The Reinheitsgebot and the Internal Market

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Preliminary Version

Abstract

This paper analyzes the effect of mutual recognition of standards, i.e. allowing imports of products not complying with a national standard, on competition and welfare. An example of application is the German market for beer, where the Reinheitsgebot (purity law) acted as non-tariff barrier to trade, until, in 1987, the European Court of Justice (ECJ) found that it interfered with the free movement of goods in the European Community and demanded a national repeal of the law. German brewers still need to follow the Reinheitsgebot, but imported beers need not comply with it.

JEL Classification: K42, L13, L50

Keywords: beer, Reinheitsgebot, standard, mutual recognition

1 Introduction

This paper analyzes the effect of mutual recognition of standards, i.e. allowing imports of products not complying with a national standard, on competition and welfare. An example of application is the German market for beer, where the Reinheitsgebot (purity law) acted as non-tariff barrier to trade, until, in 1987, the European Court of Justice (ECJ) found that it interfered with the free movement of goods in the European Community and demanded a national repeal of the law. German brewers still need to follow the Reinheitsgebot, but imported beers need not comply with it.

Policy makers apply minimum quality standards for products to protect various public interests like health and safety objectives, consumer protection, environmental

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concerns etc. Typically, three types of market failures give rise to the use of minimum quality standards: imperfect competition, imperfect information, and externalities (Baltzer (2011)). The effect of imperfect competition has been widely analyzed in the literature. Monopolists generally choose a socially sub-optimal quality level (Spence, 1975, Mussa and Rosen, 1978). In order to relax price competition, duopolists tend to over-differentiate their products (Shaked and Sutton (1982)). In a setting of imperfect information, when consumers are not aware of all relevant quality dimensions of products, minimum quality standards can protect consumers interests. Also minimum quality standards are able to avoid or alleviate negative externalities like harmful pollution.

Irrespective of the original intention, national standards regularly impose higher costs on foreign firms than on domestic firms, by design, implementation, or administration so that they constitute non-tariff barriers to trade and therefore may result in market foreclosure (Baltzer (2011), Marette and Beghin (2010)). Even if the compliance costs for meeting a non-discriminating minimum quality standard are exactly the same for domestic and foreign firms, firms will prefer different levels of regulation in a setting of imperfect competition and asymmetric information (Baltzer (2011)). A nationally optimal minimum quality standard may be stricter than an international optimal standard, as national regulators disregard losses imposed to foreign firms and take only into account positive or negative impacts of a minimum quality standard to domestic consumers and firms (Marette and Beghin (2010)).

Consequently a harmonization of standards or at least mutual recognition of national standards are expected to increase competition, reduce price and increase consumer surplus. Analyzing different standard-setting arrangement Lutz and Pezzino (2012) finds that mutual recognition can improve welfare in both home and foreign regions.

The Reinheitsgebot is an example of one of the oldest national standards on food (Van Tongeren (2011)). The Reinheitsgebot stipulates that only water, barley and hops are permissible ingredients in beer production. Products containing other ingredients were not allowed to be sold as beer in Germany. As breweries in other member states of the European Community lawfully used other ingredients in beer production, but could not sell their beers in the German market, the Reinheitsgebot resulted in a non-tariff barrier to trade. In 1987, the European Court of Justice decided that the Reinheitsgebot was not compatible with the principle of free movements of goods within the internal market of the European Community. Non-German beers could no longer be kept off the German market because of its ingredients not complying with the Reinheitsgebot. This sentence of the ECJ was in line with the famous Cassis-de-Dijon decision that is the basis for the principle of mutual recognition in the European Union: a product lawfully
marketed in one member state should be permitted in another member state as well. Restrictions may only be accepted, if they are necessary to ensure the effectiveness of fiscal supervision, the protection of public health, the fairness of commercial transactions, and the protection of the consumer.

