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THE WINE INDUSTRY IN GERMANY, AUSTRIA AND SWITZERLAND 1835-2016

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The Wine Industry in Germany, Austria and Switzerland 1835-2016

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I. Germany

Overview Wine Production

Although grapevines have been cultivated in present day Germany since Roman times (e.g., Bassermann-Jordan, 1907), compared to European wine growing nations such as France, Italy, and Spain, Germany has never been a major wine producing country. Its geographical location between the 48th and 54th parallel and the resulting marginal climate restricts grape growing to the valleys of the Rhine river and its tributaries Ahr, Mosel, Nahe, and Main in the south-west. In addition, some professional viticulture, though at a much smaller scale, can also be found in the valleys of the Saale-Unstrut and the Elbe river in the eastern part of present day Germany (see Figure GER-1).

However, Germany in its current borders has only existed since 1990, when West and East Germany reunified (depicted in dark gray in *Figure GER-1*). At one time or another, a few other viticultural regions belonged to what was then called Germany (in light gray in *Figure GER-1*). The most significant one was certainly Alsace-Lorraine, which was part of the German Empire between 1871 and 1918, and, in some years, accounted for as much as a third of the entire German wine production. Similarly significant was the merger with Austria, which joined Nazi-Germany in 1938, and became the province *Reichsgau Ostmark* until 1945. A few somewhat smaller wine growing regions in Posen and Silesia (e.g., *Zielona Góra*, German *Grünberg*), now Poland, once belonged to Prussia and, before 1818, were virtually the only domestic wine suppliers within the Kingdom.

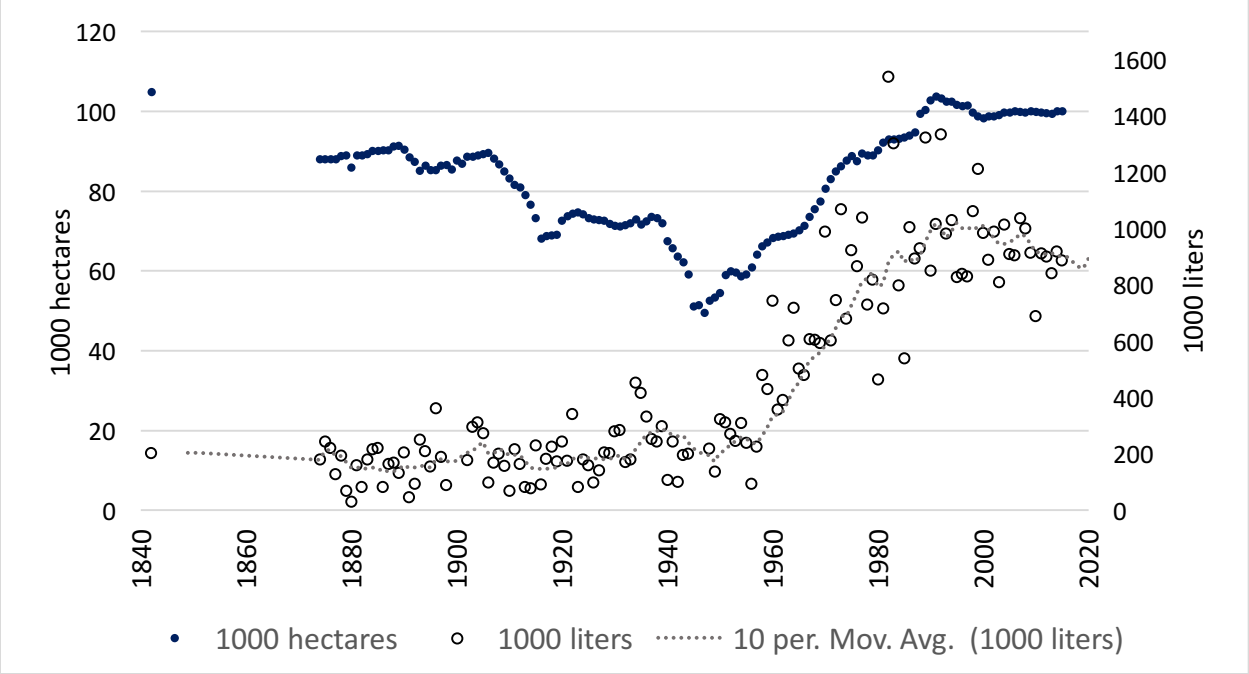
This study refers to Germany within its present day borders and all figures for "German wine production" will exclude Alsace-Lorraine, the Polish regions, and Austria by re-aggregating the production data of the official statistics.

Figure GER-1

Germany and its Wine Regions Over Time

Figure GER-2

Vineyard Area and Wine Production in Germany, 1842-2015



Notes: Bearing hectares without Alsace, Austria and Poland. Source: Anderson and Pinilla (2017).

Overall, the bearing vineyard area in Germany, in its present day borders, exhibits significant cyclical swings. During the century from the 1840s to the end of WWII in 1945, the German vineyard area is characterized by stepwise declines interrupted by short periods of stabilization. In 1947, the German vineyard was at its trough and comprised only 49,500 hectares which is less than half of the area 100 years before. However, the following decades have seen a rapid recovery to now approximately 100,000 hectares, the highest level in almost 200 years (see Figure GER-2).

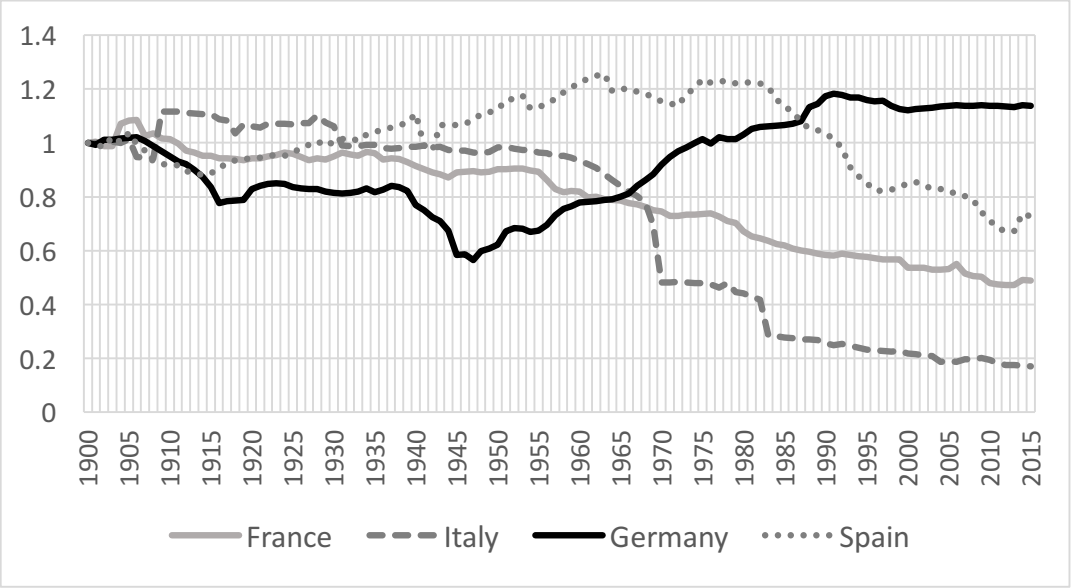
In contrast to the large European wine producing countries Spain, France, and Italy, which all exhibit strong downward trends, Germany has increased its area under vines. As shown in Figure GER-3, when setting the respective national vineyard area of 1900 equal to one, Germany has

enlarged its vineyard from 1900 to 2015 by 14%, i.e., the index for 2015 equals 1.14. During the same period, the indices for Spain (0.73) and France (0.49) reflect substantial vineyard area reductions. The corresponding index for Italy is currently at 0.17, i.e., between 1900 and 2015, Italy has lost 83% of its area under vines. Note, all national data refer to current day borders.

Figure GER-3

Vineyard Area 1900-2015 in France, Germany, Italy and Spain

Index 1900=1



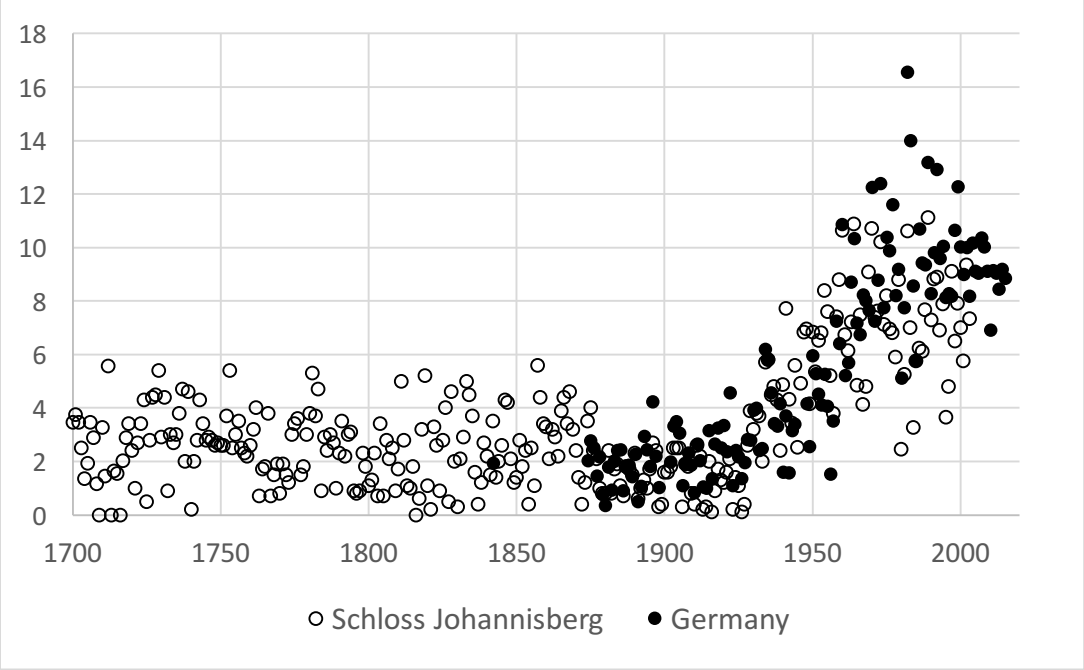
Source: Anderson and Pinilla (2017).

Figure GER-2 also depicts overall wine production in 1000 liters. First, wine production displays significantly more annual variations than does hectares planted. Second, for the time before the 1930s, production weakly follows the downward trend in vineyard area. From about 1930 on, however, overall production grows significantly stronger than the vineyard area. While the vineyard area from 1945 to 2015 has approximately doubled, production has quintupled.

Figure GER-4

Wine Yields in Germany and at Schloss Johannisberg 1700-2015

in 1000 liters per hectare



Source: Storchmann (2005), Staab, Seelinger, and Schleicher (2001). Anderson and Pinilla (2017).

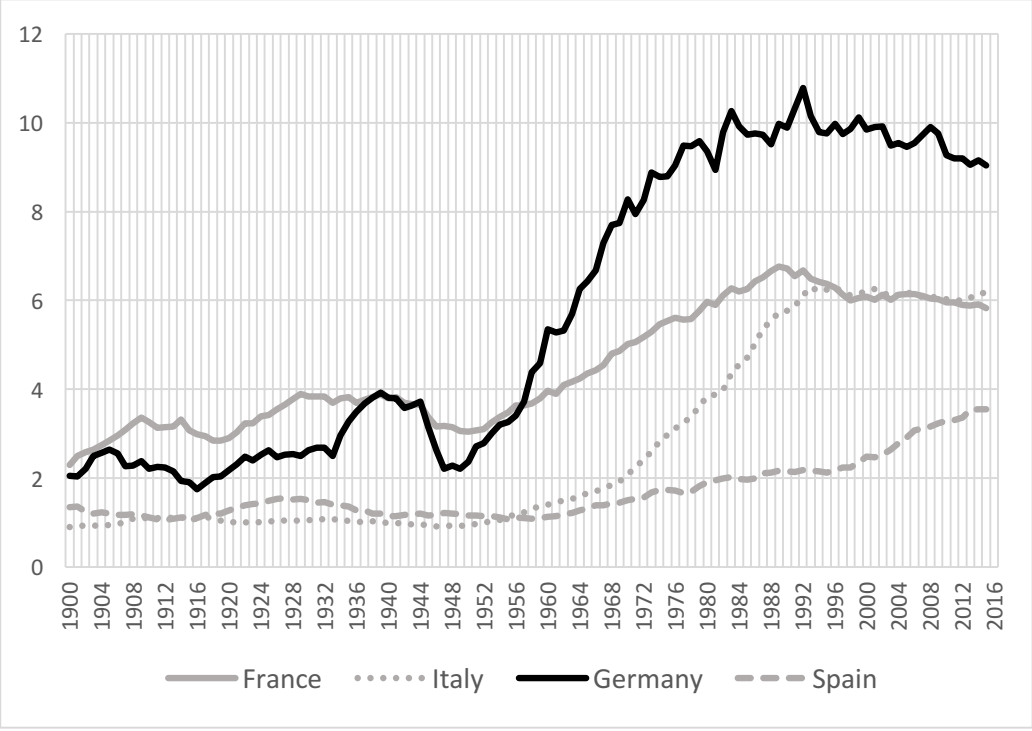
Apparently, this is due to an increase in yields per hectare. Figure GER-4 reports yields for Germany from 1842 to 2015 (the solid dots). Since yields are simply the result of production divided by area, the substantial increase in productivity from about 1930 on, and particularly after 1950, squares with the discussion in the paragraph above. However, it is not *per se* evident whether the yield increases are due to production technologies, conducive climatic conditions, or regional shifts of viticulture to more productive areas within Germany. Figure GER-4, therefore, also displays the yields of Schloss Johannisberg in the Rheingau region, an estate that has farmed the same vineyards, planted only with Riesling grapes, for centuries. Referring to a long-time series starting in 1700, Figure GER-4 (the hollow dots) suggests that Schloss Johannisberg and Germany overall have followed a similar path pointing at changes in production technologies or climatic conditions as potential drivers.

Figure GER-5 displays wine yields from 1900 to 2015 for Germany, France, Italy and Spain as 10-year moving averages. At the beginning of the 20th century, France was Europe's most productive wine growing country. Up until approximately 1930, France had average wine yields of about 3 tons per hectare (t/ha); in contrast, Germany had about 2 t/ha and Spain and Italy only about 1 (t/ha). However, with the beginning 1930s, Germany's wine industry began to substantially improve its productivity. At first, the yield rises were interrupted by WWII, but by the mid 1950s, the French productivity level of then approximately 4 t/ha was reached. In the 1980s, German yields peaked at 11 t/ha, well above French levels of 6 t/ha. With the beginning 1990s, wine yields in Germany have stabilized at approximately 9 t/ha, about 50% above French and Italian yields and approximately three times the yields in Spanish vineyards.

Figure GER-5

Wine Yields in France, Germany, Italy, and Spain 1900-2015

in 1000 liters per hectare, 10-y moving average



Overview Wine Consumption and Trade

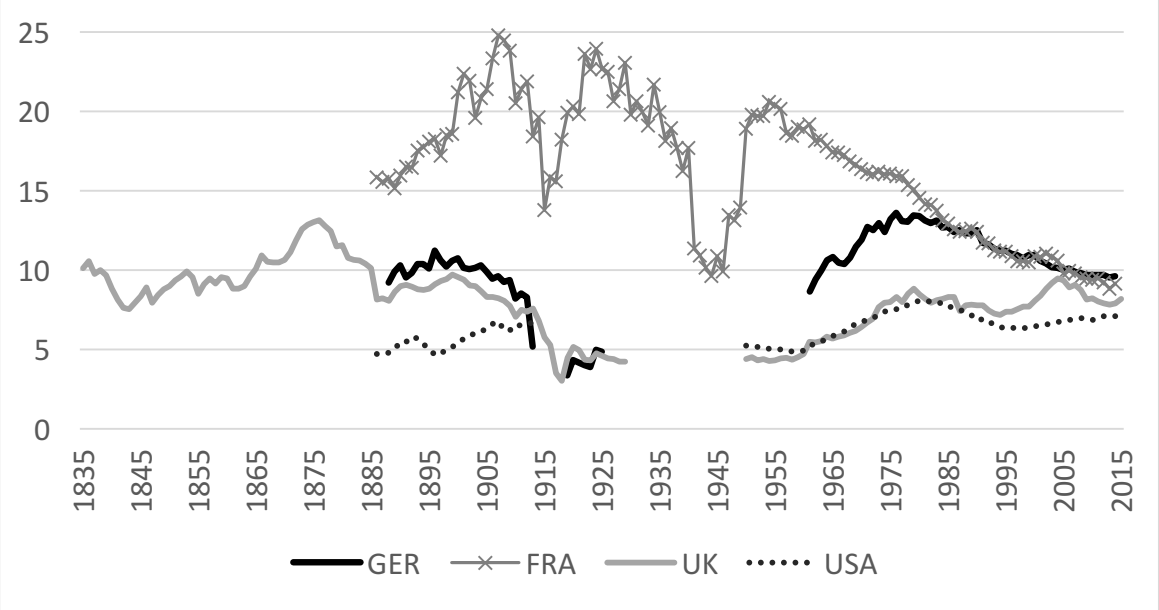
Traditionally, Germany has always been a country with one of the highest per capita alcohol consumption outside of France and Italy, roughly comparable with the UK (see Figure GER-6). During the second half of the 19th century, German per capita alcohol consumption was about 10 liters, compared to up to 25 liters in France. Except for the WW1 and WW2 periods, when France's alcohol consumption plummeted temporarily, this gap even widened in the first half of the 20th century. Only with the beginning of the "*Wirtschaftswunder*," the quick West-German economic recovery following WW2, Germany's per capita alcohol consumption has steadily increased until the late 1970s. In 1976, the average German consumed approximately 13.6 liters of alcohol – even exceeding the peak consumption of 10.8 liters in 1900. However, since then alcohol consumption has slowly declined. Currently, German per capita alcohol consumption is about 9.5 liters, a bit more than the average French consumption. In fact, in Western Europe, only Belgium (11 liters/capita) and Austria (10.6 liters/capita) exhibit a higher alcohol consumption.

