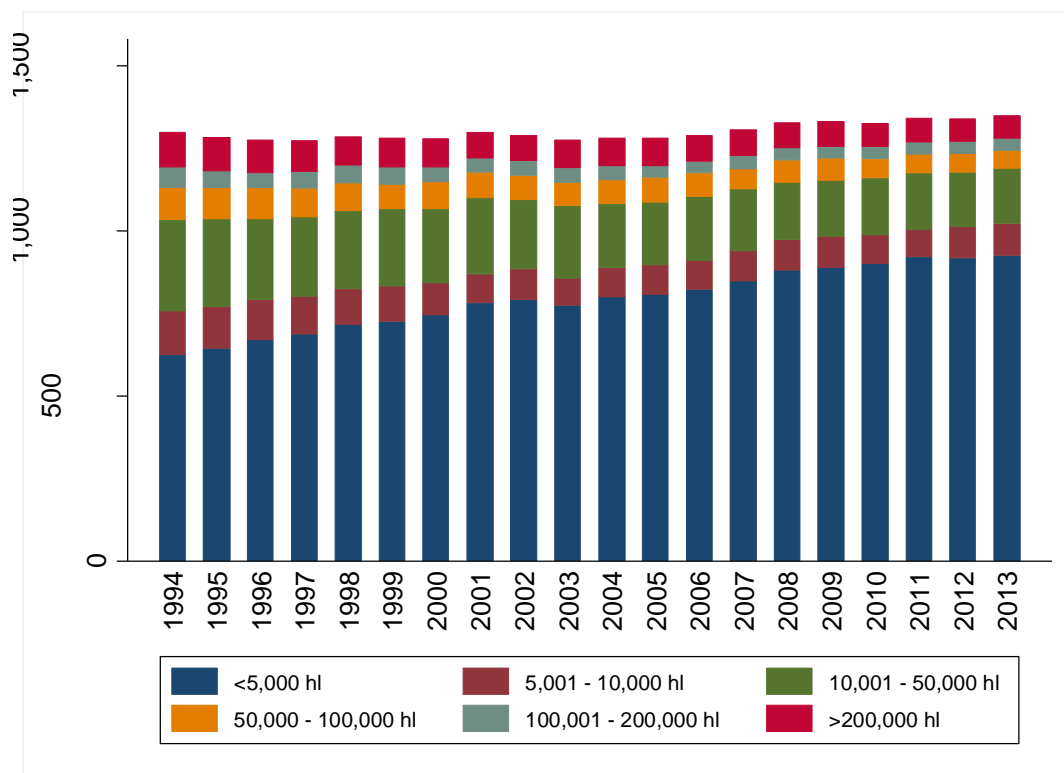


Figure 4: Number of breweries in Germany 1994-2010,
(Source: Statistics Germany)

Comparing the trend in the number of breweries in Germany to the corresponding trend in Austria one can find some striking similarities along with one clear difference. On the one hand, the number of the smallest breweries is trending upwards in Germany. Equally the increasing number of small breweries is accompanied by a clear reduction in the number of medium sized breweries. However, the striking difference between Germany in Figure 4 and Austria in Figure 3 is that the overall number of breweries in Germany remains roughly constant while in Austria this number has more than doubled. One potential reason for this could be that the reduced beer excise taxes have a stronger incentive for small breweries to enter in Austria. Beer excise taxes in Austria are more than twice as large as in Germany, thus a reduction of up to 60 percent of the full duty increases the competitiveness for small Austrian breweries much more substantially.

4. Empirical results on the impact of beer excise taxation

This section complements the case study evidence on the role of excise taxation regulation for the market concentration in the beer industry with a more systematic quantitative investigation. For this purpose we set up two empirical models that allow to assess the (average) impact of

excise taxation on a) the cross-border M&A activities in this industry (discussed in Section 4.1) and b) of reduced excise tax rates for the overall market concentration observed in 39 national beer markets (Section 4.2).

4.1. Impact of excise taxation on cross-border M&As

Starting with a complete download from the Zephyr database provided by Bureau Van Dijk, which includes all ownership transactions, we identify M&As in the beer industries via the 4-digit NACE classification of either the target or the acquiring firm. Further, we exclude all transactions where an acquiring firm already holds the majority of outstanding shares prior to the new deal or where only a minority share is acquired during the transaction. We then cross-check and complement the resulting sample with internet sources and previous studies of M&As in the beer market.⁸ In total we identify 322 M&As over the period 1999 to 2011 that took place in our sample of countries.

