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The Water of Life and Death: A Brief Economic History of Spirits

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Abstract

Spirits represent around 50% of global alcohol consumption. This sector is much less studied than other alcohol beverages such as wine or beer. This paper reviews the economic history of spirits and analyses recent trends in the spirits markets. The technology to produce spirits is more complex than for wine or beer. Distillation was known in ancient Chinese, Indian, Greek and Egyptian societies, but it took innovations by the Arabs to distil alcohol. Initially this alcohol was used for medicinal purposes. Only in the middle ages did spirits become a widespread drink and did commercial production and markets. The Industrial Revolution created a large consumer market and reduced the cost of spirits, contributing to excess consumption and alcoholism. Governments have intervened extensively in spirits markets to reduce excessive consumption and to raise taxes. There have been significant changes in spirits consumption and trade over time. Over the past 50 years, the share of spirits in global alcohol consumption increased from around 30% to around 50%. In the past decades, there was strong growth in emerging markets, including in China and India. The spirits industry has concentrated, but less so than e.g. the brewery industry. Recent developments in the spirits industry include premiumization, the growth of craft spirits and the introduction of *terroir* for spirits.

Keywords: Spirits; distillation technology; globalization and convergence of alcohol preferences; alcohol and health; alcohol regulations; craft and industry concentration

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1. Introduction

Around 50% of total alcohol consumption in the world is in the form of spirits (Anderson et al., 2018). Spirits are high-alcohol beverages whose alcohol content has been increased by distillation. They include products such as vodka, rum, tequila, cognac, whisk(e)y, baijiu etc.[1] Spirits can be produced from a variety of raw materials. For example, gin and baijiu are primarily distilled from grains, vodka from potatoes or grains, brandy and grappa from grapes or wine, and rum from sugar(cane) and molasses (see Table 1).

Studies trace the roots of spirits production back to around 3,000 years ago, several thousand years later than wine and beer that were first produced around 7,000 years ago (Nelson, 2005; McGovern, 2009). The production of spirits started later because the technology to produce spirits is more complex. The production process involves distillation, i.e. heating a fermented liquid to a temperature between 79°C (at which alcohol boils) and 99°C (after which water boils) and then cooling the vapour. The resulting liquid will contain less water and more alcohol.

While there exists an extensive literature on wine markets[2] and the literature on the economics of beer and brewing[3] is growing rapidly, there are hardly any studies on the economics of spirits. This represents an important gap in the literature, especially given the fact that spirits are the most important type of alcoholic beverage in terms of volume of alcohol consumption. In this paper, we therefore aim to contribute to the literature by presenting an economic history of spirits, combining qualitative analysis with quantitative data.

The paper is organized as follows. Section 2 presents the emergence of (non-alcoholic) distillation technologies and how these innovations spread from Alexandria and Persia through the Arab empire. Section 3 describes the historical context in which distillation was used in Europe, from the 12th century onwards, as a medicine rather than a drink. Section 4 illustrates how, in the following two centuries, alcoholic distillation transformed from its "medical" purposes, mostly produced in monasteries, to a globally traded commercially produced drink for the masses and the colonies. Section 5 examines how governments have intervened extensively in spirits markets to reduce this excessive consumption and to raise taxes. Section 6 provides data on the significant changes in spirits consumption and trade from the 19th to the 21st century. Section 7 analyses changes in the structure of the spirits industry over time. The last section presents recent developments in the spirits industry: premiumization, the emergence of craft spirits and the concept of *terroir*.

2. Distillation and Alchemists' Search for Gold, Perfumes, and Eternal Life

Anthropological studies document that spirits were distilled from rice beer in China since at least 800 BCE ("Before Common Era"). In the East Indies, the ancient Greek and Egyptian empires and other Arab countries people produced spirits more than 2,000 years ago. In Western

[1] Data on consumption or sales of different types of spirits are limited. The best-selling spirit in the world is probably baijiu, a spirit popular in China. According to The Economist (2019), in 2018 10.8 billion liters of baijiu were sold, more than whisk(e)y, vodka, gin, rum and tequila combined. Each year Chinese drinkers spend about "*three times more on baijiu than they do on beer and roughly 15 times more than on wine*".

[2] See Anderson and Pinilla (2018), Ashenfelter et al. (2018) and Storchmann (2012) for reviews.

[3] See e.g., Poelmans and Swinnen (2011); Swinnen (2011); Swinnen and Briski (2017).

Europe spirits production was limited until the 8th century when contact with the Arabs improved knowledge of distillation and the spread of more advanced technologies.

The distillation technology to produce alcohol, including spirits, was preceded by so-called 'hydraulic' (non-alcoholic) distillation technologies developed by alchemists in their search for gold and perfumes. In ancient times, alchemy was practiced in places such as China, India, Greece, and Egypt. Historical sources document that alchemists in the city of Alexandria (in today's Egypt)[4] discovered and developed the "alembic still" sometime in the 1st or 2nd century CE ("Common Era") (Thorpe, 1909). Alexandria hosted a famous school of alchemy, including some of the first well-known alchemists such as "Cleopatra the Alchemist", "Maria the Jewess", and "Zosimus of Panopolis" (Forbes, 1948: 24; Taylor, 1930).[5] The earliest stills consisted of two vessels connected by a tube. They were composed simply of a heated closed container containing the liquid to be distilled, a condenser, and a container to receive the condensate liquid—as illustrated by Figure 1. These evolved into the pot still, which is still in use—see Figure 2 and Section 7 (Forbes, 1948: 24).