Figure GER-6

Total Per Capita Alcohol Consumption

in Germany, France, the UK and the U.S. 1880-2015

in liters of alcohol per capita

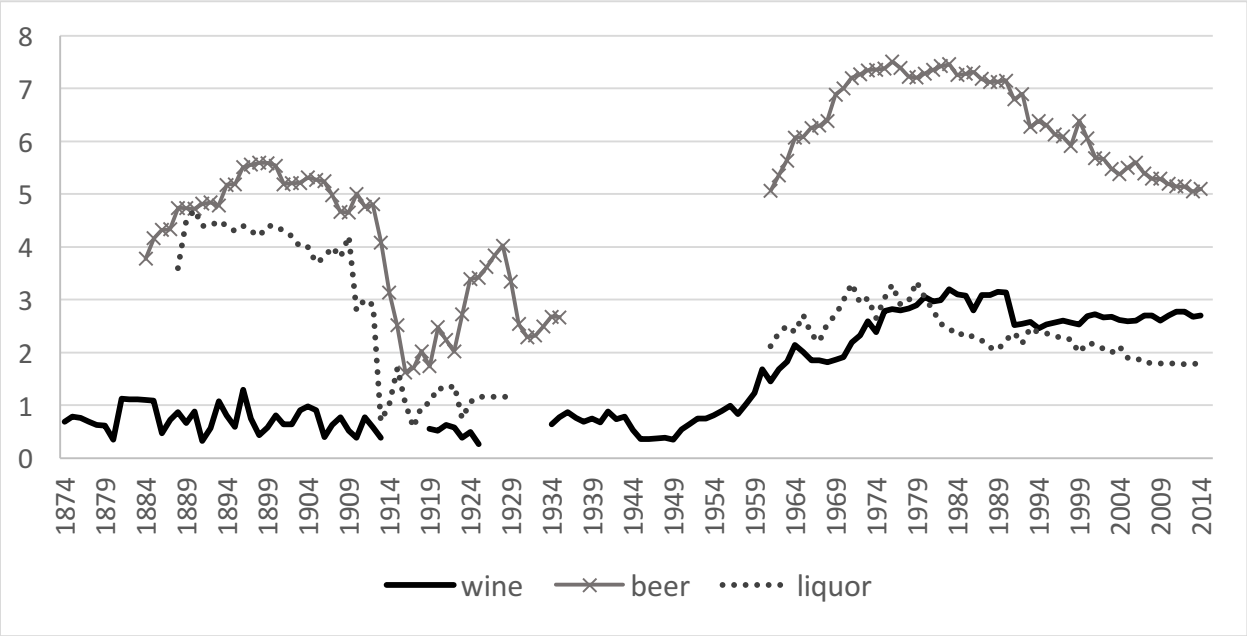


Source: Anderson and Pinilla (2017).

Figure GER-7

Per Capita Wine, Beer, and Liquor Consumption in Germany 1874-2015

in liters of alcohol per capita



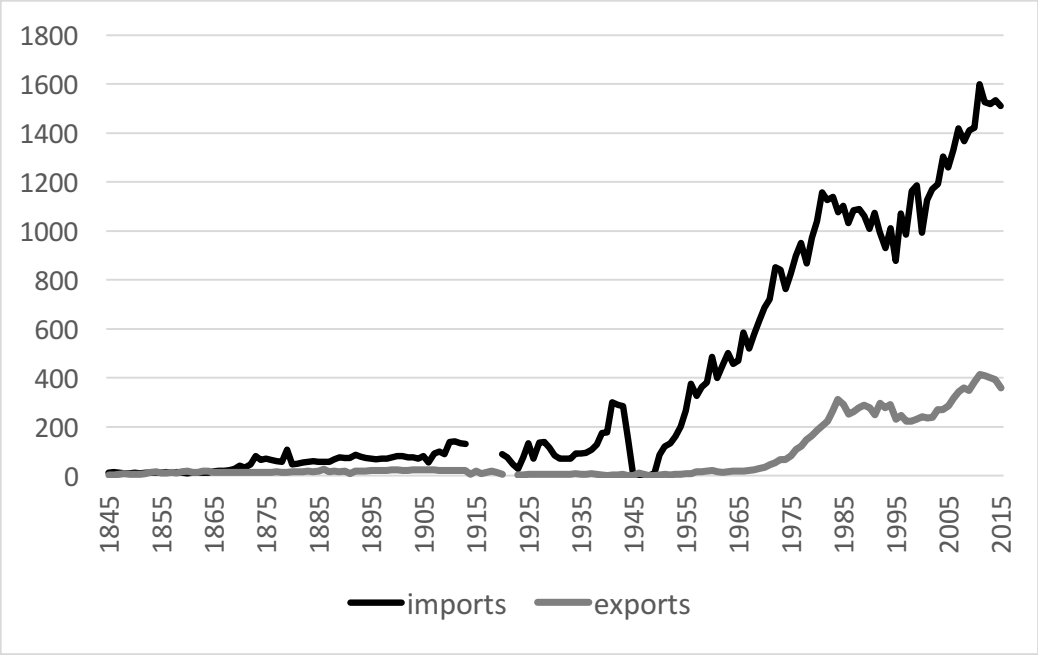
Source: Anderson and Pinilla (2017).

In addition to changing levels, there have also been significant compositional changes in German alcohol consumption (Figure GER-7). In contrast to France and Italy, Germany's alcohol consumption has always been dominated by beer. The beer share of total alcohol consumption has changed only little over the last 150 years and has always stayed close to 50%. However, wine has substituted spirits. While spirit's share was more than 40% in 1900, it fell to 24% in 1976, and now accounts for approximately 19% of German alcohol consumption. This void was filled by wine. The wine share of per capita alcohol intake rose from 13% in 1900, over 26% in 1976 to now about 32%. There are also pronounced regional differences within Germany. While northern and eastern German region focus on beer and spirits, the south-western regions, in particular the state of Baden-Württemberg, exhibit the highest per capita wine consumption in Germany (Wiesgen-Pick, 2016).

Rising per capita wine consumption combined with a growing population has significantly increased overall wine consumption. Although German viticulture has become more productive, especially from 1945 on, domestic production has almost never been able to satisfy domestic demand. That is, for almost its entire history, Germany has been a net-importer of wine. In fact, although Germany is currently the 7th largest wine exporter in the world by volume, it has been the world's largest wine importer by quantity since 1976. Figure GER-8 shows that wine trade began to become significant in the 1930s, just before WW2, but came to a complete halt from 1945-1949. However, starting in 1950, wine imports into Germany soared after post-World War II reconstruction, but wine exports also began growing from the late 1960s on. Such intra-industry trade made sense because Germany's competitiveness has been mostly in white wines, with reds being imported from warmer countries to its south. Since the 1960s the share of imports in domestic wine consumption has risen from around 50% to more than 80% (Figure GER-9).

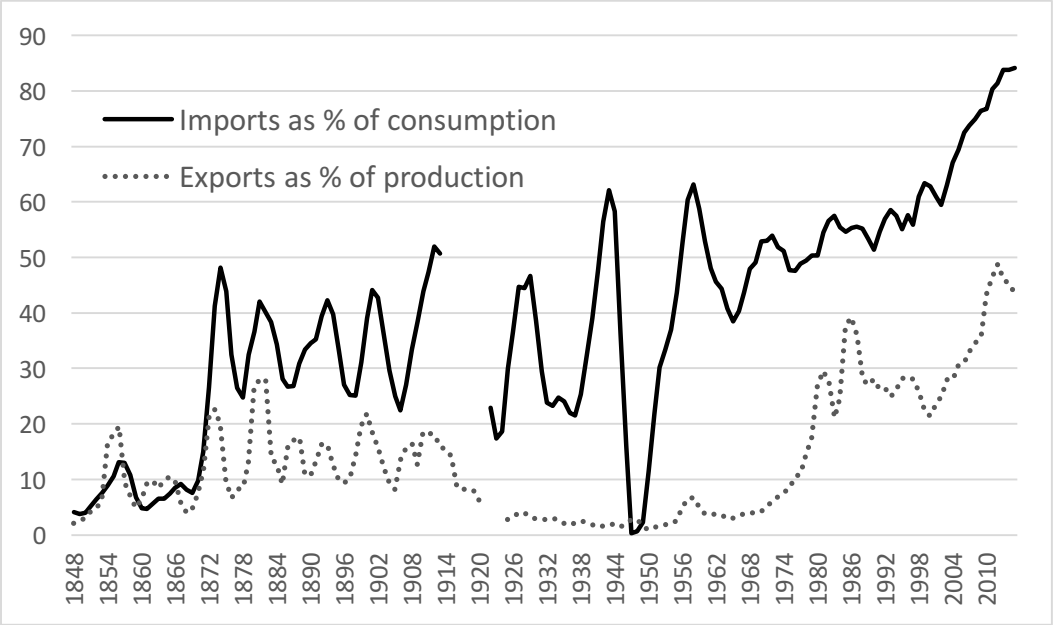
To understand the forces behind these trends, the rest of this section is divided into five time periods.

Figure GER-8
German Wine Trade by Volume 1845-2015
in 1000 tons



Source: Anderson and Pinilla (2017).

Figure GER-9
Shares of Production Exported and of Consumption Imported 1845-2015
in %, 3-year moving average



Source: Anderson and Pinilla (2017).

From Napoleon to German Unification: 1794 to 1871

For most of its history, present day Germany consisted of an extraordinary large number of small sovereign economic zones -- kingdoms, duchies and free cities, all with their own customs and tax regulations. For instance, Keller and Shiue (2014) show that, in 1789, there were more than 50 sovereign states within an area of 60 miles around the free city of Frankfurt.

This fragmentation was somewhat reduced during the *French period* between 1794 and 1815, when most of Germany was under French rule. In fact, in 1801, all German states west of the Rhine river were incorporated into the French state. This included the wine regions Ahr, Mosel, Nahe, Rheinhessen, and Pfalz, i.e., the vast majority of German wine production. As a direct result, many of the old domestic customs and trade barriers ceased to exist. In addition, like in revolutionary France, church and nobility were expropriated and the assets were put up for public auctions (Storchmann, 2006) leading to a substantial increase in the number of private, self-accountable vintners. With the abolishment of the feudal upper class and their constraints the French authorities also introduced a vineyard classification system. Like in Burgundy and other parts of France, prices of vineyard sites were assessed with the objective to introduce a "fair tax" and levy land according to its profitability (e.g., Ashenfelter and Storchmann, 2010; Beck, 1869). In general, the institutional changes during the French period tended to be deregulatory and pro-business and have greatly benefitted viticulture (Winter-Tarvainen, 1992; Meyer, 1926).

However, the French period did not last long. After the battle of Waterloo and Napoleon's final defeat, the Rhineland (which encompasses the viticultural regions Mosel, Mittelrhein, Nahe and Ahr) fell to Prussia, while the Palatinate (Pfalz) fell to Bavaria. Hesse Darmstadt received what is now known as Rheinhessen (also the home of *Liebfraumilch*).

Being part of Prussia enormously benefitted most vintners in the Rhine Province; all of a sudden, Mosel, Rhine, Nahe and Ahr winemakers had custom-free access to the vast Prussian markets in the east and the growing industrial clusters on the Ruhr. In addition, they enjoyed protection from non-Prussian competitors, including from southern German regions such Baden, Württemberg, Palatinate (Pfalz) and Rheinhessen, due to high tariff barriers. As a result, within

20 years, the vineyard area in the Prussian Rhine Province grew by 57% from 18,414 ha in 1818 to 28,850 ha in 1837 (Meitzen, 1869; Robin, 1845).[1] However, the boom already contained the seeds of the subsequent "wine crisis" involving tax reforms and customs unions, as well as detrimental weather conditions (Storchmann, 2017).

The military defeat against Napoleon in 1806, the German Campaign of 1813-1814, which liberated the German states from the domination of the French Empire, and the final defeat of Napoleon in 1815 resulted in enormous burden for the Prussian State. Prussia endured chronical annual budget deficits of up to 25% and was in 1815 as well as in 1818 almost bankrupt. Therefore, tax increases combined with a tax harmonization between eastern and western provinces was needed (Winter-Tarvainen, 1992).

In 1819, Prussia introduced a so-called "wine tax," which was a production tax. The tax was to be paid by vintners and was based on the French vineyard classification. Depending on a vineyard's rank, a certain tax amount per quantity produced was due. The tax rates were based on average prices of the outstanding vintages 1818 and 1819 but were not lowered in subsequent inferior vintages. In addition, Prussia increased property tax rates and imposed a "class tax" in 1820. The class tax was a precursor of modern income taxes and levied individuals or households according to their income and wealth. Overall, between 1818 and 1821, the per capita tax burden in the Prussian Rhine Province grew by 50% (Winter-Tarvainen, 1992, p. 51).

In 1828, Prussia and Hesse Darmstadt (home of the wine region *Rheinhessen*) entered into customs agreements; in 1829, an agreement between Prussia, on the one hand, and Bavaria and Württemberg, on the other hand, followed. In the early 1830s, more smaller states joined in and on January 1, 1834, the *Zollverein* or *German Customs Union* formally came into existence.

Figure GER-10 shows the member states of the 1834 *Zollverein* as well as subsequent members. "The Zollverein was arguably the most important free trade agreement of the 19th century. It was the first time that politically independent states removed trade barriers between themselves and

[1] Winter-Tarvainen (1992) provides detailed data for all Mosel and Saar counties from 1816 to 1832.

delegated tariff-setting authority to a higher body. Although other treaties can be found, none were as encompassing or long-lived." (Keller and Shiue, 2014).

Figure GER-10

Germany and the *Zollverein*

However, the implications for vintners in the Prussian Rhine Province were less beneficial. Within a few years, they lost their monopoly position within Prussia and had to compete with winemakers from regions with more beneficial, i.e., warmer, climates.

Figure GER-11 shows the vineyard area of all wine growing regions that belonged to the *Zollverein* in 1842. Note, the *Zollverein* included Luxembourg which has never been part of Germany, and some relatively small vineyard areas in Brandenburg and what is now Poland (mainly *Zielona Góra* - German *Grünberg* in Silesia). Accordingly, with the establishment of the *Zollverein*, the Prussian Rhine Province (shaded dark in Figure GER-11) with its regions Mosel, Saar, Rhine, Nahe, and Ahr, faced an overwhelming competition mainly from Württemberg and Baden, then the by far largest wine growing regions. Overall, the Prussian vineyard area accounted for less than 15% of the *Zollverein's* area under vines.

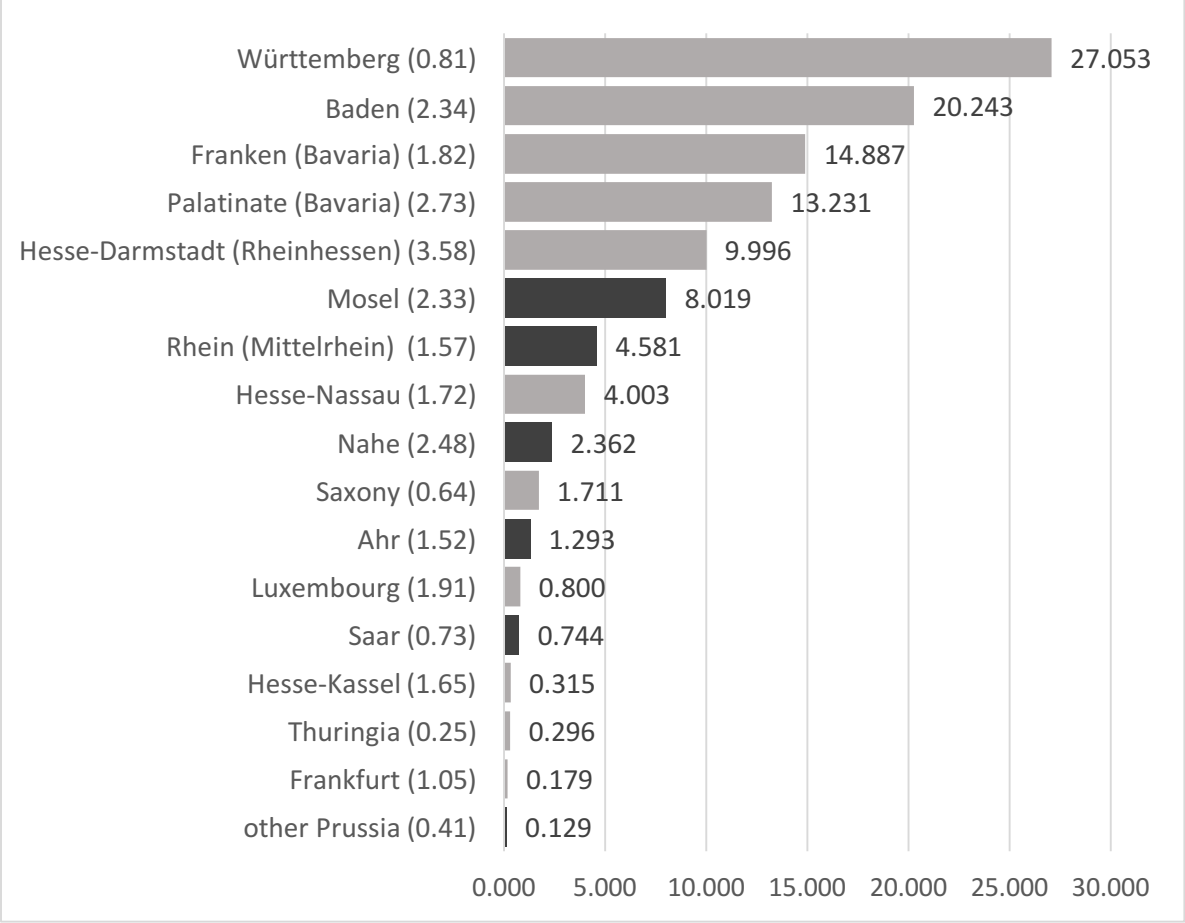
In addition, the 1830s and early 1840s were characterized by many very poor vintages with crop yields of regularly below 2 tons per hectare or even total crop failures in 1830 and in 1843.