For the analysis of (cross-border) M&A activity in the brewing industry we rely on the large literature on estimating trade and FDI flows. More precisely, we setup a model for cross-border M&As (i.e., the number of acquisitions in one target country carried out by an acquiring country) that accounts for both target and acquiring countries characteristics. In specific, we are interested in beer market related characteristics. For this purpose, the main country information included captures the market size of the considered beer markets (measured in terms of beer production) together with value added taxation as well as the beer excises taxes and our progressivity measure.

Furthermore, for this level of bilateral aggregation we observe a large share of entries amounting to zero. This is indeed the case for approximately 93 percent of all bilateral combinations including those where the acquiring and target countries are the same (i.e., for domestic M&As). In order to tackle this issue appropriately in our empirical model, we account for this mass-point in the distribution by formulating a so called zero-inflated poisson model (Lambert, 1992). We model the inflated zeros with the standard gravity variables, i.e., the logarithm of target and acquirer country GDP per capita and the bilateral distance between the two countries. For GDP per capita, as a measure for economic wealth, we expect a negative impact on the number of M&As for the target country and a positive one for the acquiring countries. The overall difference in economic wealth might explain which country is more likely to become the acquiring one. For the distance we expect a negative sign (of the marginal effect), since the number of M&As are assumed to decrease the further the target and acquirer countries are geographically apart.⁹

Starting our discussion on the probability of observing no (bilateral) M&As, the estimated average marginal effects (AMEs) reported in Table 3 are well in line with the expectations.¹⁰

⁸ See for example Ebner and Theuvsen (2007).

⁹ Note, in the full-sample we also include domestic M&As. For these observations, the target and acquiring countries characteristics are equal and bilateral information such as distance amounts to zero.

¹⁰ The marginal effects are calculated for the final outcome, which is the number of M&As while the parameter estimates refer to the impact of each variable for the probability to observe zero M&As.

Table 3: Determinants of M&A, 1997-2011

	All M&As		only cross-border M&As	
Independent variables	Coefficient	Average marginal effect	Coefficient	Average marginal effect
Target country variables				
log(Beer production)	0.462*** (0.061)	0.095*** (0.015)	0.155 (0.090)	0.013* (0.008)
Value added tax	0.871 (1.312)	0.179 (0.268)	-1.357 (2.156)	-0.12 (0.187)
Beer excise tax	0.007*** (0.002)	0.001*** (0.000)	-0.001 (0.004)	-0.000 (0.000)
Progressivity	-1.523*** (0.383)	-0.307*** (0.090)	-0.644 (0.478)	-0.06 (0.044)
Acquirer country variables				
log(Beer production)	0.755*** (0.085)	0.155*** (0.026)	0.712*** (0.147)	0.061*** (0.017)
Value added tax	11.365*** (1.659)	2.333*** (0.464)	6.705*** (2.446)	0.576** (0.228)
Beer excise tax	-0.001 (0.002)	-0.000 (0.000)	-0.009*** (0.003)	-0** (0.000)
Progressivity	0.551 (0.615)	0.099 (0.129)	-4.767*** (1.517)	-0.41*** (0.152)
Constant	-13.240 (1.112)		-8.598*** (1.848)	
Inflation				
Target country GDP per capita	0.349** (0.174)	-0.043** (0.078)	0.251 (0.209)	-0.01 (0.011)
Acquirer country GDP per capita	-1.890*** (0.336)	0.231*** (0.045)	-2.603*** (0.542)	0.134*** (0.031)
log(Distance)	0.798*** (0.102)	-0.098*** (0.014)	0.697*** (0.155)	-0.04*** (0.008)
Constant	12.168*** (3.283)		20.493*** (5.917)	
Vuong statistic	4.55		3.57	
No. of non-zeros	98		70	
No. of observations	1,521		1,482	
The Vuong (1989) statistic refers to the test statistic between the Poisson and a zero-inflated Poisson. Average marginal effects are calculated according to Bartus (2005). ***, **, * denotes significance at the 1, 5 or 10 percent level.				