Germany, as the Czech Republic or the US clearly is a beer drinking nation, where the largest part of alcohol intake comes from beer (Colen and Swinnen (2011)). German beer consumers do not only prefer domestic beer to foreign beer, there is also a preference for local beers within Germany (Adams (2006), Empen et al. (2012)). German consumers are more loyal towards beer of local breweries and are less loyal towards competing beer originating from other regions (Empen et al. (2012)). There is a stronger preference for “Weizen” in Bavaria than for Pilsener or Alt, while beer consumers in North Rhine–Westphalia prefer Pilsener and Alt over “Weizen”. The German competition authority Bundeskartellamt has argued that German beer markets are smaller than national in scope because of the preference for local beers (BKA, 2000). Despite the preference for local beers, the nationwide preference for Pilsener grew between 1981 and 2002 (Adams (2006)). Empen et al. (2012) analyze weekly retail scanner data of beer sales for Germany from 2000 to 2001. They find that there is a close relationship between the frequency and amount of offered discounts and the distance to the brewery the beer originates from. The closer the brewery the higher and the more frequent are discounts. This strategy may generate new loyal consumers, so brand loyalty may be endogenous. German beer consumers are price sensitive at the brand level and tend to consume multiple brands of beer. Brand loyalty declined between 1993 and 2001 relatively more than for many other consumer products (Adams (2006)).

Regarding the overall trend in beer consumption Colen and Swinnen (2011) find an inverse U-shaped relationship between income and beer consumption. Due to increased openness to trade and globalization there is a convergence in alcohol consumption patterns across countries. In many “beer-drinking nations” (e.g. Belgium, the Czech Republic, Germany, and the United Kingdom) relative beer consumption declines, while in “wine-drinking” countries (e.g. Italy and Spain) and “spirit-drinking” countries (e.g. China and Russia) relative beer consumption increases (Poelmans and Swinnen (2011)). Wine and beer consumption patterns converge in France and Germany (Aizenman and Brooks (2008)). The decline of beer consumption in Germany is quite remarkable. The share of beer consumption in total alcohol consumption declined from 57.14 % in 1961 to 53.3 % in 2005.

Empirical evidence regarding the price elasticity of demand is rather mixed. Measured price elasticity of beer demand varies between −0.2 (Nelson 2014), −0.46 (Wage-
naar, Salois, and Komro 2009) and −0.9 (Hogarty and Elzinga 1972). Manning et al. (1995) find that both light and heavy drinkers are much less price elastic than moderate drinkers. They cannot reject the hypothesis that very heavy drinkers have perfectly price inelastic demands. Compared to other alcoholic beverages, the demand for beer tends to be more inelastic (Gallet 2007). In a meta-regression analysis Fogarty (2004) consider 150 point estimates, drawn from studies covering price elasticity of alcohol demand in 18 different countries. They find that neither country specific effects nor beverage specific effects are statistically significant.

To our knowledge the only paper analyzing the effect of the ECJ decision on the Reinheitsgebot is Van Tongeren (2011). He uses a demand and supply-framework with heterogeneous consumers, where the ECJ decision induces market segmentation. He assumes two types of consumers – traditionalists who only drink beer brewed according to the Reinheitsgebot and experimentalists who try imported, foreign beer that may contain additives not allowed under the Reinheitsgebot. Before the ECJ decision both groups of consumers buy German beer (brewed according to the Reinheitsgebot), after the ECJ decision traditionalists continue to buy German beer, but experimentalists switch to foreign beer. Consequently, as it lowers demand, allowing imports of beers not complying with the Reinheitsgebot reduces the price for German beer. In addition, the lower price and the availability of foreign beers increases total consumption. Consumer surplus increases, producer surplus for German brewers declines, but producer surplus for foreign brewers increases.

The rest of the paper is organized as follows. The next section presents a stylized model. Section 3 presents our data, the empirical method and our basic results. Section 4 concludes.

2 Stylized Model

The following stylized model assumes that German beer and foreign beer are not perfect substitutes, but perceived as of different quality due to (non) compliance with the Reinheitsgebot as production standard.

Following Garella and Lambertini (2014), consider the German market for beer with bidimensional vertical product differentiation. Overall beer quality depends upon two attributes, \(s\) and \(v\), where \(s\) includes the ‘standard’ product quality parameter such as taste, scent, brand image, or bottle design and \(v\) refers to the adherence to the Reinheitsgebot.