Poverty and crime, especially firewood theft, was on the rise; for a detailed account see Winter-Tarvainen (1992). The wine crisis in the Mosel valley also became the topic of a series of socially critical articles by the young Karl Marx in the *Rheinische Zeitung* (Rhenish News) (Marx, 1843). Marx grew up in Trier, the main city in the Mosel valley, where his family also owned several vineyards nearby. In his articles, he denounces the poverty of Mosel winemakers, as well as the Prussian administration, their tax laws, and repressive behavior (see also Pelger, 1973). These articles ultimately forced Marx to leave Prussia and move to Paris in late 1843.

Figure GER-11

German Wine Regions in the Zollverein in 1842

in hectares (yields in tons per hectare in parentheses)



Source: Robin (1845), Dieterici (1848); Württemberg data are for 1841; Saxony yields are averages 1839-1841; other Prussia comprises Silesia, Prussian Saxony, and Brandenburg.

The Rhine Prussian wine crisis finally ended in the late 1850s, without any devoted subsidies, thanks to various factors. First, after 20 below average vintages, 1857 brought the first bumper crop, with many more excellent vintages to follow. Second, and more importantly, the railway network within the *Zollverein* states was developing at a rapid speed. Between 1845 and 1860 the rail system grew from 2,000 km to almost 12,000km (Winter-Tarvainen, 1992), which opened markets far away from the Mosel and the Rhine river. Not only did the railway system

expand the accessible market area, hauling wine by train was also less expensive and substantially faster than on-road transportation. An overland trip from Trier/Mosel to Berlin used to take several weeks. By train, this could be accomplished in two to three days.

Third, in addition to better weather and an improving transportation infrastructure, the wine industry also benefitted from a new technology, the so-called "gallisation." In contrast to chaptalization, where sugar is added to the grape juice, gallisation enhances wine by adding sugar water to the grape juice before fermentation. It is, therefore, also called "wet chaptalization." Gallisation dilutes and reduces the acidity of the finished wine, raises its alcoholic content and increases the volume of wine produced. It is named after the originator of the practice, Ludwig Gall, whose method was explicitly aimed at enabling vintners to make wine from unripe grapes (Gall, 1854).

However, all these factors would not have been as effective as they were without the *Zollverein* – a tariff-free customs union. The *Zollverein* was the necessary condition for expanding and profitable production in the first place. Before the implementation of the *Zollverein*, shipping wine within Germany was prohibitively expensive because each transit state imposed its tariff on the wine; and there was a multitude of states between the Mosel and Berlin. In fact, before the implementation of the *Zollverein* is was cheaper to ship wine almost tariff-free from Bordeaux to Hamburg than from the Rhine or Mosel to Berlin, which, in 1848, allegedly caused chancellor Otto von Bismarck to state "Red wine from Bordeaux is the natural beverage of northern Germans." (Thiersch, 2008; Bassermann-Jordan, 1907).

After the victory of Prussia over the Austria Empire in 1866, Prussia became the undisputed leader among the German states. Otto von Bismarck, the first German chancellor, saw the *Zollverein* as a vehicle toward German unity and, what was a loose customs league of independent states with a veto right for every member, became a customs federation with majority decisions in 1867. The late 1860s years became the apex of German free trade policy (Torp, 2014).

It is noteworthy to mention that, while the common market abandoned all tariff barriers, each

member state still maintained its own fiscal policy. That is, although there was no general *Zollverein* wine excise tax, several states, such as Württemberg, Baden, and Hesse, did impose various kinds taxes on wine consumption.

Overall, in the 1850s and 1860s, the wine industry within the *Zollverein*, including the Rhine Province, was flourishing. In fact, for the only time in its history, Germany (without Alsace-Lorraine) exhibited a positive wine trade balance, i.e., its wine exports exceeded its import in 1853 and 1854 and 1859-1864. Even the northern viticultural regions like the Mosel recovered.

From Unification to WW1: 1871 to 1918

After France's defeat in the Franco-Prussian war in 1871, all states of the *Zollverein* except Luxembourg, unified to the German Empire under Prussian leadership. In addition, former French Alsace-Lorraine, a large wine producing region, became part of the German Empire as well.

In the late 1870s, in Germany and elsewhere, trade policies began to turn towards protectionism. In 1879, Bismarck began to raise the protective barriers of the German Empire for all industries including wine. Wine tariffs increased by approximately 50% (Bassemir, 1930). For instance, the bulk wine tariff grew from 16 Mark/100kg to 24 Mark/100kg. However, given a rate of 48 Mark/100kg in 1864 and before, this increase was relatively modest.

The high tariff phase lasted until 1890 when Leo von Caprivi succeeded Bismarck as German chancellor. The German Empire was looking for markets for its industrial production. In numerous bilateral treaties, Caprivi cut back tariffs on breadstuff and wine in exchange for lower tariffs on German exports of industrial goods.

Bilateral treaties with Italy in 1891 and with Spain in 1893 lowered the tariffs on their bulk wine exports to 20 Mark/100kg. In addition, a new category, "blending wine," was introduced and levied with only 10 Mark/100kg. Tariffs on must (grape juice) were reduced to 4 Mark/100kg

(Bassemir, 1930). Two attempts to introduce an empire-wide excise tax on wine, in 1893 and in 1908, failed due to resistance in the Reichstag, the German parliament (Thiersch, 2008).

At first, and despite the lower protectionist level, German wine production was growing. Wine consumption was rising due to rapidly growing incomes. And the further improved railway network enhanced the competitiveness against foreign wines that were imported via the sea route.

However, in France and globally, wine prices had been declining for decades. For instance, Hassinger (1928) reports that wine prices in France fell steadily from 400 Mark per ton in 1884 to 160 Mark per ton in 1911. At the same time, imports of French wine grew from 52,211 tons (1884) to 136,810 tons (1911). This development was in parts also the result of the rising production in Algeria.

Consequently, by about 1906, German wine production found itself in another crisis. With about 90,000 hectares under vines, the German vineyard area had remained constant from about 1860 to 1906. However, the crisis caused a contraction to 69,000 hectares by the end of WW1, a preliminary low point.

In 1918, still during WWI, Germany introduced a very high import tariff of 60 Mark/100kg on bulk wine. However, due to the war and the trade blockade, its relevance was minor since the importation of foreign wine had come almost to a complete halt (Mueller, 1913; Bassemir, 1930; Hassinger, 1928).

Due to the absence of competing imports, the strong demand by the German army, and a series of excellent vintages, 1915, 1916, 1917, and 1918 were all above-average yield vintages, the domestic wine industry survived WW1 relatively well, at least compared to other industries. Given the lucrative position of the wine industry and the enormous financing requirements of the German Empire at the end of WW1, the German parliament finally introduced a general wine excise tax, the *Reichsweinsteuer*, in July of 1918. The tax was imposed on the final consumption

and the tax rate equaled 20% of the retail price for still wine and 30% on sparkling wine. From its introduction on, the tax was designed to expire and needed to be renewed by July 1923.

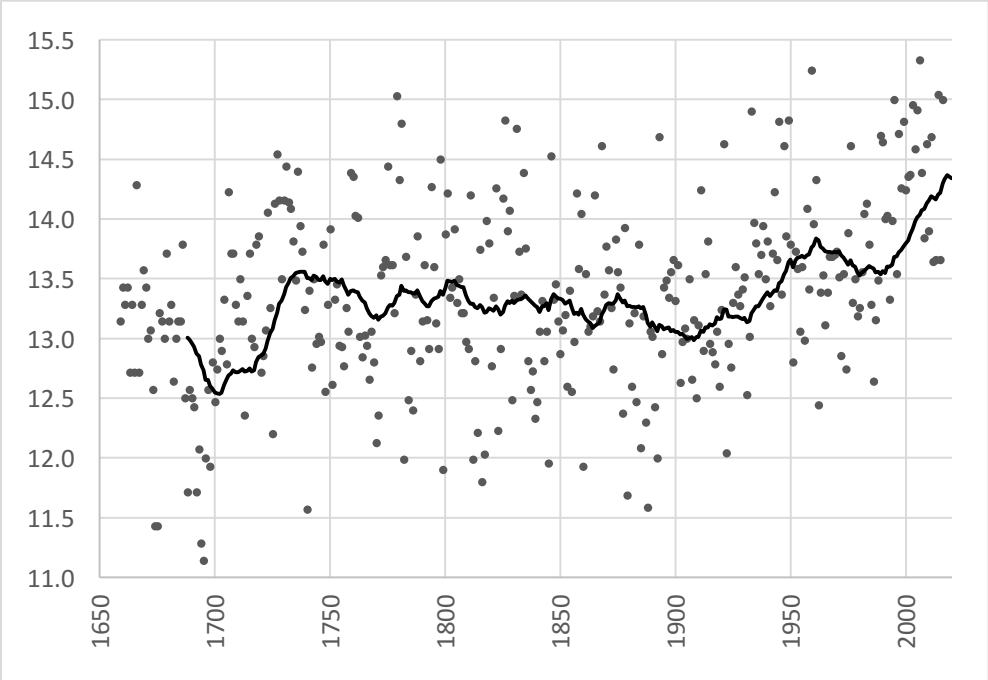
At the time, less attention was given to another turning point. First, average growing season temperatures reached a low point at the turn of the century and would grow henceforth. Figure GER-12 displays growing season temperatures drawing on the Manley series for Middle England, the world's longest measured temperature series. The 30-year moving average line suggests that from 1900 to 2016, temperatures have grown by approximately 1.5C°. As shown by Storchmann (2005), English temperatures are a good proxy variable for actual temperatures in Rhenish vineyards.

In addition, from the early 20th century on, the number of late frost days, i.e., freezing days after April 15, began to decrease. Late frost days are the main reason for high yield variability and total crop failures in Germany. Figure GER-13 shows the number of late frost days for the city of Jena, located in the wine growing region of Thuringia. While the occurrences appear to be erratic, the moving 25-year average suggests that, after about 1910, the number of frost days has steadily declined. What was a not uncommon event in the 19th century has become increasingly rare. The same pattern, only at a lower level, is true for the growing region on Rhine and Mosel. However, and this may be a caveat, rising growing season temperatures have also shifted the vine's phenological events to earlier calendar dates (e.g., Ashenfelter and Storchmann, 2016), somewhat reducing the positive effect.

Figure GER-12

Growing Season Temperatures in Europe 1659-2016

Manley Series for Middle England in ºC; Average from March to October

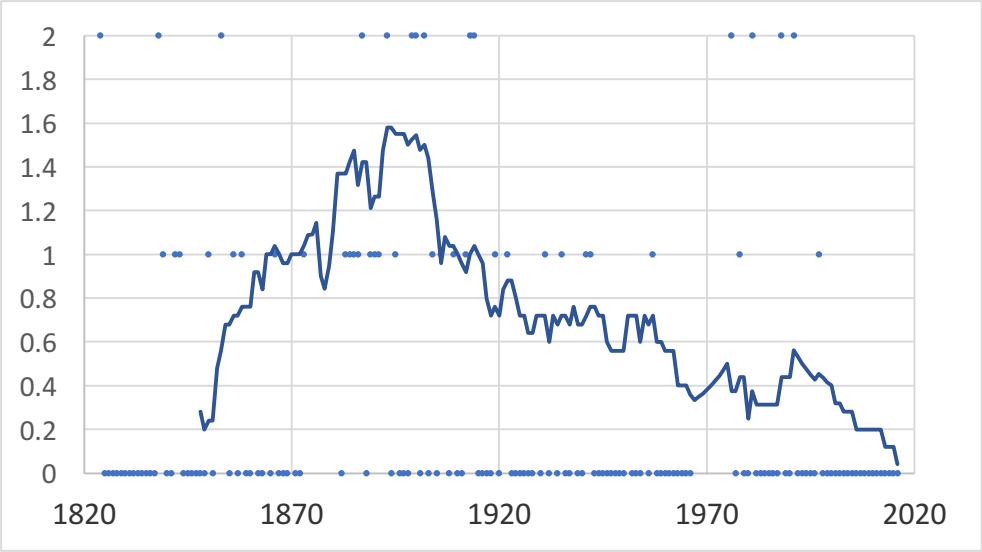


Source: Met Office Hadley Centre (2017).

Figure GER-13

Growing Season Frost Days in German Wine Region 1824-2016

(number of days <0^{0}C after April 15 in Saale-Unstrut; moving 25y-average)



Source: KNMI (2017).

From WW1 to the Third Reich: 1918 to 1933

After WW1, the economic situation in Germany, i.e., the Weimar Republic, was determined by the Treaty of Versailles of June 1919 and the therein stipulated German war reparation payments, principally to France, which put enormous burdens on the new German state. The main pillar of German economic development, its industrial exports, had come to an almost complete halt. The agricultural sector was incapable of producing enough foodstuffs and imports were hampered by a lack of foreign currency. Imports were further curbed by the beginning German inflation in 1919.

In 1918, the German area under vines was only 69,000 hectares, the lowest it had been in 100 years. Note, these figures refer to Germany in its borders from after 1990 and do not include Alsace-Lorraine.

German winemakers were pressured from various sides. First, the wine tax, still in place, was seen as a major burden. From 1923 on, the national wine excise tax (*Reichsweinsteuer*) was renewed and even augmented by a local beverage tax which taxed the entire local beverage consumption, at bars and other public drinking places as well as in private households (Thiersch, 2008). High tax burden in conjunction with low incomes led to a significant decrease in domestic wine consumption. Per capita wine consumption fell from 14.1 liter per capita in 1910 to 7.5 liter per capita in 1925 (Schmölders, 1932).

Second, Germany's wine exports, which were between 20,000 and 25,000 tons before WW1, fell to virtually zero after the war. This was only partially due to anti-German sentiments after the war. Given that the United States had been the largest export market for German wine, by volumes as well as by value, Germany lost approximately 30% of its wine exports due to the prohibition in the U.S. (1919-1933). In addition, the UK and Sweden, also major export markets for German wine, substantially reduced their demand.

Third, although German winemakers were protected by high tariffs that were implemented in 1918, a few months before the end of WW1, the Treaty of Versailles stripped Germany from its

tariff autonomy until 1923. The Treaty stipulated that France reserves the right to export a certain contingent of wine to Germany free of any duties until 1925. This quota was set at the average export between 1911 and 1913. Furthermore, Germany was obliged to grant the most-favored nation tariff rate to all allied nations and their associates (i.e., for wine, particularly France and Italy). In addition, there was an abundance of French wine entering Germany duty-free through the French occupied Saar region (Schnitzius, 1964; Thiersch, 2008).

However, the German market was not flooded with imported wine for several reasons. In 1923, when Germany recovered its partial tariff autonomy, the Weimar Republic went through the heights of a hyper-inflation. The mark lost value at a staggering rate. In the first half of 1922, the mark had a value of about 320 marks per US$. In contrast, in November 1923, one US$ was worth 4,210,500,000,000 marks (i.e., 4.21 trillion US$). Germany defaulted on its reparation payments (which were to be paid in gold) regularly and, against Anglo-American resistance, France occupied the Rhineland and the Ruhr to receive in kind (coal) reparations.

In order to facilitate its reparation payments, Germany introduced so-called gold tariffs in 1923, i.e., tariffs were to be paid gold. Due to the high gold tariff rate and the fact, that the delivered wine would have been paid in worthless marks, the German market became undesirable for large wine exporting countries such as France, Spain, and Italy. A series of bilateral tariff agreements followed. First, in 1923, Germany signed a trade agreement with Spain which cut the high 1918 tariff rate in half (Thiersch, 2008). Trade agreements with Italy and France followed in 1925 and 1927, respectively. As a result, wine imports increased significantly and in 1927 and 1928, the Weimar Republic was the world's second largest wine importer by volume after France. In 1927, France imported 1,040,000 tons,[2] compared with Germany's 136,000 tons, Switzerland's 121,000 tons and the UK's 84,000 tons; the U.S. was in the midst of prohibition and imported only 100 tons.

The German wine industry responded to the trade agreements with considerable skepticism and vehement protests. In 1926, furious winemakers even stormed the local tax office in Bernkastel

[2] This deems wine deliveries from Algeria wine imports (see also Meloni and Swinnen, 2014).

in the Mosel valley. Consequently, in 1926, the much disliked wine tax (*Reichsweinsteuer*) was abandoned and has never been resuscitated.