Accordingly, an increase in the distance between both countries increases the probability of observing no M&A and thus reduces the number of expected M&As. This finding indicates that brewing companies tend to increase their targeted markets by engaging in M&A activities in neighboring countries. In the beer market, producers might find it easier to obtain accurate information on preferences and the overall market situation for markets which are rather similar due to geographic proximity. In a similar vein, for wealthier target countries we also observe a larger probability of zero M&As taking place. By contrast, breweries located in rich host countries tend to engage more in M&A activities. The latter result might reflect that brewery companies located in more wealthy economies typically are able to generate sufficient profits allowing them to invest abroad. Moreover, the Young test statistics provided at the bottom of Table 3 clearly indicate that, the zero-inflated model should be preferred for the data at hand. Given the large number of zeros in the data, this comes not as a big surprise.

When focusing on the results for the non-zero observations (provided at the top of Table 3) we also obtain interesting results. First, the estimated effects differ substantially across a model that includes all M&As (first two columns) and one that only includes cross-border M&As (columns 3 and 4). Accordingly, cross-border M&A motives might substantially differ from the ones for domestic M&As. However, starting with their similarities, market size seems to play a role for all types of M&As in the brewing industry. In countries with larger beer production, more M&As are observed. This is indicated by the significant estimates for both the acquiring and target country level of beer production. By contrast, value added taxation plays a role only at the side of the acquiring country. Accordingly, we observe more M&A transactions (both domestic and cross-border ones) in and from countries with higher value added taxation. Finally, a larger number of domestic M&As tends to take place in countries with higher beer excise taxes and with lower progressivity in this tax measure while cross-border M&As are carried out by countries with lower beer excise taxes (and again a lower progressivity measure). Taken these last two findings together, the country-specific regulations with regard to the taxation of beer production clearly tend to affect M&A behavior in this market which ultimately also shapes market concentration. In the next sub-section we will shed some more light on this issue.

4.2. Impact of reduced excise rates on market concentration

In this section we investigate the impact of excise taxes coupled with a reduction for small breweries on the resulting market concentration in the beer industries. There are a number of widely used empirical measures of market concentration, which differ substantially both with respect to what the primary measure and also in terms of data requirements. For example simple measures as the concentration ratios only require information about market share of the biggest companies. In contrast, measures like the Herfindahl index require information about the output level of all the firms in the market. Somewhere in between there are other simple measures like $1/N$ which only requires the total number of competitors in the market. Note that, throughout this paper we define the market as the beer market within a particular country.¹¹

Given the data restrictions already discussed when presenting our case studies, we draw on the Global Market Information Database provided by the Euromonitor. This source provides market shares of the leading brewing groups in the most important economies. The combination of the countries which have a comparable tax system and is covered in the Euromonitor dataset pins down the sample to 39 countries. One drawback of the Euromonitor data is that it only

¹¹ Alternative market definitions would include alcoholic drinks or different geographical concepts like the EU. See Slade (2011) for a in-depth discussion how to define the market in the case of the brewing industry.

includes information about the largest brewing companies and groups. For example for Germany, which historically had the largest number of breweries and currently is still home to 1,349 breweries (see Figure 3), the Euromonitor dataset only includes up to 30 companies. Therefore we use the 3-firm concentration ratio as our preferred concentration measure since it is not possible to construct measures like the Herfindahl index for the full sample of included countries.

With this information at hand we setup an econometric model that explains the variation in market concentration rates as a function of the beer excise tax regime in force and further controls. Beer excise taxes are measured by its level for a typical beer together with the progressivity indicator defined above. In order to investigate potential additional non-linearities in the effect of progressivity, we also include an interaction term of both. This is motivated by our case study evidence highlighting that the progressivity might be more important for higher excise duties (see the comparison of Austria and Germany). Among the additional controls, we account for overall market size (measured in the beer production), a country's wealth in terms of GDP per capita and the value added taxation which will be levied on top of the beer excise taxes. In order to explicitly account for the bounded nature of market concentration rates (i.e., they cannot exceed 100 percent) we apply a quasi-maximum likelihood estimator (QMLE) which Papke and Wooldridge (1996) proposed for such data.