Two domestic firms supply beer in two quality levels, \(s_H\) and \(s_L\), with \(s_H > s_L\).
Each firm supplies only one quality level. Both firms follow the requirements of the Reinheitsgebot, i.e. \( v_H = v_L = v > 0 \). One foreign firm supplies beer with the quality level \( s_F \), which is not brewed according to the Reinheitsgebot, \( v_F = 0 \).

On the one hand, the foreign beer may have the appeal of something new, which consumers may want to try out. Due to not being familiar to everyone the foreign beer may also be perceived as an exclusive good to publicly display status or wealth (Veblen, 1899). Evidence from the trade literature that firms with higher quality are more likely to export (and export more) (e.g. Crozet et al. (2011) for French wine) also implies high quality of imported goods. On the other hand, unfamiliarity with the foreign beer and the resulting uncertainty regarding product characteristics can be interpreted as quality differentials following to Schmalensee (1982). Thus, consider the following ranking of quality levels: \( s_H > s_F > s_L \).

Consumers differ with respect to their gross valuation \( \theta \), which is uniformly distributed on the unit interval. Each consumer demands either one or zero units of the most preferred good. The utility derived from no purchase is zero, while a consumer who buys one unit of the good obtains a net utility of \( U = \alpha v_i + s_i \theta - p_i \), with \( i = H, F, L \), when buying the beer and a utility of zero otherwise. A consumer with a positive net utility of the good will choose the most preferred version of the good by trading off perceived quality against the price. The higher the gross valuation \( \theta \), the higher the willingness to pay for quality. The consumer heterogeneity can be interpreted as differences in income or as difference in consumption patterns. Frequent usage may be accompanied by a higher willingness to pay for quality.\(^1\)

Firms’ profits are given as \( \pi_i = p_i q_i \). Production technologies exhibit constant marginal costs, which are normalized to zero for simplicity. It is assumed that there are no trade cost.

**Imports of non-complying products not allowed** Consider first the case where imports of non-complying products are not allowed (situation prior to 1987). The marginal consumer who is indifferent between buying the domestic beer of quality \( s_H \) and the beer of quality \( s_L \) is given by \( \theta^{H,L} = \frac{p_H - p_L}{s_H - s_L} \) and the marginal consumer who is indifferent between buying the domestic beer of quality \( s_L \) and none is given by \( \theta^{L,0} = \frac{p_L - \alpha v}{s_L} \). Hence, demand for both beers is \( q_H = 1 - \frac{p_H - p_L}{s_H - s_L} \) and \( q_L = \frac{p_H - p_L}{s_H - s_L} - \frac{p_L - \alpha v}{s_L} \). Equilibrium prices are

\[
    p_H = \frac{(2s_H + \alpha v)(s_H - s_L)}{4s_H - s_L}, \quad p_L = \frac{(s_L + 2\alpha v)(s_H - s_L)}{4s_H - s_L}.
\]

\(^1\)Note that \( \theta \) can also be interpreted as the marginal rate of substitution between income and quality (see Tirole, 1988).
Equilibrium quantities are
\[ q_H = \frac{2s_H + v_0}{4s_H - s_L}, \quad q_L = \frac{s_H(s_L + 2v_0)}{s_L(4s_H - s_L)}. \]