The *Third Reich*: 1933 to 1945

On January 30, 1933, Adolf Hitler was appointed Chancellor of Germany. Upon taking office, he immediately began accumulating power and changing the nature of the Chancellorship. Once in power, his National Socialist German Workers' Party (Nazi Party) went to swift action and, in September 1933, founded the *Reichsnährstand* (RNST), a government body responsible for all questions related to agrarian economics and politics. The Nazi Party did not trust markets and aimed at controlling production and prices for all agricultural goods including wine. The RNST played an active role in interfering on markets using a complex system of regulations and price controls. Headed by Richard Walther Darré, the RNST had legal authority over everyone involved in agricultural production and distribution; its directives could be enforced with police power. All former wine industry associations were dissolved or merged into the RNST (Herrmann, 1980; Thiersch, 2008; Deckers, 2010; Keil and Zillien, 2010).

Beginning in the fall of 1933, the RNST instituted a variety of regulations for the wine industry including laws for new vineyard plantings and the regulation of all distribution channels (see also Deckers, 2010; Keil and Zillien, 2010; Thiersch, 2008). One of the most important regulation was the introduction of a price floor in 1934. The price floor was based on detailed cost estimates and distinguished several price classes. Depending on the respective local vineyard characteristics each village was assigned to a price class. Since the price floor changed from time to time, minimum price lists were regularly published in the local papers. In general, winemakers welcomed the new regulation since the price floor was perceived to be above the free market price (Thiersch, 2008). However, the sign of RNST's price policy changed in 1936, when the price floor was turned into a price ceiling. From then on until the end of the war, prices must not exceed the instituted maximum.

In addition to the wine production, RNST also regulated the wine trade by defining maximum margins. First, a maximum markup of 20% was stipulated; later, a certain range as a function of past markups was allowed (Thiersch, 2008). After the outbreak of WWII in 1939, these regulations were severely tightened to secure a large contingent of inexpensive wine for the German military. Wine brokers and retailers had to sell 40% of their lower qualities to the Wehrmacht at a set liter price of 1.40 Reichsmark. This price was further lowered in 1943 leaving retailers, brokers and winemakers with even smaller (or no) margins. In addition, to alleviate scarcities, the entire wine production was to be registered and at least 80% was to be sold within 8 months after production (Herrmann, 1980).

Foreign Trade

Given the complex system of agricultural price controls under the Nazi regime, unregulated imports had the potential to cause serious problem since domestic prices were regularly above world market prices. Tariff barriers could only partially solve this problem. It was, therefore, planned to regulate wine imports similar to the corn (maize) market, where all imports pass through a state-owned monopoly that adds a margin and then distributes the imports to regional middlemen. Although a monopoly institution for wine was launched in 1936, it only dealt in oils, dairy and eggs; wine was exempt. RNST decided that tariffs in conjunction with price controls and regulated trade margins were sufficient to protect the domestic production.

Figure GER-14 shows that the market share composition of importing countries has changed considerably between 1897 and 1940. First, wine imports from France had been on the decline virtually since 1910. Once the dominant wine importer into the German Empire with markets shares well above 50% before 1910, France's share fell to about 30% just before WWI and to 20% after WWI. While this share stayed even in the 1920s, from 1930 on, the Frabce's import share fell to 3% in 1940.

The void was mainly filled by Italy, whose share grew from 10% in 1930 to more than 40% in 1940. Imports from Spain behave somewhat erratic. While up to 46% of German wine imports came from Spain in the early 1930s, the Spanish Civil War brought this share down to 10%.

Other significant importers in the 1930s were Greece with import shares between 6-20% and Hungary with shares between 4-14%.

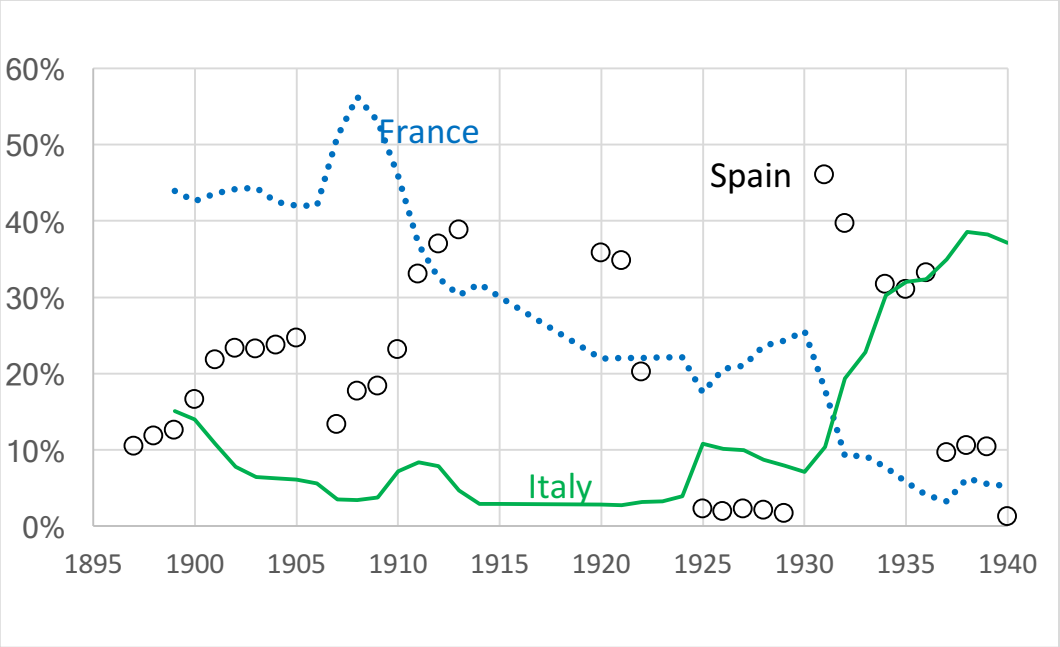
During WWII, especially from 1941 to 1943, imports almost doubled compared to 1939. Opposite to the pre-war trend, most wine was imported from France. In fact, in 1944, France's import share was 80% (Herrmann, 1980).

Compared to wine imports, German wine exports were minimal. In 1934, the Nazi regime established a state-run export agency (*Weinausfuhrstelle*). All wine exports needed the approval of the *Weinausfuhrstelle* which controlled quality and quantity of German wine exports (Thiersch, 2008). During the 1930s, German wine exports hovered around 6,000 tons per year and never reached the pre-WWI levels of about 24,000 tons. With the outbreak of WWII, wine exports virtually ceased.

Figure GER-14

Import Share of France, Italy and Spain on the German Wine Market

in % of volume



From WWII to the European Common Market: 1945 to 1970

1945 to 1949: After WWII

After WWII and the collapse and division of Germany, German viticulture found itself at its lowest point in history. The area under vines began falling even before WWII and further declined during the war and the following years. After a recorded vineyard area of 72,000 hectares in 1939, only about 49,500 hectares were left in 1947. This is less than half of the vineyard area 100 years before. Not all of this decline can be attributed to the war, some was due to the extremely harsh winter in 1939/40. Herrmann (1980) reports that 80 million vines died in the frost and more than 4,000 hectares were grubbed up in Rheinhessen and the Pfalz in early 1940. In 1941/42 another extreme winter, not as cold as in 1939/40 but very volatile, caused even more damage. The *Reichsministerium für Ernährung und Landwirtschaft* (Ministry for Food and Agriculture) reported a total vineyard loss of 10,400 hectares (Herrmann, 1980).

After the war, there was no official statistically registered foreign wine trade until 1949. With Schnitzius (1964), and given the above average yields in 1946 and 1947, we can assume that the Allied Forces confiscated some wine and exported it to the U.S. or the UK. Likewise, and just like after the end of WWI, the Saar region was occupied by French troops and uncontrolled quantities of French wine were imported into Germany. However, official foreign wine trade data for the time-period between 1945 and 1949 do not exist.

1949 to 1958: From Currency Reform to the Treaty of Rome

The currency reform, i.e., the introduction of the Deutsche Mark (DM) in June 1948, was a necessary condition for the revitalization of Germany's foreign trade. However, due to the extremely low incomes, the demand for imported wine was virtually non-existent at first. In addition, trade needed to be approved by the agency of the respective occupying force.

The first amount for wine imports worth US$ 200,000 was approved in February of 1949 by the *Joint Import-Export Agency (JIEA)*, a British-American regulatory agency for bi-zonal foreign

trade located in Frankfurt/Main (Schnitzius, 1964). In all of 1949, Germany imported just 10,900 tons of wine worth 9.6 million DM. However, the demand for foreign wines increased rapidly and two years later, in 1951, imports already amounted to 118,600 tons.

Once again, the domestic wine industry deemed itself incapable of surviving on the world market without any government support. During the period from 1949 to 1958, Germany's wine imports were, therefore, regulated by a complex system of quotas and tariffs. The first pillar consisted of country-specific contingents for France, Italy, Spain, Greece, Yugoslavia and a few other smaller wine exporters. While the largest contingent in the early 1950s was reserved for Italy, France's share grew rapidly and, in 1956, it was about as large as the shares of Italy, Spain and Greece combined. The contingents were set in bilateral trade agreements and, in order to mitigate negative impacts on the domestic wine industry, which predominantly produced white wines, provided larger quotas for red than for white wine (Thiersch, 2008). In addition to these country-specific quotas, there was an "open quota" to be filled by any country on a first-come-first-served basis and a separate contingent for fermented grape juice (Weise, 1958).

In August of 1949, the government instituted the first protectionist law[3] which provided that the government can lift the price of all imported wine to the domestic level. Essentially, this is an equivalent of an import tax or tariff. As a result, the average price level of imported wine doubled (Schnitzius, 1964; Thiersch, 2008).

In contrast, the government was reluctant to provide direct producer supports. The support levels were small and predominantly aimed at improving productivity. The main focus was put on supportive measures against recurring phylloxera infestations and on land consolidations (*Flurbereinigung*) in which small plots were merged to larger ones to exploit some economies of scale. Further measures aimed at improving wine quality, marketing, and the support of wine cooperatives (Thiersch, 2008).

[3] Gesetz über die Festsetzung und Verrechnung von Ausgleichs- und Unterschiedsbeträgen für Einfuhrgüter der Land- und Ernährungswirtschaft.

Similar to the rapidly growing import volume in the 1950s, wine exports increased as well, although at a much lower level. While in 1950 about 2,300 tons were exported, this increased to about 9,400 tons in 1958. Like before WWII, the main importers of German wine were the United Kingdom and the U.S.

1958 to 1970: Preparations for the Common Market

On January 1, 1958, the *Treaty establishing the European Economic Community (TEEC)*, or short *Treaty of Rome*, came into effect. It was the first step into the creation of a European common market without trade barriers for all goods including wine. The Treaty provided a 12-year transition phase until 1970 when the markets will finally open. The main implication for the German wine industry was the successive reduction of protective import quotas and tariffs. From 1970 on, no protective measures were allowed anymore. Again, the German wine industry, as the Mosel winemakers in 1834, feared the supposedly more effective competition from the south.

The German government instituted that new plantings and re-plantings required permission and plantings of certain varieties were prohibited. The federal government launched a stabilizing fund (*Stabilisierungsfonds*), financed jointly by the government and wine industry dues, to promote research, quality, and marketing. The fund also provided loans for the provision of space for surplus storage to control the wine supply and subsequently the market price.

German wine tariffs were lowered in incremental steps; first on January 1, 1959, by 10%, then on July 1, 1960, by another 10% and further, on January 1, 1961 by 5%. That is, a 25% decrease was attained after only two years. By 1968, two years ahead of plan, all wine tariffs were removed and the German wine sector faced the world market's competition for the first time in many decades.

After WWII: Consumption and Trade

Table GER-1 reports population, income, wine consumption and wine trade for each decade from 1950 to 2015. It is evident that, starting from a very low level in 1950, all variables exhibit the strongest growth rates during the first decade; only population shows its strongest growth in

the second decade. Remarkably, Table GER-1 suggests a close link between per capita income and per capita wine consumption. Over the entire period, from 1950 to 2015, both variables exhibit similar average annual growth rates of 2.71% and 2.49%, respectively. However, the relation between income and wine consumption has become increasingly loose from the 1980s on. While per capita wine consumption growth rates by far exceeded income growth rates in the 1950s, wine consumption has reached its peak in 1990 and has leveled off since then. Since 1990, per capita consumption has declined from about 26.1 liters to 22.3 liters in 2015.

Most of the wine consumed has been imported. In 1967, for the first time in history, Germany surpassed France and became the world's largest wine importer by volume for one year. While, from 1968 to 1975, Germany and France took turns being the world's largest importer, since 1976 Germany has been the world's largest wine importer by volume. The only exception was the year 2005, when the United Kingdom slightly exceeded Germany's wine imports. Due to the high share of imported bulk wine, however, Germany is only the second largest wine importer value; the United Kingdom has ranked before Germany since 1985.

Table GER-2 provides some insights into German wine imports and their composition from 1991 on, the first full year of the reunified Germany. While quantities have grown by approximately 43% until 2015, import values have increased by 71% suggesting that the average price has risen too. However, prices display an uneven development and appear flat since about 2005, which is partially due to the rising share of imported bulk wines. In the year 2000, the bulk wine import share was at 37.3%, its lowest point in recent history. Since then, however, the bulk wine share has risen to 57.9% in 2015 making Germany the by far largest bulk wine importer in the world. As a result, nominal import prices have not exhibited any significant changes since 2005.

Table GER-1

Population, Income, Wine Consumption and Wine Trade in Germany 1950-2015

	1950	1960	1970	1980	1990	2000	2010	2015
Population (in 1000)	68,375	72,481	77,783	78,298	79,380	82,188	81,777	82,176
income per capita in real 1990 US$	3,881	7,705	10,839	14,114	15,929	18,944	20,661	22,070
wine consumption (in 1000 tons)	309.2	1,014.2	1,237.4	1,991.3	2,074.4	1,843.0	1,838.7	1,813.0
wine consumption per capita (in liters)	4.5	14.0	15.9	25.4	26.1	22.4	22.5	22.3
wine production (in 1000 tons)	324.4	743.3	988.9	463.5	851.4	985.2	690.6	887.3
wine exports (in 1000 tons)	3.6	22.1	34.5	185.1	277.6	241.4	385.2	360.0
wine imports (1000 tons)	86.4	485.1	687.6	1,039.2	1,008.4	992.2	1,421.7	1,511.5
				Average Annual Growth Rate per decade				
	1950s	1960s	1970s	1980s	1990s	2000s	2010s	1950-2015
population	0.58%	0.71%	0.07%	0.14%	0.35%	-0.05%	0.05%	0.28%
income per capita	7.10%	3.47%	2.68%	1.22%	1.75%	0.87%	0.66%	2.71%
wine consumption	12.61%	2.01%	4.87%	0.41%	-1.18%	-0.02%	-0.14%	2.76%
wine consumption per capita	11.96%	1.29%	4.80%	0.27%	-1.52%	0.03%	-0.08%	2.49%
wine production	8.64%	2.90%	-7.30%	6.27%	1.47%	-3.49%	2.54%	1.56%
wine exports	19.87%	4.56%	18.28%	4.14%	-1.39%	4.78%	-0.67%	7.34%
wine imports	18.83%	3.55%	4.22%	-0.30%	-0.16%	3.66%	0.61%	4.50%

Source: Anderson and Pinilla (2017).

Table GER-2

German Wine Imports 1991 to 2015

	1991	1995	2000	2005	2010	2015
imports (1000 tons)	1079.1	995.0	1157.9	1334.7	1431.2	1539.1
imports (mill US$)	1637.9	1685.3	1667.2	2382.3	2696.8	2804.8
Avg Price (US$/liter)	1.52	1.69	1.44	1.78	1.88	1.82
			Import Share by Importing Country			
France (% of volume)	28.6%	23.7%	22.4%	17.7%	16.8%	14.7%
Italy (% of volume)	42.7%	50.0%	44.6%	40.4%	42.9%	36.7%
Spain (% of volume)	5.4%	11.3%	11.4%	16.4%	15.4%	25.7%
France (% of value)	48.4%	41.7%	32.4%	28.5%	29.4%	27.2%
Italy (% of value)	31.7%	33.8%	33.0%	33.9%	36.2%	35.9%
Spain (% of value)	6.9%	11.8%	14.9%	15.2%	12.3%	15.5%
Bulk (% of volume)	55.9%	40.8%	37.3%	44.8%	55.0%	57.9%

Source: UN Comtrade Database (2017). Note: there are slight discrepancies between the Comtrade data and the import data provided by Anderson and Pinilla (2017), which are based on FAOSTAT (Food and Agriculture Organization of the United Nations, 2017).

Table GER-3

Top 8 Bulk Wine Routes in 2000 and in 2015

in thousand tons

2000		2015	
Italy → France	292.4	Spain → France	511.0
Italy → Germany	254.4	Italy → Germany	251.9
France → Germany	83.3	Spain → Germany	250.6
Spain → France	79.5	Australia → UK	204.2
Macedonia → Germany	47.2	Spain → Italy	133.2
Spain → Germany	35.8	South Africa → Germany	126.2
Australia → UK	35.7	Spain → Portugal	122.2
France → UK	29.5	Chile → China	104.1

Source: UN Comtrade Database (2017).