This distillation technology and improved versions of it spread through the Middle East in the following centuries. For example, in the 6th century CE the Byzantine Greek physician Aëtius of Amida refers to his use of an alembic 'distillation still' made of glass. Plouvier (2008) writes that the scientific and intellectual center of Gundisabur in Persia (today's Iran) played a role by improving the "*cucurbit*" (the flask or pot containing the liquid to be distilled) and the "*cap*" (which is placed over the cucurbit to receive the vapors) of the alembic still.

The purpose of the Greek and Persian alchemists' (and that of the Arab alchemists' later) search for distillation techniques was not to produce alcoholic drinks, but different products. One objective was to produce perfumes and floral essences.[6] To produce essential oils they used plants such as roses and olives as raw material. These plant products contain enough fragrance/oil to derive perfume and "essences" when distilled with the first distillation technologies. Their more ambitious target was to find "gold" and "eternal life". That is, their ultimate objective was to find a technology that would allow them to transform base metals into precious ones (as gold and silver—the "philosopher's stone") and to produce the "elixir of life" which would give people immortality (Taylor, 1930; Forbes, 1948).

In the 7th century the Arabs conquered both Alexandria and Persia and thus acquired knowledge of the 'hydraulic' distillation. Arab scientists further developed the distillation technology and introduced innovations that would also allow to distil grapes, wine and (later) starchy cereals—and thus to produce alcohol. In the 9th century, the Arab chemist and

[4] Alexandria was founded by Alexander the Great in 331 BCE and colonized by the ancient Greeks in 305 BCE. It became an important center of Hellenistic civilization and the capital of the Greek Ptolemaic Kingdom in north-east Africa.

[5] The Greek alchemical texts that have survived were written by about forty authors, whose texts cannot be exactly dated. For instance, Maria the Jewess, one of the earliest alchemical authors, wrote her texts not later than the first century CE. What we know is that she discovered and perfected some major processes used by the Greek. For instance, she perfected the apparatus for distillation so efficiently that her innovation suffered little alteration in the next two millennia (Taylor, 1930).

[6] "*Although it took 700 kilograms of petals to get a liter of 'oil of roses', King Khosroes of Persia (6th century CE) could nevertheless arm two hundred women with small gold watering cans in order to purify the crowd during the processions in honor of Zoroaster*." [Translation by the authors. "*Malgré qu'il faille 700 kg de pétales pour obtenir un litre d'essence, le roi Khosroès (VIe siècle) pouvait néanmoins armer deux cent femmes de petits arrosoirs d'or afin d'inonder la foule de rhodostakton à l'occasion des processions en l'honneur de Zoroastre*."] (Plouvier, 2008: 171).

philosopher Al-Kindi (ca. 800–873) refers to alcoholic distillation in his "*Book of the Chemistry of Perfume and Distillations*" (ca. 866): "*In the same way one can drive up date-wine (nabldh) using a water-bath (fVl-rutuba), and it comes out the same colour as rose- water*" (cited in Needham et al., 1980).[7]

However, the production of substantive amounts of alcohol requires specific cooling technology which was not yet available during Al-Kindy's research. To obtain a sufficient quantity of alcohol, the alcohol vapors must be rapidly cooled with cold water. A century later, innovations by the Arab chemist and surgeon Abulcasis Al-Zahrawi (ca. 936–1013) improved the cooling technology to produce alcohol efficiently through distillation (Needham et al., 1980: 128; Plouvier, 2008).

The new distillation technology spread through the Arab empire. Much of today's Spain was under the Arab empire and some of the innovations took place in that region (also known as Al-Andalus, today's Andalusia).[8] While the Arab alchemists knew how to distil wine, it was not a major activity, since their Muslim religion did not allow to consume wine. However, this changed with the spread of the advanced distillation technology outside the Arab empire.

3. Aqua Vitae: The Water of Life

From the 12th century onwards, the distillation technology developed by the Arabs spread to other parts of Europe, first to Southern Europe, where the universities of Salerno (Italy) and Montpellier (France) became centres of knowledge on distillation (Patrick, 1952: 29).[9] Initially the alcohol that was produced was also there used as a medicine rather than a drink. In the south of Europe, wine was a common drink and a ready supply as raw material for distillation. Since wine had long been in use as a medicine, distillations from wine were also initially used in medicine, especially for its supposed positive human health effects. Alcohol was used as antiseptic and disinfectant.