**Imports of non-complying products allowed** Consider first the case where imports of non-complying products are allowed (situation after 1987). The marginal consumer who is indifferent between buying the domestic beer of quality \( s_H \) and the foreign beer is given by \( \theta^{H,F} = \frac{p_H - p_{\text{F}} - \alpha v}{s_H - s_F} \), the marginal consumer who is indifferent between buying the foreign beer and the domestic beer of quality \( s_L \) is given by \( \theta^{F,L} = \frac{p_{\text{F}} - p_L + \alpha v}{s_F - s_L} \), and the marginal consumer who is indifferent between buying the domestic beer of quality \( s_L \) and none is given by \( \theta^{L,0} = \frac{p_L - \alpha v}{s_L} \). Hence, demand for the domestic beers and the foreign beer is
\[ q_H = 1 - \frac{p_H - p_{\text{F}} - \alpha v}{s_H - s_F}, \quad q_L = \frac{p_{\text{F}} - p_L + \alpha v}{s_F - s_L} - \frac{p_L - \alpha v}{s_F - s_L} \]
and \( q_F = \frac{p_H - p_{\text{F}} - \alpha v}{s_H - s_F} - \frac{p_{\text{F}} - p_L + \alpha v}{s_F - s_L} \).
Equilibrium prices are
\[ p_H = \frac{(s_H - s_F)(4s_FS_H - 3s_FS_L - s_Hs_L) + v_0 (3s_FS_H - s_F^2 - s_FS_L - s_Hs_L)}{2(4s_FS_H - s_F^2 - 2s_FS_L - s_Hs_L)}, \]
\[ p_L = \frac{s_L(s_F - s_L)(s_H - s_F) + v_0 (4s_Hs_F - s_F^2 - 2s_FS_L + s_L^2 - 2s_Hs_L)}{2(4s_FS_H - s_F^2 - 2s_FS_L - s_Hs_L)}, \]
\[ p_F = \frac{s_F((s_F - s_L)(s_H - s_F) - v_0 (s_H - s_L))}{4s_FS_H - s_F^2 - 2s_FS_L - s_Hs_L}. \]
Equilibrium quantities are
\[ q_H = \frac{(s_H - s_F)(4s_FS_H - 3s_FS_L - s_Hs_L) + v_0 (3s_FS_H - s_F^2 - s_FS_L - s_Hs_L)}{2(s_H - s_F)(4s_FS_H - s_F^2 - 2s_FS_L - s_Hs_L)}, \]
\[ q_L = \frac{s_L(s_F - s_L)(s_H - s_F) + v_0 (4s_Hs_F - s_F^2 - 2s_FS_L + s_L^2 - 2s_Hs_L))}{2s_L(s_F - s_L)(4s_FS_H - s_F^2 - 2s_FS_L - s_Hs_L)}, \]
\[ q_F = \frac{s_F(s_H - s_L)((s_F - s_L)(s_H - s_F) - v_0 (s_H - s_L))}{(s_F - s_L)(s_H - s_F)(4s_FS_H - s_F^2 - 2s_FS_L - s_Hs_L)}. \]
Allowing imports of non-complying products decreases prices and increases quantities of domestic firms, with the valuation of compliance with the Reinheitsgebot dampening the price-decreasing effect and amplifies the quantity-increasing effect.

### 3 Empirical Analysis

In this section we describe the data and provides empirical evidence for the effect of the ECJ on imports, prices and consumption.
Yearly data on beer imports, beer retail and producer price indices, per capita consumption at country level as well as production and exports at federal level is obtained from various issues of the statistical year book (Statistischer Bericht) of the German Brewing Association (Deutscher Brauer-Bund e.V.). We use data until 1989, i.e. only information on former Western Germany is included. Since items reported in the statistical year book were changed over the years, not all data is available for the same time period. Per capita consumption is available from 1950 onwards, the consumer price index from 1957 onwards, production and exports at federal level are available from 1960 onwards and import data and the producer price indices are available from 1970 onwards. Minimum and maximum beer prices at the Oktoberfest from 1971-1989 are obtained from oktoberfest.de. Data on the CPI and the GDP comes from the Bundesbank and the Federal Statistical Office. Data on average temperature comes from the German weather service.

**Imports** Figure ?? shows imports of bottled beer and draft beer for 1970 - 1989, the vertical line indicates the ECJ decision in 1987. While imports of draft beer seem to not vary much over time, imports of bottled beer increase over time.

We estimate the following regression: \( y_t = \beta_0 + \beta_1 x_t + \delta_t + \varepsilon_t \), where the dependent variable \( y_t \) is beer imports, \( \beta_0 \) is a constant term, \( x_t \) is GDP, \( \delta_t \) is a dummy for the ECJ decision and \( \varepsilon_t \) is the error term. We estimate the regression separately for imports of bottled beer and imports of draft beer.