In addition, the composition of importing countries has changed as well. Italy has not only defended its role as Germany's main wine supplier by volume, since 2000 it has also been the prime importer by value. At the same time, France's position has substantially deteriorated. Between 1991 and 2015, its volume share fell from 28.6% to 14.7%; its value share fell from 48.4% to 27.2%. Noteworthy is the rise of Spanish wine on the German wine market. Spain joined the European Union in 1986 and in 1991 Spain had a 5.4% volume market share in Germany. However, in 2015, Spain's share has grown to 25.7%.

Most of the rise of Spanish wine imports into Germany is due to Spain's increasing focus on bulk wine, not only for the German market. Table GER-3 lists the world's top 8 bulk wine routes in 2000 and in 2015. Aside from the fact that the bulk wine trade has grown significantly, its structure has changed as well. Italy, once the undisputed leader among bulk exporting countries, has been replaced by Spain. France has changed its position from a net exporter to a net importer of bulk wine. In 2015, Spanish bulk wine exports to France account for 10.6% of all global bulk wine exports. Spain's second most important bulk wine customer is Germany. With major bulk wine imports from Italy, Spain and South Africa, Germany imports approximately 21.3% of the world's bulk exports.

After WWII: Rising Yields and Yield Restrictions

Most European countries, especially the leading yield-countries France and Germany, have experienced a significant increase in wine yields beginning in the mid 1950s (see Figure GER-5). Italy's yield rise began later, in the late 1960s; Spain's yield rise was rather gradual and has never reached German or French levels.

While France had always been Europe's top-yield country, Germany caught up and, with 3.7 tons per hectare (t/ha), passed France in 1957 (see Figure GER-5). Since then, Germany has been the top yielding wine country in Europe. Its peak yield of 10.8 t/ha in 1992 was second to none. In contrast, Spain's yields have never been higher than 3.6 t/ha. Over the last 20 years, German yields have constantly been in excess of 9 t/ha, about 50% above French and Italian yields of 6 t/ha.

As early as 1962, the European Union began to institute a complex system of regulation for the wine industry "with the official intention of affecting the quality and location of wine production. Such 'quality regulations' include policy instruments, such as the geographical delimitation of a certain wine area, winegrowing and production rules (as regulations on grape variety, minimum and maximum alcohol content and maximum vineyard yields ..." (Meloni and Swinnen, 2013, p. 248). Most of the policies, including maximum yield regulations, were based on prior policies that have already been in place in France since the 1930s.[4]

Against the background of the persistent "oversupply" (at minimum prices) in the European Union during the 1970s and 1980s, various yield regulations were instituted, mainly in France and Italy. Germany introduced maximum yield regulations in 1989. This measure was based on a European Union provision from 1970 that obliged Germany to cap yields by 1990. The provision stipulated a maximum wine production per hectare, differentiated by region and grape variety. Excess quantities must not enter the market, neither as wine nor as must, juice, distilled spirit or vinegar. However, it was possible to roll over excess quantities into the following years if the cap is underused then. For instance, in Rhineland-Palatinate (the state that includes the majority of Germany's wine production), the thresholds were set at 12 t/ha for Riesling and 13 t/ha for Müller-Thurgau. Between 1973 and 1987, i.e., before the regulation took hold, these thresholds were surpassed four times for Riesling and eight times for Müller-Thurgau (Kosmetschke and Hepp, 1991). Therefore, in Germany, the discussion about maximum yield regulations was led controversially; many authors were dismissive as the stipulation was seen as contra free market and a punishment of productivity. As a result, vintners held on to their unproductive plots and did not expand productive plots. A detailed account of the regulations and the related discussion is provided by Kosmetschke and Hepp (1991), and particularly by Hoffmann (1988).

Figure GER-5 shows the effects of the maximum yield regulations. After 1990, average German yields almost never exceeded 10t/ha and tend to slightly decline in subsequent decades. Table GER-4 reports per hectare revenues, costs, subsidies, and profits for 2014 in the14 wine

[4] Meloni and Swinnen (2013) provide a detailed account of the history and political economy of EU wine regulations.

producing countries of the European Union. In the last column, the Table provides the average yield from 2000-2015. The monetary figures are based on data from the Farm Accountancy Data Network (FADN) of the European Commission which relies on a sample of about 2-3% test farms. The data are national averages and do not report intra-national and inter-firm disparities. For instance, in France, winemakers in Champagne have a per hectare profit that is approximately 10 times higher than the one the of a winegrower in Languedoc. Similarly, firms that sell bottled wine have larger profits than bulk wine producers. Also note, the subsidy figures only contain direct payments. Tax support or wine purchased by the European Union (e.g., for distillation purposes) are not included. That may be one reason for relatively low per hectare subsidies in France, Spain and Italy.

All variables display enormous inter-country disparities. Profit excluding subsidies range from almost 3,000 €/ha in Luxembourg to -233 €/ha in Bulgaria. Germany's per hectare profits are second only to Luxembourg and with 2,242 €/ha almost 40% above the average French profit.

Profits are closely related to yields. While Luxembourg and Germany report average yields of about 9.2 t/ha, yields in Bulgaria are significantly below 2 t/ha. Even Spain exhibits average that are below 3.5 t/ha. Table GER-4 suggests a close link between yields and profits per hectare. In fact, a simple linear regression between the two returns an R2 of 0.79.

Maximum yields are also often justified with the supposedly inverse relationship between quantity and quality. However, the assumption that high yields result in low quality and *vice versa* has been put under increasing scrutiny by viticulturists (e.g., Franson, 2016; Matthews, 2016; Skinkins, 2016; Uzes and Skinkins, 2016). In fact, there are many indications for a positive link. For instance, France AgriMer publishes yields, prices, and profits for French wine regions suggesting that the northern wine regions Champagne, Alsace, and Bourgogne not only exhibit the by far highest yields but also command the highest per ton prices within France (France AgriMer, 2016).

Table GER-4

Per Hectare Revenue, Cost and Profits in the European Union 2014

Results from Accountancy Data FADN; all in €/hectare

Country	Revenue	of which direct subsidies	Cost	Profit incl. subsidies	Profit w/o subsidies	Yield[a] t/ha
Austria	5,517	834	3,996	1,521	688	5.47
Bulgaria	2,503	470	2,269	234	-236	1.58
Croatia	3,265	288	2,829	436	147	2.38
Czech Republic	8,057	1,101	5,282	2,775	1,674	na
France	8,941	261	7,072	1,869	1,608	5.96
Germany	**12,242**	**1,102**	**8,899**	**3,343**	**2,242**	**9.17**
Greece	4,869	819	2,504	2,365	1,546	3.16
Hungary	5,337	664	4,091	1,246	583	4.18
Italy	5,943	485	3,485	2,458	1,973	6.46
Luxembourg	18,882	2,838	13,076	5,806	2,968	9.16[b]
Portugal	4,168	665	2,605	1,562	897	3.07
Romania	2,444	159	2,381	63	-97	2.29
Slovenia	6,479	1,163	4,840	1,638	475	na
Spain	1,990	250	1,030	960	710	3.46

Source: European Commission (2017), Grand-Duchy of Luxembourg (2017), Bundesministerium für Ernährung und Landwirtschaft (2016a); Anderson and Pinilla (2017); Notes: [a] average yield 2000-2015; [b] only average for 2000 and 2011-2015.

After WWII: Regional Shifts in Search for Profitability

Over the last 200 years, viticulture and winemaking has exhibited remarkable regional shifts within Germany. In 1842, a few years after the German customs union, the *Zollverein*, was established, most of the German vineyard area was located in the south of Germany, particularly in Württemberg and Baden (Table GER-5). The northern regions, e.g., Mosel, Nahe,and Rheingau, felt threatened by the south's assumed higher productivity. However, Germany's vineyard area did not move south but shifted to the northwest. Although 1842 is only a snapshot, Table GER-5 suggests that Württemberg already exhibited serious yield problems 175 years ago.

These problems did not go away. In 1905, the young Theodor Heuss wrote his PhD thesis on the lacking profitability of Württemberg's viticulture providing a detailed account of revenues, prices, costs, and profits (Heuss, 1906). 44 years later, in 1949, Heuss should become the first President of the newly founded Federal Republic of Germany (West Germany).

Until 1920, Württemberg lost 60% of its vineyards and was still at the bottom of the German yield scale. In contrast, driven by high yields and profitability, Rheinhessen almost tripled its vineyard area from approximately 10,000 ha in 1842 to now almost 26,000 ha (see also Türke, (1969) and, for data on the county level, Hahn (1956)). Overall, the search for high yields and profits have spurred a regional substitution process that has increased overall productivity. And in contrast to general beliefs, vineyards in Southern Germany's warmer climates appear to exhibit below-average productivities.

As reported in Table GER-6, the highest per hectare profits between 2010 and 2015 were attained in the Mosel region. Mosel vineyards have returned €6,326 per hectare with Coefficient of Variation of 12.2%. In contrast, Württemberg's vineyard land only yielded just €2,581 with more the twice the variability. It should be noted that the low per-hectare profits in Rheinhessen are offset by a larger average vineyard area per winery. Rheinhessen wineries exhibit an average vineyard area of 25.7 hectares and are approximately three times as large as the average Mosel winery (8.7 ha) (Bundesministerium für Ernährung und Landwirtschaft BMEL, 2016a)

In 1976, the European Union introduced planting rights. Since then, the planting of new vineyards has been forbidden unless the planter has a permission, i.e., a planting right (Deconinck and Swinnen, 2015). The introduction of planting rights has been aimed at limiting supply and stabilizing prices. However, there have been several problems with the planting rights system. First, the enforcement of planting rights has been a major problem from its very beginning (Meloni and Swinnen, 2016). For instance, vintners in some wine-growing countries have repeatedly ignored planting rights. In fact, in 2000, the EU found 120,507 ha of illegally planted vineyards, an area that exceeds all the vineyard land in Germany and Alsace combined. Most of the illegal plantings were found in Spain (55,088 ha), Italy (52,604 ha), and Greece (12,268 ha). In Greece, more than 18% of all vineyards were illegally planted. The EU

retroactively legalized almost all of the irregular plantings (Commission of the European Communities, 2007; Ashenfelter and Storchmann, 2016).

Table GER-5
Regional Changes in German Vineyard Areas 1842 to 2015

	1842		1920		2015	
	ha	t/ha	ha	t/ha	ha	t/ha
Württemberg	27,053	0.81	10,897	1.45	11,118	9.70
Baden	20,243	2.34	12,675	2.96	15,478	7.49
Franken	14,887	1.82	3,600	2.99	6,013	6.93
Palatinate	13,231	2.73	14,968	4.78	22,978	9.87
Rheinhessen	9,996	3.58	13,604	3.47	25,753	9.69
Mosel-Saar	8,763	2.20	8,008	5.14	8,488	8.85
Mittelrhein	4,581	1.57	2,014	2.47	439	6.36
Rheingau	4,003	1.72	2,314	2.20	3,109	6.49
Nahe	2,362	2.48	2,671	2.20	4,105	7.64
Ahr	1,293	1.52	608	4.00	548	7.18

Source: Robin (1845), Dieterici (1848), Statistisches Reichsamt (1922), Bundesministerium für Ernährung und Landwirtschaft (2016a)

Table GER-6
Per Hectare Profits in German Wine Growing Regions 2010-2015
in current € per hectare

	2010	2011	2012	2013	2014	2015	Average	Coefficient of Variation
Mosel	4,708	5,662	6,775	6,159	6,337	6,696	6,326	12.2%
Rheinhessen	2,678	2,583	2,538	3,097	2,934	3,087	2,848	8.8%
Palatinate	3,197	3,912	4,260	4,696	3,966	4,550	4,277	12.6%
Württemberg	2,775	1,707	2,531	3,102	2,044	3,522	2,581	25.9%
Franken	4,380	3,849	4,132	4,064	4,773	4,905	4,345	9.6%
Total	3,115	3,232	3,651	3,938	3,442	4,033	3,659	10.2%

Source: Bundesministerium für Ernährung und Landwirtschaft (2016a).

Second, vineyard planting rights were allocated to the firms and countries with vineyards, thus granting monopoly rents to those vineyard owners. Cross-country trade in rights is not allowed. The European Commission has recognized this problem and planned to liberalize vineyards plantings by 2015. However, due to lobby pressure this deregulation did not occur. The current policy is a compromise and allows each country to expand its vineyard area by up to 1% of its 2015 area. This regulation, scheduled to stay in place until 2030, implies that, if the allowances are exhausted, the absolute largest vineyard expansion will take place in less productive regions. In addition, to exasperate the situation, and in response to lobby pressure form the German wine industry, Germany chose to stay below the 1% allowance and committed to only 0.3%. According to a letter of the German government to the European Commission, the reasoning for this unexpected move is that an increase in the supply of German wine would depress producer prices and, therefore, the incomes of German vintners (Bundesministerium für Ernährung und Landwirtschaft, 2016b). Apparently, the German government does not regard imported wine as price-relevant for the German wine market. For 2016, the European Union permitted new plantings of 17,156 ha, only 308 of which are located in Germany (European Commission, 2016; Wine-Inside, 2016).[5] Most of the new planting rights for 2016 were granted to Italy (6,376 ha), Spain (4,173 ha), France (3,538 ha), Portugal (1,657 ha) and Greece (636 ha).

As a result, regional shifts in the vineyard area in the search for higher productivity, as observed over the last 170 years within Germany, have been made impossible on the European level until at least 2030. This may become a major obstacle for swift responses to changing environments, such as tighter budgets, changing markets, or climate change.

[5] Germany later returned 45 ha of the allotment and utilized only 263 ha.

II. Austria

Similar to Germany, Austria's borders have shifted considerably over the last 200 years. Germany incurred most of its territorial losses after WWIIs and fell from its maximum extent of 541,000 km^2 at its founding in 1871[6] to about 357,000 km^2 now (-34%). In contrast, Austria's decline occurred after WWI and was more significant. Before WWI, Austria-Hungary comprised a territory of 676,600 km^2 and was the second largest European country (after Russia) and the third most populous country (after Germany and Russia). After WWI, Austria lost more than 87% of its territory and now encompasses only 83,900 km^2. The loss becomes even more significant when looking at viticultural areas only. While Germany lost about 25% of its vineyard area in 1918 due to loss of Alsace-Lorraine, Austria lost more than 95% of its area under vines after WWI.

We can broadly distinguish four different Austrian states, the Austrian Empire (1804-1867), Austria-Hungary (1867-1918), the First Republic (1918-1938) and the Second Republic (1955-present). During the interim period (1938-1955), Austria was annexed by Germany (1938-1945) and occupied by Allied Forces (1945-1955).

Austrian Empire and Austria-Hungary: 1804-1918

The Austrian Empire (1804-1867) was a multinational state governed by the Austrian Emperor. The Austro-Hungarian Compromise (Ausgleich) of 1867 elevated Hungary's status. It became a separate entity from the Empire, joining it in the dual monarchy of Austria-Hungary (1867-1918). The *Cisleithanian* (Austrian) and *Transleithanian* (Hungarian) regions of the Empire were governed by separate parliaments and prime ministers. Although Austria and Hungary shared a common currency, they were fiscally sovereign and independent entities.

Figure AUT-1 shows the borders of the Austrian Empire and the nations it included. The darker area depicts present-day Austria, which is roughly identical with the nine states (*Bundesländer*) Lower Austria (incuding Vienna), Burgenland, Styria, Carinthia, (North)-Tyrol, Vorarlberg,

[6] For a short period, in 1939, just before WWII, due to the annexation of Austria and the Sudetenland, Germany's territory encompassed 634,000 km^2.

Upper Austria, and Salzburg, of which only the first four have professional vineyards. These states were deemed the Core-Austria. However, Core-Austria of the 19th century is not identical with present-day Austria for three reasons. First, Burgenland, a major wine state in current Austria, used to be a German-speaking part of Hungary and has never been part of *Cisleithania* (i.e., the Austrian part of the Austrian-Hungarian Empire). It was incorporated into Austria in 1922, after WWI. Second, Styria, also a wine producing state, which was formerly all Core-Austria, was divided after WWI and about 2/3 of its territory went to Slovenia. Third, Tyrol was divided after WWI and South-Tyrol, the wine producing part of the state, went completely to Italy.