Table 4: Determinants of market concentration 2002-2011

Independent variables	All countries		Excl. CYP, LUX and MLT	
	Coefficient	Average marginal effect	Coefficient	Average marginal effect
log(Beer production)	-0.175*** (0.022)	-0.131*** (0.017)	-0.088*** (0.025)	-0.065*** (0.018)
log(GDP per capita)	-0.102*** (0.034)	-0.077*** (0.025)	-0.175*** (0.032)	-0.129*** (0.025)
Value added tax	-2.642*** (0.423)	-1.988*** (0.332)	-1.898*** (0.378)	-1.390*** (0.278)
Beer excise tax	0.137*** (0.040)	0.103*** (0.031)	0.188*** (0.035)	0.138*** (0.029)
Progressivity	0.010 (0.104)	0.008 (0.080)	-0.260*** (0.096)	-0.192*** (0.074)
Interaction	0.769 (0.660)	0.579 (0.516)	1.659** (0.647)	1.223** (0.477)
No. of observations	358		337	

Estimated following the procedure of Papke and Wooldridge (1996). All regression include year fixed effects and a constant. The average marginal effects are calculated according to Bartus (2005). ***, **, * denotes significance at the 1, 5 or 10 percent level.

Table 4 reports the corresponding estimation results. The first two columns focus on the full sample and report the estimated parameters as well as the AMEs. In the remaining two columns we exclude Cyprus, Luxembourg and Malta. In these three countries the market concentration

rate based on the three largest market participants (CR3) remains 100 percent during the whole 10 year time period.¹²

Regarding the included controls, our estimates provide the following findings. Market concentration is lower in larger and richer markets. Accordingly, an increase in the overall production of beers allows more competitors to survive in the market, thus reducing market concentration. In a similar vein, in more wealthy countries love-of-variety seems to be more pronounced increasing the pluralism in served beers. In a similar vein, in countries with higher value added taxation, beer producers find it more difficult to occupy a market dominating position.

With regard to beer excise regulations across countries we obtain interesting results. First, in countries with higher beer excise taxes, the beer market is more concentrated. Higher excise taxes increase variable costs and, thus, result in a smaller number of active firms. If the less profitable and smaller firms are the ones driven out of the market this results in a more concentrated market. When focusing on the full sample including all 39 countries we do not estimate significant effects of the progressivity. However, when excluding the three countries with perfect market concentration throughout the whole sample period, we obtain strong and significantly negative parameter estimates and AMEs. This finding suggests that, on average, a more progressive excise tax system indeed helps to reduce market concentration in the beer market. This result points to the effectiveness of EU regulation, since the reduction in excise taxes for smaller breweries is indeed politically justified by such reasoning. The significantly positive effect estimated for the interaction effect (in the restricted sample), however, indicates that progressivity in the excise tax system does not increase the competition in the beer market under all circumstances. On the contrary, in countries with very high excise taxes a more progressive system further increases market concentration. This finding is counterintuitive but shows that regulating the beer market in terms of excise taxes is not sufficient to guarantee a competitive environment. In countries, where beer drinking is, in general, very high taxed, it seems to be difficult for new entrants to get a proper access to the market.

5. Conclusion

Over the last couple of years the beer industry has experienced an intense consolidation process resulting in an every declining number of globally active brewing companies. At the same time, in some large beer markets the number of micro-breweries steadily increased. While the former is often explained by prevailing economies of scale in this industry the latter is often associated with demand side arguments including love-of-variety preferences. This chapter offers an additional explanation for these tendencies observed in the beer markets. More precisely, we argue that a country's policy concerning the taxation of beer products might have a direct impact on the emerging market structure.

More precisely, our main finding supports the view that EU's beer excise tax regulation which couples a minimum amount of beer excises taxes obliged to charge with the possibility of reduced rates for small breweries has direct implications for the market structure in the brewing industry. More precisely, this regulation tends to trigger a polarization of the market in the sense that one observes a very small number of large and globally active brewing companies while, at the same time, the number of micro breweries increases. Medium-sized beer producers tend

¹² Since the only information we have about these countries, is that there are less than 3 active breweries, we assume a CR3 of 100.

to be forced out of the market by this regulation or choose to adjust their production level to a smaller amount. Some of the (formerly) medium-scale beer producers also have been targets of M&As, which further fosters an increase in market concentration among the global players in beer producing.

This overall finding confirms that specific tax rules might directly and indirectly affect market structures and in the medium-run might also have implications for customers. Especially, the very small number of globally active brewing companies might increase the likelihood for collusive behavior and thus calls for a careful monitoring by competition authorities all over the world.

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