Since Dickey-Fuller-test cannot reject the null hypothesis of a unit root at the 10% level of significance, first differences are applied in estimations.

Table 1: Imports of bottled beer and draft beer

<table>
<thead>
<tr>
<th>dependent variable:</th>
<th>imports bottled beer</th>
<th>imports draft beer</th>
</tr>
</thead>
<tbody>
<tr>
<td>cons</td>
<td>839.40 (73758.4)</td>
<td>895.16 (1612.69)</td>
</tr>
<tr>
<td>GDP</td>
<td>-76971.07 (62657.18)</td>
<td>2372.79 (1346.78)</td>
</tr>
<tr>
<td>ECJ</td>
<td>4000.00 (483.13)</td>
<td>438.11 (526.09)</td>
</tr>
<tr>
<td>adj R²</td>
<td>-0.0400 (-0.0781)</td>
<td>0.3521 (0.4192)</td>
</tr>
<tr>
<td>prob &gt; F</td>
<td>0.5861 0.0121</td>
<td>0.4192 0.7112</td>
</tr>
</tbody>
</table>

Table 1 summarizes the results of regressions. Columns (1) and (3) show only GDP as explanatory variable, columns (2) and (4) include the ECJ dummy as well. The effect of GDP on imports is positive for all specifications, but is only significant at the 10%
level in column (2). In specifications (2) and (4), the ECJ-dummy is positive, but only significant at the 1% level in column (2). Note that the adjusted R-square indicates that specifications (1), (3), and (4) do not fit properly. This is, from (2), we can infer that the ECJ decision has resulted in an increase of imports.

Prices  Figure ?? shows the consumer price index for beer and the CPI for 1957 - 1989. The consumer price index for beer has increased at a much lower rate than the CPI.

We estimate the following regression: \( p_t = \beta_0 + \beta_1 x_t + \delta_t + \varepsilon_t \), where the dependent variable \( p_t \) is CPI for beer, \( \beta_0 \) is a constant term, \( x_t \) is CPI, \( \delta_t \) is a dummy for the ECJ decision and \( \varepsilon_t \) is the error term.

Since Dickey-Fuller-test cannot reject the null hypothesis of a unit root at the 10% level of significance, first differences are applied in estimations.

<table>
<thead>
<tr>
<th>dependent variable:</th>
<th>CPI for Beer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td>cons</td>
<td>-0.6 (0.55)</td>
</tr>
<tr>
<td></td>
<td>-0.62 (0.58)</td>
</tr>
<tr>
<td>CPI</td>
<td>0.42***</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
</tr>
<tr>
<td></td>
<td>0.42***</td>
</tr>
<tr>
<td></td>
<td>(0.08)</td>
</tr>
<tr>
<td>ECJ</td>
<td>0.27</td>
</tr>
<tr>
<td></td>
<td>(1.82)</td>
</tr>
<tr>
<td>adj R²</td>
<td>0.4545</td>
</tr>
<tr>
<td>n</td>
<td>32</td>
</tr>
<tr>
<td>prob &gt; F</td>
<td>0.0000</td>
</tr>
<tr>
<td></td>
<td>0.0001</td>
</tr>
</tbody>
</table>

Table 2: CPI for beer

Table ?? summarizes the results of regressions. Column (1) shows only CPI as explanatory variable, column (2) includes also the ECJ dummy. The effect of CPI on the CPI for beer is positive and significant at the 1% level for both specifications. In specification (2) the ECJ-dummy is positive, but not significant. We can conclude that the ECJ decision has not resulted in a decrease of the CPI for beer.

Figure ?? shows producer price indices for bottled beer and draft beer for 1970 - 1989. The producer price index for draft beer has increased at a higher rate than the producer price index for bottled beer.