Figure AUT-1

Austrian Empire Between 1816 and 1867

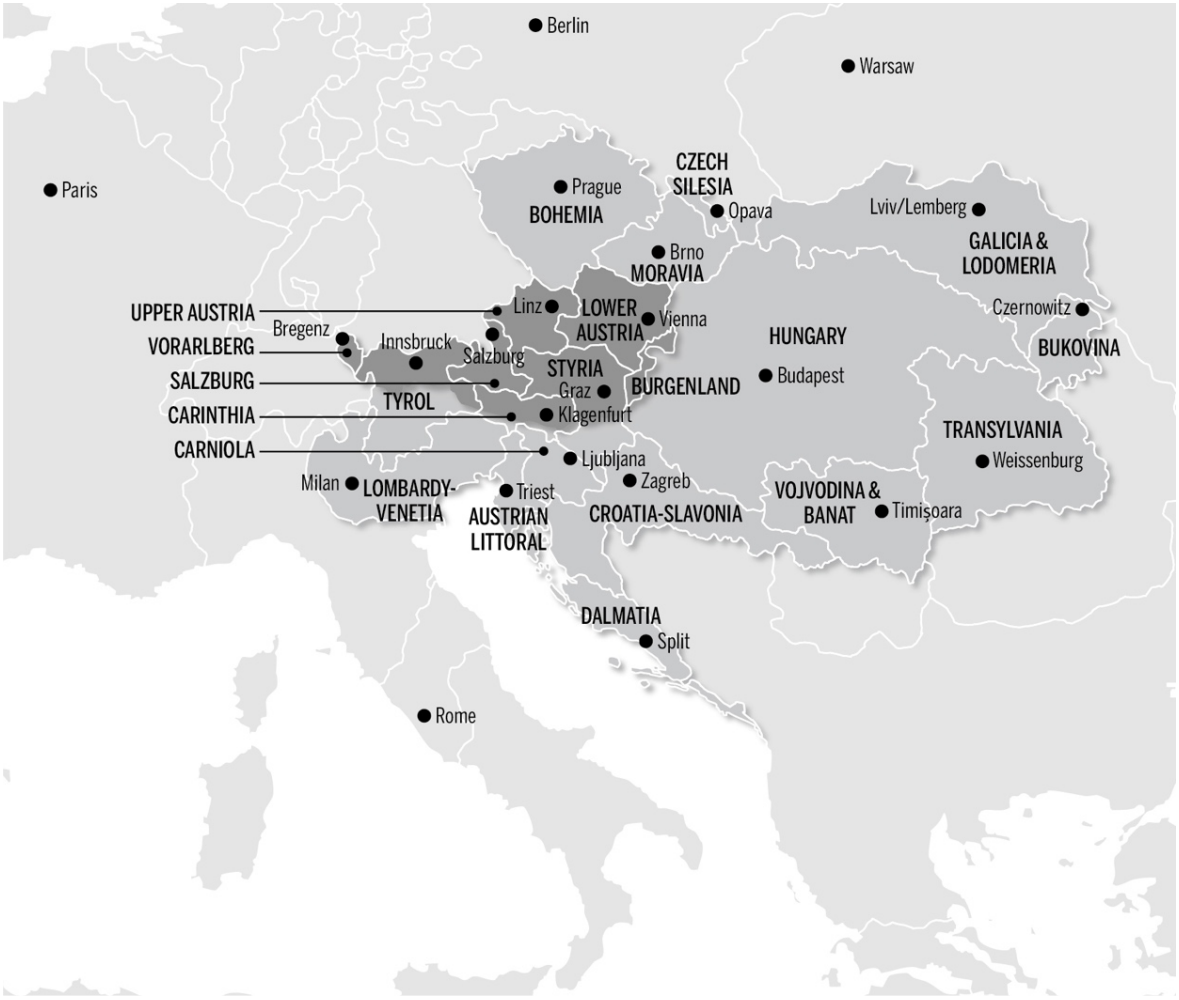


Table AUT-1

Vineyard Area and Yields in Austria 1842-2015

		Hectares under Vines (bearing)						Yield (tons/hectare)		Red Wine as % of Production	
		1842	1875	1890	1913	1950	2015	1890-1913	2000-2015	1890	2015
Austria (present day borders)		53,987	50,566	48,741	42,430	34,682	43,611	2.13	5.38	2%	35%
Lower Austria (incl. Vienna)		46,215	39,911	39,713	35,053	23,802	26,876	2.22	5.40	2%	25%
Styria		31,446	32,668	34,056	26,660	2,616	4,546	1.71	5.07	9%	24%
Carinthia		n.a.	53	54	22	7[a]	167[a]	0.33	3.33	8%[a]	40%[a]
Vorarlberg		n.a.	249	244	63	n.a.	n.a.	1.15	n.a.	0%	n.a.
North-Tyrol		n.a.	267	262	0	n.a.	n.a.	1.78	n.a.	25%	n.a.
Burgenland		n.a.	n.a.	n.a.	n.a.	8,518	11,585	n.a.	5.34	n.a.	58%
South-Tyrol		22,898	5,416	16,678	27,038			3.11		82%	
Carniola		9,682	9,644	11,631	9,799			1.40		0%	
Austrian Littoral		15,038	27,161	46,700	38,106			1.21		74%	
of which Goerz[b]			9,568	9,882	9,936			1.64		65%	
Triest			1,027	1,087	582			1.10		61%	
Istria			16,566	35,731	27,588			1.08		77%	
Dalmatia		64,444	67,743	72,256	70,701			1.41		94%	
Bohemia		2,573	771	861	495			1.23		42%	
Moravia		29,805	15,474	12,134	10,644			1.42		13%	

Source: Anderson and Pinilla (2017); K.K. Ackerbau-Ministerium (various years); K. K. Direction der administrativen Statistik (various years); Wohlfahrt (n.a.); Statistik Austria (various years); Notes: [a] includes Vorarlberg and North-Tyrol. [b] Goerz and Gradisca. Grapes grown in the Bukovina region (between 30 and 70 ha) were not used for wine. [c] data are for 1854. In 1842, the Austrian Empire also included significant vineyard areas in Hungary (644,706 ha), Transylvania (58,676 ha), Military Frontier (27,112 ha), all of which fell under Transleithanian rule, i.e., the Hungarian Crown, in 1867. In addition, until its independency in 1866, the Austrian Empire included the Kingdom of Lombardy-Venetia with an 1842 vineyard area of 76,793 ha (Lombardy) and 96,881 ha (Venetia), respectively.

Production

Table AUT-1 reports some trends in Austrian wine production from 1841 to 2015 by referring to the *Cisleithanian* states only. The top row displays all figures for Austria in its present-day borders, i.e., Lower Austria, a small part of Styria, Carinthia, Vorarlberg, North-Tyrol and Burgenland. Overall, Austria's vine acreage has experienced a steady decline from 54,000 ha in 1842 to less than 35,000 ha in 1950. The vineyard reached its all-time low point with approximately 25,000 ha directly after WWI (Anderson and Pinilla, 2017). Most of this development has been driven by Lower Austria, Austria's main wine growing region.

In the 19th century, many wine growing countries belonged to the Austrian Empire and Austria-Hungary, respectively. The viticulturally most significant regions were *Austrian Littoral* with its sub-regions Triest (now Italy), Goerz & Gradisca (now mostly Slovenia), and Istria (now mostly Croatia) on the one hand and Dalmatia (now Croatia) on the other hand. With the exception of South-Tyrol, then Core-Austria, the mainland produced mainly white wine. In contrast, the warmer southern regions of Austrian Littoral and Dalmatia were red wine areas.

Table AUT-1 also reports yields. First, compared to 19th century yields in Switzerland or the German Mosel Valley, Austrian yields are surprisingly low (see also Table GER-5 above and Table CHE-2 below). In addition, there are substantial yield disparities among the various Austrian countries. During the period 1890-1913, only South-Tyrol, the Empire's most productive wine region, and Lower Austria exhibit average yields above 2 t/ha. Even the large wine growing regions Dalmatia (1.41 t/ha), Istria (1.08 t/ha) and Styria (1.71 ha) are considerably below these figures. One possible reason for these low productivity figures might be the beginning and rapidly growing phylloxera epidemic.

Phylloxera appeared in Austria the first time in 1872 near Vienna and spread quickly. The Agricultural Ministry (*K.K. Ackerbauministerium*) began publishing phylloxera reports in 1874. The first publications were published irregularly, but beginning with the year 1892, annual reports provide detailed accounts of infestations on the village level. According to the 1898/99 report, the contamination rates vary greatly among Moravia (13.3%), Dalmatia (17%), Styria

(45.2%), Goerz & Gradisca (46.7%), Lower Austria (55.7%), Istria (60.5%), Carniola (91.2%), and Triest (100%). That is, Dalmatia was less affected than Lower Austria.

In addition, yield data from 1842, i.e., before the occurrence of phylloxera and mildew in Europe, suggest that Dalmatia has always been lagging behind. Official Statistics (K.K. Direction der administrativen Statistik, 1842) report the following yields, Hungary 2.32 t/ha, Lower Austria 2.22 t/ha, Tyrol 1.97 t/ha, Military Frontier[7] 1.82 t/ha, Lombardy 1.82 t/ha (1854), Bohemia 1.59 t/ha, Transylvania 1.45 t/ha, Moravia 1.42 t/ha, Venetia 1.41 t/ha (1854), and Dalmatia 0.95 t/ha. Apparently, with the exception of Triest, phylloxera seems to be only a weak explaining variable for yield disparities among Austrian states. Climatic and geographical variables may exhibit more explanatory power.

In addition to low yields, Dalmatia also received the lowest prices per ton of wine. According to data provided by Mach (1899a and 1899b) and shown in Table AUT-2, Dalmatian wine prices were the lowest in all Austrian countries, while wines from Moravia and Bohemia commanded the highest prices.

Table AUT-2
Prices of Austrian Wine between 1840 and 1860
Gulden per ton

	1840	1850	1855	1860
Lower Austria	199.6	81.3	141.3	307.5
Styria	141.4	162.6	229.7	332.2
Carinthia and Carniola	15.55	176.7	226.2	402.9
Austrian Littoral	67.1	78.2	219.1	360.5
Tyrol	127.7	137.8	275.7	494.7
Bohemia	494.8	318.0	586.6	713.9
Moravia	135.0	212.9	226.1	484.1
Dalmatia	17.7	31.8	123.7	268.5

Source: Own Calculations according to Mach (1899b).

[7] Military Frontier was a province at the southern border of the Austrian Empire, and later of Austria-Hungary, that served as a buffer against the Ottoman Empire. It reached from Croatia to Transylvania and included parts of present-day Croatia, Serbia, Hungary, and Romania. It was demilitarized and dissolved between 1869 and 1873. The larger part, the Croatian Military Frontier, was incorporated into the Kingdom of Croatia-Slavonia, which was under the Hungarian Crown. The eastern part was incorporated directly into Hungary.

Consumption and Trade

19th century Austria was not only the world's 4th largest wine producer, it was also a major wine consuming country.

After the defeat of Napoleon Bonaparte in 1815 and the ensuing Congress of Vienna, all German speaking states, including the Austrian Empire, established the *German Confederation*, a lose association of 39 German states in Central Europe aimed at coordinating their economies. The Austrian Empire was a multinational state that included parts of 13 present day countries.[8] Due to the fact that all non-German speaking countries of the Austrian Empire were excluded from the *German Confederation* on the one hand, and, more importantly, due to the growing rivalry between Austria and Prussia on the other hand, the Austrian Empire did not become part of the *German Zollverein* in 1834. Therefore, Austria was excluded from the benefits of what became the largest free trade zone in Europe.

In addition, for a long time, Austria itself was not a unified tariff-free market either and trade was sluggish. In fact, until 1818, the importation of non-Austrian wine (referring to the Core-Austria) was generally prohibited. Allowed were only imports of Hungarian, Tyrolian and Tuscan wine. The general prohibition was replaced by a tariff system in 1818 (Mach, 1899b). Similar to Germany, a general free-trade movement followed. In 1825, the tariffs between the Kingdom of Lombardy-Venetia and the rest of the Austrian Empire were lifted. In 1826, Tyrol and Vorarlberg followed. But it took until 1850 to abolish border tariffs between Austria and Hungary -- 16 years after the launch of the German *Zollverein*. Dalmatia and Istria finally joined the tariff union in 1880 (Mach, 1899b).

Table AUT-3 reports income, consumption and trade figures for Austria from 1842 to 2015. Note, while the population, income and consumption data refer to Austria in its present-day

[8] Austria, Croatia, the Czech Republic, Germany, Hungary, Italy, Montenegro, Poland, Romania, Serbia, Slovakia, Slovenia, Ukraine.

borders, the trade data for 1842 and 1890 refer to the Austrian customs union which was much larger in 1890 than in 1842 (and after 1918).

Between 1842 and 1890, Austria's population grew by an average rate of 0.62% per year, more than the growth of real per capita income. In 1890, Austria's per capita wine consumption was about 15 liters, more than twice the German value of 7.4 liters. However, compared to France (91.7 liters) and Italy (90.3 liters), Austria's wine consumption appears to be modest. The same is true for beer when we compare Austria with beer drinking nations such as the United Kingdom and Germany. In 1890, Austria's per capita beer consumption of 32.9 liters appears small to the UK's 135 liters and Germany's 104 liters.

Table AUT-3 suggests that, between 1842 and 1890, major changes have occurred in Austria's wine trade. In 1842, Austria was a net wine importer and imported approximately 22,500 tons – a volume of historical dimensions that was not reached again until 1990. However, while imports fell between 1842 and 1990 by more than 80%, exports more than quintupled from 12,251 tons to 67,747 tons. Since all trade data are for the area of the Austrian Customs Union, both effects are largely due to its expansion.[9] For instance, imports from Dalmatia were deemed domestic shipments from 1880 on, when Dalmatia joined the Customs Union, leading to a decline in recorded imports. At the same time, exports from Dalmatia to Russia or Turkey, were deemed Austrian exports only from 1880 on, leading to increasing export figures. However, aside from these technicalities, the wine trade was generally benefitting from the rapidly expanding rail network (Mach, 1899a) and the free-trade climate and in all of Europe until the late 1870s. Austria could particularly grow wine shipments on its main export market, the German Zollverein. Mach (1899b) reports that, even after the Customs Union between Austria and Hungary in 1850, wine exports from Austria to Germany grew steadily from about 24,000 tons in 1860 to almost 60,000 tons in 1869. The Austro-Prussian war of 1866 only briefly interrupted this development. However, Prussia's victory over Austria resulted in a shift in power within the *German Confederation* from Austrian toward Prussian hegemony. It also accelerated the

[9] For details about the Austrian Customs Union, its development and economic effects see also Komlos (1983).

economic integration and eventual unification of the German states, from which Austria was excluded.

Many contemporary authors still hoped, although Austria-Hungary was not part of the newly established German Empire in 1871, it could join into a German Customs Union (e.g., Hlubek, 1864; Braumüller, 1873). In fact, a "Wine Commission" (*Weinbau-Enquête)* appointed by the Austrian government recommended the reciprocal abolishment of all wine tariffs between Germany and Austria-Hungary (K.K. Ackerbau-Ministerium, 1873). However, Austria's desire to join the German Customs Union did not materialize.

Table AUT-3

Wine Consumption and Wine Trade in Austria 1842-2015

	1842	1890	1937	1950	1970	1990	2015
Population (in 1,000)	3,762	5,394	6,755	6,935	7,467	7,723	8,545
Income per Capita[e]	1,515[a]	1,624	1,808	3,706	9,747	16,895	24,753
Wine Consumption (liter/capita)		15.1[d]	20.9[b]	14.7	32.7	33.2	31.2
Beer Consumption (liter/capita)		32.9[d]	33.0[b]	41.4	108.9	134.7	119.0
Exports (tons)	12,251	67,747	76	12,248	4,974	13,000	48,531
Imports (tons)	22,510	4,009	5,888	5,158	22,693	24,337	73,652

		Average Annual Growth Rates					
		1842-1890	1890-1937	1937-1950	1950-1970	1970-1990	1990-2015
Population (in 1,000)		0.62%	0.48%	0.20%	0.37%	0.17%	0.41%
Income per Capita		0.12%	0.23%	5.68%	4.95%	2.79%	1.54%
Wine Consumption (liter/capita)			0.69%	-2.67%	4.08%	0.08%	-0.25%
Beer Consumption (liter/capita)			0.01%	1.76%	4.95%	1.07%	-0.49%
Exports (tons)		2.99%	-13.46%	47.84%	-4.41%	4.92%	5.41%
Imports (tons)		-2.93%	0.82%	-1.01%	7.69%	0.35%	4.53%
main export destinations	German Zollverein	Germany	Germany	Germany	Germany	Germany	Germany
main import origins	Austria outside of Customs Union[c]	Italy	Italy	Italy	Italy	Italy	Italy

Notes: [a] 1840. Sources: Anderson and Pinilla (2017); Wohlfahrt (n.a.), [d] Hoppe (1901). [b] Statistisches Reichsamt (1938). [c] Austrian Empire outside of the Austrian Customs Union (i.e., mainly Dalmatia, Austrian Littoral, Lombardy-Venetia, Hungary), data for 1861 (Mach, 1899b). [e] per capita GDP in 1990 International Geary-Khamis dollars.

With about 102,800 tons, Austro-Hungarian wine exports reached their peak in 1889 -- a volume that has never been reached since then. Only a few years later, in 1892 its export were just above 20,000 tons and remained at that level. At the same time, in 1892, Austro-Hungarian wine imports began to rise dramatically. While all wine imports in 1891 equaled just 5,000 tons, this rose to 55,000 tons in 1892, and further to 154,000 tons in 1898. Austria turned from a wine net exporter into a net importer. Since then, with the exceptions of 1950 and the time periods 1978-1985 and 2002-2005, Austria's wine imports have always exceeded its exports. From the middle of the 19th century until this day, most Austrian wine imports have originated from Italy. In fact, at the end of the 19th century, wine was the single most important import good coming from Italy. In 1898, the value of imported Italian wine amounted to 27% of the value of all imports from Italy (K.K. Statistische Central-Commission, 1900).

First Austrian Republic and WWII: 1919-1945

After WWI, Austria became a Republic and its territory was reduced to the core state of present-day Austria. Compared to the Austria-Hungary of 1918, the new First Republic was now landlocked and lost all non-German speaking provinces as well as some German-speaking provinces, including South Tyrol, to neighboring countries. However, in 1922, Austria received the mainly German-speaking *Burgenland* (except for its capital Sopron) which, under the name *Western Hungary*, had been part of the Hungarian Kingdom. Burgenland has become one of Austria's large wine growing regions and in 2015 accounted for about 27% of Austria's vineyard area (see also Table AUT-1).

After WWI, Austria underwent severe economic hardship. The economy almost collapsed and many neighboring countries (Czechoslovakia, Hungary, Yugoslavia, and Italy) had imposed a trade blockade and refused to sell food and energy to Austria. Like Germany, although at a somewhat lower level, Austria experienced a rapid decline in the value of its currency in 1922, which severely affected imports. The wine trade came to an almost complete halt (see Table AUT-4) and did not recover before the mid 1950s. In addition, to make matters worse for the wine industry, wine consumption was highly taxed. In fact, in 1922, wine tax revenue amounted

to 49.1% of all Austrian excise tax revenue, and 13.7% of all tax revenue in Austria (Österreichisches Statistisches Zentralamt, 1924).

The absence of trade was offset by an increasing domestic vineyard area. From 1922 to 1930, the Austrian vineyard grew by 40% from 25,000 ha to 35,000 ha (Anderson and Pinilla, 2017). In addition, due to new technologies, particularly the cold filtration, which enabled even small wineries to fill their wines into bottles, the share of bottled wine increased substantially in the 1920s. This development also furthered the production of quality wine (Postmann, 2010).

But even the expanding vineyard area and improving quality could not revive Austrian wine exports which averaged at 60 tons per year during the 1930s, i.e., 0.06% of the 1888 exports. Similarly, imports in the 1930s were also only a small fraction of the pre-WWI level (Table AUT-4).

Table AUT-4
Austrian Wine Trade 1920 to 1938
in tons

	Exports	Imports	Net Exports
1920	10,581	101,323	-90,742
1921	5,420	89,013	-83,593
1922	4,652	91,291	-86,639
1923	1,897	13,385	-11,488
1924	2,014	37,923	-35,908
1925	176	3,106	-2,930
1926	54	32,735	-32,681
1927	77	42,888	-42,811
1928	81	48,210	-48,129
1929	78	42,457	-42,379
1930	81	37,285	-37,204
1931	78	28,206	-28,128
1932	63	17,090	-17,027
1933	55	6,540	-6,485
1934	106	4,860	-4,754
1935	40	6,450	-6,410
1936	60	6,690	-6,630
1937	30	5,900	-5,870
1938	50	6,550	-6,500

Source: K.K. Ackerbauministerium (various years);
Anderson and Pinilla (2017)

In March 1938, Austria was annexed by Germany and, in 1939, became the German province *Ostmark*. Between February 1940 and August 1945, the German wine law applied to Austria and, as in Germany, the entire wine industry fell under the supervision of the *Reichsnährstand* which set price ceilings and stipulated wine contingents to be set aside for military consumption (see also Chapter Germany).

Post WWII and Second Austrian Republic: 1946-present

After WWII, Austria was occupied by the allied powers and divided into four zones. The wine growing regions Lower Austria, Vienna, and Burgenland were all located in the Soviet sector; Styria was in the British sector. When Austria became independent in 1955, the Second Republic was proclaimed.

Incomes and Consumption

The decades that followed are characterized by moderate population growth and an enormous increase in real per capita income (see Table AUT-3). Between 1950 and 2015, Austria's population grew from 6.945 million to 8.545 million, an average annual growth rate of 0.32%. In contrast, real per capita GDP grew from US$ 3,706 in 1950 to US$24,753 in 2015 (Table AUT-3), which is equal to an average annual growth rate of 2.96%. As a result, per capita wine consumption more than doubled to 31.2 liter per capita in 2015. Per capita beer consumption almost tripled to about 120 liters per capita in 2015. However, both wine and beer consumption already peaked in 1990 and have slightly fallen since then.

Production

Overall, the time after WWII has been very beneficial for the Austrian wine industry. As shown in Table AUT-1, acreage, productivity and production have increased by significant amounts. While the vineyard area grew in all growing regions, the smaller regions Styria and Burgenland exhibited the largest gains. Burgenland, Austria's second largest wine growing region, has

experienced the most significant ups and downs, however. In 1923, one year after it became part of the Austrian Republic, Burgenland had just 3,800 ha under vines. Since then, and especially during the 1970s, Burgenland's vineyard area grew continuously to its peak expansion of more than 21,000 ha in 1982. However, beginning in the years preceding Austria's EU entry in 1995, Burgenland's vineyard has experienced a substantial and steady decline to now 11,500 ha.

Although the average Austrian yields grew from 2.13 t/ha in 1890-1913 to 5.38 t/ha during 2000-2015, productivity levels are still below those in Germany (9 t/ha) or France and Italy (6 t/ha) (Figure AUT-1, see Figure GER-5). Austria has also seen a shift from white to red wine. Red wine's share, which was approximately 2% in 1890, now amounts to 35% (Table AUT-1).

Trade

The post WWII time has also seen a strong rise in wine trade (Table AUT-5). Both exports and imports have grown to levels that even exceed pre-WWI levels, when Austria was much larger than now. However, the growth rates were far from constant.

First, wine imports grew rapidly, from virtually zero after WWII, to 43,600 tons in 1960. However, since then until Austria's accession to the European Union in 1995, imports stayed relatively flat and mostly fluctuated between 20,000 and 40,000 tons per year. After 1995, another growth period began, wine imports increased from 26,239 tons in 1995 to 73,652 tons in 2015.

The rise of Austrian wine exports was severely affected by the wine glycol scandal of 1985, when several Austrian wineries adulterated their wine with diethylene glycol,[10] which is also used as an anti-freezing agent. After Germany prohibited the sale of all Austrian wine on July 9, 1985, a global wave of prohibition followed (Postmann, 2010; Brüders, 1999). Austrian wine exports, which were above 48,000 tons in 1984, dropped to 4,564 tons in 1986 and even below 4,000 tons in 1988. The pre-scandal export levels of 41,000-52,000 tons were not reached again before 2001, i.e., 16 years after the scandal.

[10] Between 1978 and 1985, more than 340 tons of glycol were applied to adulterate at least 26,000 tons of wine. 325 people were indicted and 15 people received jail sentences of up to 5 years (Postmann, 2010).

Table AUT-5
Austrian Wine Trade 1950 to 2015
in tons

	Exports	Imports	Net Exports
1950	12,200	5,200	7,000
1960	2,600	43,600	-41,000
1970	5,123	22,758	-17,635
1975	17,269	86,430	-69,161
1980	47,148	22,379	24,769
1984	48,014	19,606	28,408
1985	27,157	24,780	2,377
1986	4,564	25,320	-20,756
1987	4,891	36,710	-31,819
1988	3,995	35,721	-31,726
1989	5,043	25,166	-20,123
1990	13,000	24,337	-11,337
1995	23,097	26,239	-3,142
2000	32,281	48,737	-16,456
2005	69,555	67,568	1,987
2010	67,572	79,092	-11,520
2015	48,531	73,652	-25,121

Source: Anderson and Pinilla (2017).

Public Supports

According to 2014 data from the Farm Accountancy Data Network (F.A.D.N.) of the European Union, Austrian vineyards belong to the least profitable ones in Europe (see also Table GER-4). The Austrian government has supported the wine industry in many ways. In 1965, first planting limitations were imposed on wineries in Lower Austria and Burgenland. In 1966, the Austrian government established the *Weinwirtschaftsfonds* (wine industry fund), a government wine marketing agency. Just like in the European Union, the Austrian Federal Ministry of Agriculture and Forestry began to intervene in the wine market and bought wine for storage, export, and distillation purposes in 1969 (Wohlfahrt, n.a.). The *Weinwirtschaftsfonds* granted loan subsidies for the storage of excess wine of the 1969 vintage. In 1970, the *Weinwirtschaftsfonds* paid direct

subsidies of S0.15/l for excess quantities, a total of S3m.[11] The measure was first seen as a one-time intervention, but similar direct payments with increasing amount occurred from 1977 on, on an annual basis. In the early 1980s, the support system became significantly more complex with the addition of measures such as export supports (mainly to Eastern Germany), distillation and vinegar subsidies or premiums for re-plantings and investments. For a detailed account of all measures and their amounts see Wohlfahrt (n.a.).

[11] The Schilling (German: *Österreichischer Schilling*) was the currency of Austria from 1925 to 1938 and from 1945 to 1999, and the circulating currency until 2002. In 2002, the euro was introduced at a fixed parity of €1 = 13.7603 Schilling to replace it. That is, based on March 2017 exchange rates, one Schilling is the equivalent of approximately $0.08.

Table AUT-6

Supports for Wine Producers in the European Union in 2012

	Vineyard Area (1,000 ha)	Production (million tons)	Direct Supports (million €)	Other Supports (million €)	Total Supports (million €)	Support/ha (€)	Support/ton (€)
EU-27	3,209	15.9	923.6	1,361.4	2,285	712	144
Bulgaria	60	0.12	0.2	18.6	18.8	313	157
Czech Rep.	16	0.07	5.8	6.4	12.2	763	174
Germany	100	0.92	59.1	50.2	109.3	1,093	119
Greece	99	0.28	21.7	7.7	29.4	297	105
Spain	943	3.37	180.6	223.1	403.7	428	120
France	761	5.08	348.4	490.4	838.8	1,102	165
Italy	718	4.27	182.1	370.7	552.8	770	129
Cyprus	7	0.01	4	4.6	8.6	1,229	860
Hungary	76	0.28	9.1	30.4	39.5	520	141
Austria	44	0.28	74.3	29.1	103.4	2,350	369
Portugal	180	0.56	13.5	80.5	94	522	168
Romania	177	0.41	9.5	44	53.5	302	130
Slovenia	16	0.09	7.6	8.4	16	1,000	178
Slovakia	11	0.04	1.8	7.8	9.6	873	240

Source: Anderson and Jensen (2016).

In 1995, Austria joined the European Union and most policies supporting the wine industry fell under the regime of the European Commission (Meloni and Swinnen, 2013). Anderson and Jensen (2016) find that Austria's wine industry has not improved its competitiveness and still heavily depends on public support. According to data for 2012, Austrian wine producers receive the highest supports per hectare within the European Union (Table AUT-6). With €2,350 per hectare Austrian vintners were provided more than threefold the European average of €713/ha. Within Austria, most subsidies go to Styria and Burgenland. Drawing on 2003 data from the Austrian Ministry of Finance, Homlong and Springler (2007) report that wine producers in Styria receive the highest amounts per hectare (€382/ha in 2003) while those in Vienna (€74/ha) and Lower Austria (€161) receive the lowest supports.

Apparently, as has been the practice in all EU countries for decades, public supports have been used to sustain wine production in unprofitable regions and block structural changes and regional shifts.

III. Switzerland

Switzerland is one of the most developed countries in the world and has one of the highest per capita income of all countries. After France and Portugal, it also has the world's highest per capita wine consumption. Although there is a worth mentioning wine production, its annual production of currently 85,045 tons (2015) makes it only rank 20 of all wine producing countries (see Anderson and Pinilla, 2017).

In contrast to Germany and Austria, Switzerland has enjoyed territorial integrity for centuries and has existed in its current borders since 1815. Switzerland is a multilingual country and is comprised of 26 cantons. Of its population of approximately 8 million 64% state German as their native language, 24% French, 8% Italian, and less than 1% Romansh. In general, German is mainly spoken in the north, east and center, while French is dominant in the west of the country. Italian is the language south of the Alps in the canton Ticino and in Val Mesolcina, a valley belonging to the south-eastern canton of Grisons (Graubünden).

Currently, most Swiss wine is produced in the west and in the south of the country, i.e., in the French speaking cantons of Geneva, Neuchâtel, Valais (overly French speaking) and Vaud as well as in the Italian speaking Ticino. While red varieties are dominant and planted on 58% of Switzerland's vineyard area, there are also some regional white wine clusters, especially in Vaud, Fribourg, and Neuchâtel (Eidgenössisches Departement für Wirtschaft, Bildung und Forschung, 2016). However, the dominance of red varieties is relatively recent. Before the late 1990s, most varieties planted were white. In fact, in 1900, about 85% of the wine produced was white (Eidgenössisches Statistisches Amt, 1901).

As in Germany, Swiss wine production experienced a significant boost after the French revolution of 1789. The early industrialization in Switzerland and the resulting rising incomes were conducive to domestic wine consumption. Likewise, incomes in the bordering southern German states, especially Württemberg and Baden, were growing too, which was particularly beneficial for the exports of winemakers from the northern cantons of Thurgau and Aargau. Only

after the establishment of the South German Customs Union (*Süddeutscher Zollverein*) in 1828, a regional precursor to the 1834 *German Zollverein* under Prussian leadership, Swiss winemakers faced increasing tariff barriers, which affected especially exports from the canton Thurgau. However, the rise in domestic demand more than offset these losses.

Between 1850 and 1880, Swiss viticulture enjoyed rapid growth and prosperity. Schauwecker (1913) reports that, between 1850 and 1870, wine prices were soaring. While the average prices per decade from 1790 to 1850 had been relatively stable, in the following 20 years, prices increased by 50% in Schaffhausen and about 85% in Geneva. As a result, the area under vines expanded substantially, mostly at the expense of grazing land. Although, reliable data for Switzerland in its entirety are only available from 1891 on, data for Zurich show that the vineyard area grew from 4,150 ha in 1851 to 5,586 ha in 1881 (Schlegel, 1973). Similar increases are reported for Vaud, Geneva and Schaffhausen (Schauwecker, 1913; Schlegel, 1973).

Table CHE-1

Vineyard Area in Switzerland 1877 to 2015

in hectares

	1877	1910	1930	1960	2015
German Speaking	13,545	7,818	2,279	1,533	2,620
of which					
- Zurich	5,279	3,236	914	417	607
- Aargau & Thurgau	4,286	2,213	475	363	642
French Speaking	11,190	11,957	8,604	8,839	11,046
of which					
- Vaud	6,570	6,003	3,645	3,410	3,771
- Valais	1,140	2,897	3,160	3,615	4,906
Italian and Romansh Speaking	7,970	4,880	1,800	1,679	1,127
Switzerland Total	32,705	24,655	12,683	12,051	14,793

Source: Brugger (1968), Schlegel (1973), Eidgenössisches Departement für Wirtschaft, Bildung und Forschung (2016).

Around 1880, the overall vineyard area in Switzerland encompassed approximately 36,000 ha, a level that has never been reached again (Schlegel, 1973).

The expansion experienced a further boost from beneficial weather leading to record yields in the 1870s. For instance, for the canton Zurich, the official Swiss Statistics lists ton-yields per hectare of 7.4 (1874), 11.2 (1875), 9.9 (1876), 9.0 (1877) and 7.9 (1878) (Eidgenössisches Statistisches Amt, 1891). Rising yields and prices resulted in per-hectare nominal revenues of more than CHF 2,600 in 1875 and 1876 (Eidgenössisches Statistisches Amt, 1891). According to the *Swiss Historical Monetary Value Converter* (Swistoval, 2016), this equals about CHF 29,000 (approx. US$28,400) in 2016 prices, for the canton Zurich a value of historical dimensions (see also Table CHE-2).

As reported in Table CHE-1, in 1877, most vineyards (i.e., 41.4%) were located in the German speaking part of Switzerland, particularly in Zurich, Aargau and Thurgau. In contrast, the French speaking western cantons had a vineyard share of 34%, the Italian speaking southern part, i.e., Ticino and Val Mesolcina, had a 25% share. However, the overall area under vines as well as its regional composition has experienced significant changes since then.

Table CHE-2

Wine Production, Yield and Value in Switzerland 1900-2015

	1900	1920	1950	1965	1980	2015
			Wine Production in KL			
Zurich	28,123	3,591	4,797	1,803	2,221	3,244
Vaud	77,032	17,090	26,421	25,349	19,857	21,803
Valais	24,573	18,960	11,453	41,727	37,397	32,784
Ticino	10,269	4,805	8,399	6,311	4,013	4,403
Switzerland	210,325	60,554	72,030	96,559	84,196	85,045
			Yield in KL/hectare			
Zurich	5.86	2.09	6.92	4.62	4.74	5.35
Vaud	11.64	3.81	7.16	7.88	5.69	5.78
Valais	9.18	6.00	3.37	10.61	7.05	6.68
Ticino	1.29	0.98	4.68	5.46	4.85	4.01
Switzerland	6.91	3.28	5.53	8.15	6.19	5.75
			Value of Production in 1000 SFr.			
Zurich	6,368	5,298	5,055	3,328	8,681	.
Vaud	21,249	24,874	30,121	41,851	71,471	.
Valais	6,078	23,172	14,797	69,138	167,700	.
Ticino	1,457	2,973	7,007	8,944	14,189	.
Switzerland	52,070	80,630	79,690	153,693	338,764	.
			Value per hectare (1000 SFr/hectare)			
Zurich	1.33	3.09	7.30	8.52	18.53	.
Vaud	3.21	5.55	8.16	13.01	20.47	.
Valais	2.27	7.33	4.35	17.58	31.63	.
Ticino	0.18	0.61	3.90	7.74	17.15	.
Switzerland	1.71	4.37	6.11	12.97	24.90	.

Source: Eidgenössisches Statistisches Amt (various volumes).

First, after its peak around 1880, the overall vineyard area began to decrease. However, at the turn of the century and particularly in the 1920s, the decline accelerated and in the 1930s less than a third of the 1880 vineyard area, i.e., about 11,000 ha, was left. Only in the 1970s, the Swiss vineyard has seen a gradual recovery and has moderately grown to now about 15,000 ha. Parallel to these overall changes, large parts of the vineyard area have shifted and moved west, especially into Valais (see Table CHE-1). In general, all regions experienced, partially dramatic, losses. For instance, Zurich's vineyard area shrank from 5,586 ha in 1881 to 417 ha in 1960.