We estimate the following regression: \( p_t = \beta_0 + \beta_1 x_t + \delta_t + \varepsilon_t \), where the dependent variable \( p_t \) is PPI for beer, \( \beta_0 \) is a constant term, \( x_t \) is CPI, \( \delta_t \) is a dummy for the ECJ decision and \( \varepsilon_t \) is the error term. We estimate the regression separately for PPI for bottled beer and PPI for draft beer. Since Dickey-Fuller-test cannot reject the null hypothesis of a unit root at the 10% level of significance, first differences are applied in estimations.
Table 3: Producer price index for bottled beer and draft beer

<table>
<thead>
<tr>
<th>dependent variable:</th>
<th>PPI bottled beer</th>
<th>PPI draft beer</th>
</tr>
</thead>
<tbody>
<tr>
<td>cons</td>
<td>1.94* (1.10)</td>
<td>3.01** (1.39)</td>
</tr>
<tr>
<td>CPI</td>
<td>0.35* (0.18)</td>
<td>0.45* (0.22)</td>
</tr>
<tr>
<td>ECJ</td>
<td></td>
<td>0.02 (3.08)</td>
</tr>
<tr>
<td>adj R²</td>
<td>0.1345</td>
<td>0.0886</td>
</tr>
<tr>
<td>n</td>
<td>19</td>
<td>19</td>
</tr>
<tr>
<td>prob &gt; F</td>
<td>0.0680</td>
<td>0.1855</td>
</tr>
</tbody>
</table>

Table 4: Minimum and maximum beer prices at the Oktoberfest

<table>
<thead>
<tr>
<th>dependent variable:</th>
<th>minimum price</th>
<th>maximum price</th>
</tr>
</thead>
<tbody>
<tr>
<td>cons</td>
<td>0.2** (0.07)</td>
<td>0.15*** (0.04)</td>
</tr>
<tr>
<td>CPI</td>
<td>0.01 (0.01)</td>
<td>0.02 (0.01)</td>
</tr>
<tr>
<td>ECJ</td>
<td>0.06 (0.16)</td>
<td>-0.02 (0.09)</td>
</tr>
<tr>
<td>adj R²</td>
<td>-0.0450</td>
<td>0.1340</td>
</tr>
<tr>
<td>n</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>prob &gt; F</td>
<td>0.6120</td>
<td>0.1329</td>
</tr>
</tbody>
</table>

Table 3 summarizes the results of regressions. Columns (1) and (3) show only CPI as explanatory variable, columns (2) and (4) include also the ECJ dummy. The effect of CPI on the PPI for beer is positive and significant at the 10% level in (1), (2), and (3). In specifications (2) and (4) the ECJ-dummy is positive, but not significant. We can conclude that the ECJ decision has not resulted in a decrease of the PPI for beer.

Figure ?? shows minimum and maximum beer prices at the Oktoberfest for 1971 - 1989. Both minimum price and maximum price have increased at a similar rate over time.

We estimate the following regression: \( p_t = \beta_0 + \beta_1 x_t + \delta_t + \varepsilon_t \), where the dependent variable \( p_t \) is beer price at the Oktoberfest, \( \beta_0 \) is a constant term, \( x_t \) is CPI, \( \delta_t \) is a dummy for the ECJ decision and \( \varepsilon_t \) is the error term. We estimate the regression separately for minimum prices and maximum prices. Since Dickey-Fuller-test cannot reject the null hypothesis of a unit root at the 10% level of significance, first differences are applied in estimations.

Table 4 summarizes the results of regressions. Columns (1) and (3) show only CPI as explanatory variable, columns (2) and (4) include also the ECJ dummy. The effect
of CPI on the PPI for beer is positive, but only significant at the 5% level in (4). In specification (2) the ECJ-dummy is positive, in specification (4) negative, but both times not significant. Note that the adjusted R-square indicates a bad fit of specifications (1) and (2).

Consumption

4 Conclusion

This paper has analyzed the effect of mutual recognition of standards, i.e. allowing imports of products not complying with a national standard, for the example of the German market for beer, where since the European Court of Justice decision in 1987 imported beers need not comply with the Reinheitsgebot, but German brewers do. The stylized model indicates that allowing imports of non-complying products decreases prices and increases quantities of domestic firms, with the valuation of compliance with the Reinheitsgebot dampening this effect. The empirical analysis suggests that the ECJ decision has resulted in an increase of bottled beer, but not in a decrease of CPI or PPI for beer.
References