Likewise, Aargau's area fell from 2,681 ha (1881) to 258 ha (1967). Most areas in eastern Switzerland lost about 90% of their vines. But the vineyard area in the Italian and Romansh speaking part fell as well. Even the vineyard area in Vaud, in western Switzerland, was almost cut in half.

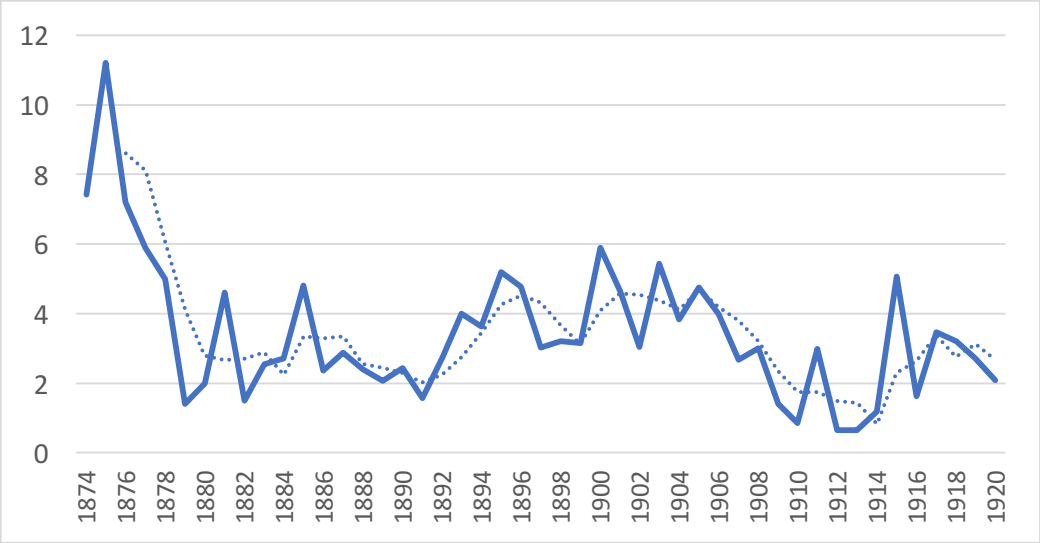
In contrast, Valais has seen rapid growth in its area under vines, from 1,140 ha in 1877 to now almost 5,000 ha. In fact, Valais is the only canton with a thriving vineyard area. As a result, approximately a third of all Swiss grapevines are now located in Valais alone.

Essentially, the regional shift into the western cantons was induced by yields and, therefore, profitability. As reported in Table CHE-2, vineyards in Valais and Vaud have almost always displayed significantly higher yields and revenue per hectare than those in Zurich and Ticino. During the early 19th century, the Valais vineyards earned revenues per hectare that were four times higher than those in Zurich. The difference between Valais and Zurich exceeded the factor ten. It is little surprising that almost the entire decline in vineyard area in Zurich and Ticino took place between 1880 and 1930. Only the more productive plots remained under vines resulting in an increase in average productivity.

The Swiss "wine crisis" has been the subject of numerous studies that try to shed light on possible causes and remedies (e.g., Schauwecker, 1913; Zaugg, 1924; Welti, 1940; Schlegel, 1973). The main factors that have contributed to the downfall of the Swiss wine industry are falling yields, higher production cost than competitors, and increasingly stiff competition from imported wines.

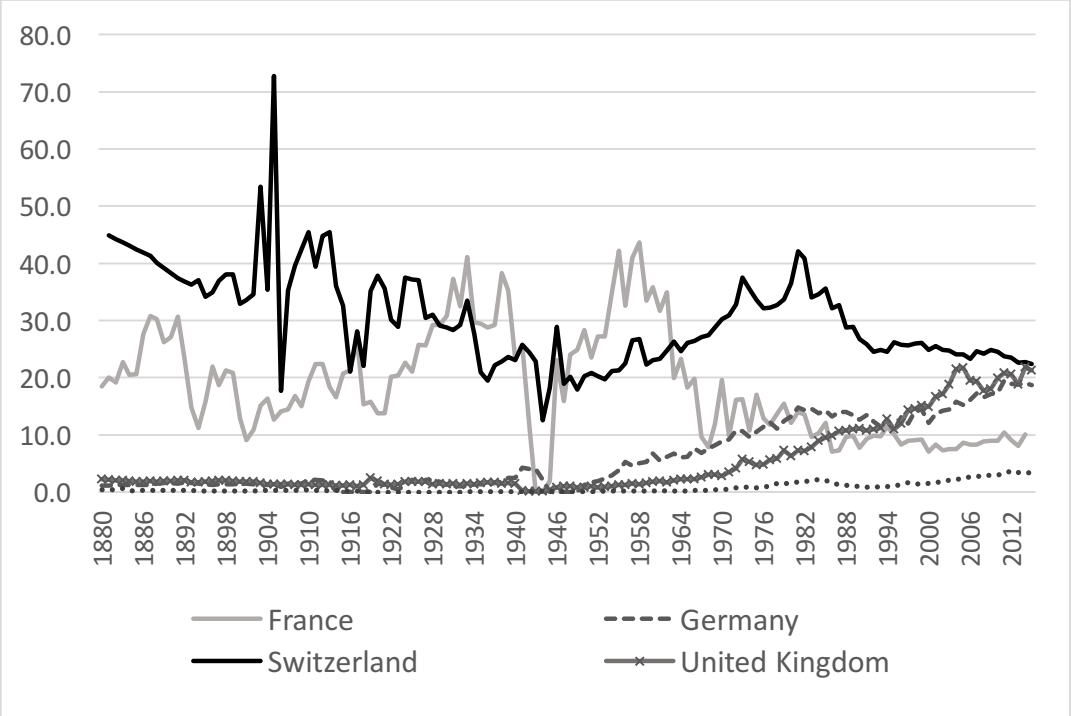
First, after a series of excellent vintages in the 1870, weather conditions were less conducive to grape growing and, as everywhere else in Europe, Swiss vineyards were affected by various diseases and pests, particularly downy mildew, in subsequent decades. As a result, per hectare yields fell significantly. The example of the canton Zurich is typical for all of Switzerland (Figure CHE-1) and puts the extraordinary yields of the 1870s into perspective. Harvests of more than 8 or even 11 tons per hectare were followed by average yields ranging between 2 and 4 tons per hectare for decades.

Figure CHE-1
Grape Yields in Canton Zurich 1874-1920
in tons per hectare; annual and moving 3-year average (dotted line)



Source: Eidgenössisches Statistisches Amt (various volumes, 1891-1921)

Figure CHE-2
Per Capita Wine Imports 1880-2015
in 1000 liters per capita



Sources: Anderson and Pinilla (2017).

Second, in contrast to many neighboring countries, Swiss vineyards are mostly family owned and managed and comparatively small. In addition, most vineyards are located on steep slopes which requires manual labor. The degree of mechanization that was achieved in other wine growing countries could not be achieved in Switzerland. Jaugg (1924) provides a detailed account of various production cost components, their regional distribution as well as their changes over time. Accordingly, the production cost is mainly determined by labor cost. However, against the background of rapidly rising incomes and standards of living in Switzerland, manual vineyard work was less desired and vineyard workers were scarce and expensive (see also Schlegel, 1973; Welti, 1940; Schauwecker, 1913).

Third, falling yields were accompanied by falling prices, mainly due to rising wine imports that stiffly competed with the domestic production. The importation of wine (and other goods) was crucially facilitated by the fast development of railways in all of Switzerland. When the Gotthard Tunnel opened in 1882, a major physical trade barrier fell. For the first time in history, trains could cross the Alps resulting in a rapid increase in transalpine trade with rising wine imports into Switzerland. Other major railway tunnels and connections followed in quick succession. In the east, the Austrian Arlberg line (1884) was the first (and still Austria's only) east-west mountain railway, connecting Switzerland and Austria. In the west, the Simplon tunnel (1906) created another north-south connection to Italy.

In addition to improving infrastructural conditions for trade, Switzerland had relatively low import tariffs. For instance, while Switzerland's wine import tariff in 1892 was CHF 3.00-3.50 per hectoliter of wine, neighboring Germany charged CHF 24.70 for the same amount (Schauwecker, 1913; Welti, 1940).

Not only did the relatively high German tariff barrier impair Swiss wine exports into Germany and foster German exports into Switzerland. It also made Switzerland a target of large wine producing countries such as France, Italy, Spain, and Austria (Dorner, 1922). In fact, except for the time periods from 1930 to 1940 and from 1948-1962, when France had slightly higher per capita imports (mostly from Algeria), Switzerland has always exhibited the world's highest per capita wine imports by volume (see Figure CHE-2).

The high per capita imports more than offset the fact that Switzerland is a very small country compared to its neighbors. For much of the pre-WWI period, Switzerland imported approximately as much wine as Germany and the United Kingdom combined and was second only to France. Note, in 1900, Switzerland's population was about 3.3m, while Germany (54.4m) and the United Kingdom (41.2m) were substantially more populous. This is as much the result of high Swiss per capita consumption and low import tariffs as it results from high tariffs in Germany and the United Kingdom. Only after WWII, when many trade barriers were lowered or fell, Germany and the United Kingdom became the world's largest importers.

Public Policies

These developments in production, consumption, and trade were accompanied by various political measures. Similar to Germany, but in contrast to France and most other wine producing countries, Switzerland did not impose a federal excise tax on wine until 1935 (also see Anderson, 2014).[12] A federal wine tax was introduced in 1935, only to be revoked in October 1937. The pressure of the wine industry and the threat of a referendum that would have abolished the tax forced the total withdrawal. In addition, during the short time the tax was in place, the tax rates were fairly modest (CHF 0.05/liter) resulting in revenues of just CHF 4.2m in 1937 – much less than resulted from import tariffs. An attempt to reintroduce the wine excise tax was defeated in a 1966 referendum (Zurbrügg, 2009).

In response to mounting tariff barriers in Germany and France in the late 1870s, the Swiss agricultural sector, including its wine industry, was calling for protection as well. However, due to conflicting interests between wine growers, wine importers and consumers, the government resisted these demands a long time. Only in the early 20th century, wine tariffs were eventually

[12] Anderson (2014) reports 2014 excise tax rates for wine, beer and spirits. Aside from Switzerland, only Argentina, Austria, Czechia, Germany, Greece, Hungary, Israel, Italy, Luxembourg, Portugal, Slovakia, Slovenia, and Spain did not impose excise taxes on wine in 2014.

increased. After CHF 3.50/hl in 1872, the rate grew to CHF 8.00/hl in 1906, still considerably lower than the German rate (Schwauwecke, 1913; Welti, 1940).

For a short period, during and immediately after WWI, Swiss viticulture seemed to enjoy some renewed prosperity. Due to the limited availability of imported wine mainly from Italy, France and Spain during WWI, wine prices in Switzerland increased considerably and, for the first time, the government installed a quota system for Swiss wine exports between 1914-1917. In 1918, this quota system was replaced by a total prohibition of all wine exports (Dorner, 1922). However, with increasing European wine production and the absence of war-induced transportation frictions in transportation in the early 1920s, wine imports rapidly increased to record highs. Wine prices fell and export quotas became obsolete.

In the 1920s, Switzerland began to follow the protectionist path of its neighbors and increased its wine tariff rates to CHF 24-33/hl in 1921 and further to CHF 30-50/hl in 1925. The rate applied depended on the wine's traits where the upper bound was charged to white wines with alcohol contents above 13% (Welti, 1940). Given the dominance of white varieties in Swiss viticulture at the time, higher rates for white wines are little surprising. The relative tariff burden reached its peak in 1936, when wine tariffs paid exceeded the import value of all wines shipped into Switzerland. An import value of CHF 22.2m was levied with customs of CHF 24m, i.e., 107% of the import value (Welti, 1940). Tariff revenue from wine imports has become a major budget position for the Swiss Federal government and would remain in this position for decades to come.

Switzerland provides substantial financial support to its agricultural sector including to grape growers and winemakers. According to OECD data, with 62.4% of all gross farm receipts in 2015, Switzerland exhibits the highest support rate of all OECD countries (OECD, 2016, 2017). The main vehicle of support are *direct payments*. However, in contrast to growers of non-wine crops as well as to cattle and sheep farmers, the wine sector has benefited only little from direct payments such as supports for wine cultivation on steep slopes, conversion to ecological farming, and the promotion of Swiss wine abroad.

In order to protect its viticultural sector, Switzerland mainly relies on a complex system of import quotas and tariffs. While tariffs have existed for more than 120 years, a system of import quotas was added in the 1950s to augment the protection of the domestic wine industry (Jörin, 2000).

Swiss wine import tariff rates are considerably above those of most other OECD countries. For instance, while the U.S. levied 1% and most EU countries levied 4% on the value of a $9 premium bottle of wine in 1999, Switzerland's rate equaled 17% (Berger and Anderson, 1999).

After the Swiss Federal Government's suggestion to join the European Economic Area (EEA) was rejected in a referendum in 1992,[13] Switzerland saw itself increasingly surround by a free trade zone it does not belong to. With Austria's accession to the EEA in 1995, Switzerland became an isolated island within what is now called the European Union. Although the pressure to lower its trade barriers has been mounting, so far Switzerland has been successful in maintaining its protection system for the wine industry.

The main components of the current system (as of January 2017) are the following. Switzerland sets an annual wine import quota of 170m liters for still wine (red, rosé and white). Within this quota the low contingent tariff rate applies. The rates per 100kg are CHF 91 for sparkling wine, CHF 50 for bottled white wine and red wine and CHF 34/42 for red bulk wine and CHF 34/46 for white bulk wine depending on alcohol content.[14] The tax rates refer to the gross weight and include all packaging materials including the transportation pallet.

Once the import quota is exhausted the tariff rates increase substantially and the so-called THC rate will be applied. For instance, the rate for bottled still wine will increase from CHF 50 to between CHF 300 and CHF 510. The THC rate, however, refers to the net weight (for all tariff rates see Schweizerische Eidgenossenschaft, Federal Customs Administration, 2017).

[13] In Switzerland, many national and regional issues have been decided by referendum since 1798. The history of Swiss alcohol regulations is particularly rich in rejections by referendums (Zurbrügg, 2009).
[14] EFTA countries, China, Japan, Korea, all countries of the South African Customs Union and many developing countries are exempt. However, except for South Africa, none of these countries are major wine exporters.

The assignment of a certain quantity will be “first come, first served” at the border. However, so far, the import quota has never been exhausted. Relevant for EU countries, only Greek Retsina and Portuguese Port Wines are exempt from all tariffs (Bundesrat der Schweizer Eidgenossenschaft, 2016).

IV. Conclusions

Germany, Austria and Switzerland share a long history of viticulture reaching back to Roman times, more than 2,000 years ago. They share a common language (with the exception of a significant share of French, Italian and Romansh speakers in Switzerland), are high-income countries, and grow grapes in what is deemed "cool climates" (with the exception of various warm climate regions, such as Dalmatia, that belonged to 19th century Austria). Also, for most of their history, all three countries have been net importers of wine. In fact, Germany and Switzerland rank number one worldwide for wine imports by volume and per capita, respectively. Due to their location in the middle of Europe, all three countries have been exposed to similar forces such as wars, business cycles, changes in the trade environment or climatic changes.

In spite of these commonalities, there are also profound differences between Germany, Austria and Switzerland. First, looking back 200 years, Germany has come into existence by unifying numerous small states in the 19th century (integration), while the Austrian Empire was decomposed into its single states after WWI (segregation). In contrast, Switzerland has enjoyed territorial integrity for centuries.

As a result, for the German states, the abolishment of customs barriers was a means to achieve unification. With the creation of a single free trade zone, the *Zollverein*, in 1834, the German states moved from economic integration to political integration in 1871. For the Austrian Empire (1804-1867) and later Austria-Hungary (1869-1918) free trade was a less pressing issue. In fact, customs free trade between Austria and Hungary, the two main parts of the Empire, was possible only after 1850. Other far flung states of the Empire, such as Dalmatia, received tariff-free market access only after 1880. Switzerland did not have to integrate heterogeneous states on its territory and did not have any internal trade barriers. Until the 1920s, Switzerland also resisted to follow protectionist moves of its neighbors to build up external trade barriers.

Winegrowers in all three countries have asked for protectionist measures that shield them from wine imports from regions in warmer climates for almost 200 years. During the 1830s, Mosel

vintners feared the competition of Southern German winemakers, Austrian winemakers were afraid of Dalmatian wines in 1870, and Swiss vintners were concerned about Italian wine imports in the 1920s. In general, grape growers in cool climates have always dreaded the warm climate competition.

Germany is one of the founding members of what was to become the European Union. With the establishment of the European Common Market German winegrowers, mostly unprotected, substantially improved their productivity and profitability. German vineyards exhibit the highest yields and, on average, the highest profitability per hectare within Europe. This was partially accomplished by intra-German substitutions. In search for profitability, the German vineyard moved north-west - from Württemberg and Baden toward Rheinhessen and Palatinate (Pfalz).

In contrast, Austria joined the European Union only in 1995 and Switzerland has never been a EU member. Austrian and Swiss viticulture still heavily depends on public protection (subsidies and tariffs, respectively).

However, it remains to be seen whether future challenges, such as climate change, can be mastered in a similar fashion. The European system of planting rights and maximum yield regulations may pose a major obstacle to successful adaptations. After all, the current system allots most increases in vineyard areas to incumbents. In 2016, the EU granted a combined 16,380 ha of new planting rights to Italy, Spain, France, Portugal and Greece. Germany only planted 263 ha.

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