Physicians and alchemists across Europe saw the new technology as a major innovation to enhance life and health and joined the quest for the "*water of life*" (*aqua vitae* in Latin) (de Planhol, 1985; Fairley, 1907; Forbes, 1948: 34). Their experiments with distilled spirits of wine (*aqua vitae*) are written down in various Latin texts from the 12th and 13th century (Roueché, 1963: 172).[10] The most famous are a technical treatise, known as "*Mappa Clavicula*" (which contains a recipe for alcohol) and two medical works developed by the famous Medical School

[7] Another central figure in the history of distillation was the Persian physician, alchemist and philosopher Abū Bakr Muḥammad ibn Zakariyyā al-Rāzī (854–925) (Forbes, 1948: 34).

[8] Spain was under Arab rule from 711 to 1492.

[9] There may have been some production of distilled spirits in Western Europe earlier, but production was certainly limited and only developed at a larger scale after contact with the Arabs during the 11th century.

[10] In the early 14th century, the physician and alchemist Arnaldus de Villanova (c. c. 1235–1313) working at the University of Montpellier is credited to be the first who used the term "*aqua vitae*", or brandy. "*We call it [distilled liquor] aqua vitae, and this name is remarkably suitable, since it is really a water of immortality. It prolongs life, clears away ill-humors, revives the heart, and maintains youth*" (Arnaldus de Villanova, The Earliest Printed Book on Wine, Now for the First Time Rendered into English, and with an Historical Essay by H.E. Sigerist, with Facsimile of Original Edition, 1478. New York: Schuman's, 1943, cited by Roueché, 1963, p. 172).

of Salerno (Italy) (i.e., the "*Compendium Magistri Salerni*" and "*The Practice of Surgery*") (Multhauf, 1956; Partington, 1937: 40).[11]

As the technique of alcoholic distillation spread further north in Europe, other products were increasingly used as raw materials for distillation into alcohols (still for medicinal purposes). For example, in northern France, Germany and the Low Countries (today's Belgium and the Netherlands), "medicinal juniper" was used to treat stomach, kidney and liver diseases. Juniper (the alcohol that later became '*genièvre*' in France, '*jenever*' or '*genever*' in Holland and 'gin' in England) was a purified distilled alcoholic beverage made from a grain mash with the juniper berry as its principal flavouring ingredient. In the 14th century, the Black Death spread across Europe and the use of juniper elixirs as a cure spread—albeit with little effect (Barnett, 2011).

Still, alcohol remained in use as an important medicine in the following centuries. The first printed book on alcoholic distillation was written in 1500 by the German physician and botanist Hieronymus Brunschwig (ca. 1450–1512) (*Liber de Arte Distillandi: De Simplicibus*, or "The Virtuous Art of Distilling"), and claimed that distilled alcohol could cure a wide range of diseases: from fever, baldness, lethargy, deafness, bad digestion to the bites of a mad dog:[12]

> "*It eases the diseases coming of cold. It comforts the heart. It heals all old and new sores on the head. It causes a good colour in a person. It heals baldness and causes the hair well to grow, and kills lice and fleas. It cures lethargy. Cotton wet in the same time and a little wrung out again and so put in the ears at night going to bed, and a little drunk thereof, is of good against all deafness. It eases the pain in the teeth, and causes sweet breath. It heals the canker in the mouth, in the teeth, in the lips, and in the tongue. It causes the heavy tongue to become light and well-speaking. It heals the short breath. It causes good digestion and appetite for to eat, and takes away all belching. It draws the wind out of the body. It eases the yellow jaundice, the dropsy, the gout, the pain in the breasts when they be swollen, and heals all diseases in the bladder, and breaks the stone. It withdraws venom that has been taken in meat or in drink, when a little treacle is put thereto. It heals all shrunken sinews, and causes them to become soft and right. It heals the fevers tertian and quartan. It heals the bites of a mad dog, and all stinking wounds, when they be washed therewith. It gives also young courage in a person, and causes him to have a good memory. It purifies the five wits of melancholy and of all uncleanness*."

The association of spirits with health as embedded in "*aqua vitae*" as a name for spirits was in wide use in the Middle Ages and the Renaissance. Even today it lives on in many spirits names, such as for example *eau-de-vie* in France, *acquavite* in Italy, *akvavit* in Scandinavia, *okowita* in Poland, *yakovita* in parts of Russia. Etymologists explain that *whisky* also derives its name from *aqua vitae*, from the old Gaelic expression *uisce beatha* or *usquebaugh* (literally "water of life"), which in the 1700s became "*usky*," "*uiskie*" and "*whiskie*" (Phillips, 2014: 189).

[11] Rogerius (ca. 1140–1195), also known as Roger of Salerno, wrote the popular work "The Practice of Surgery" (*Chirurgia Practica*) and promoted innovations in antiseptic, anesthetic and surgery.

[12] Quoted by Roueché, 1963, pp. 172–173.

4. From Medicine to Drink for the Masses and the Colonies

"*The great innovation, the revolution in Europe was the appearance of brandy and spirits made from grain. The sixteenth century created it; the seventeenth century consolidated it; the eighteenth century popularized it*."

Braudel (1981: 241)

From the 16th century onwards Europeans became accustomed to the growing use of distilled alcohol as a drink and not (only) a medicine. Until then, distillation was still expensive (due to the high cost of the stills) and the recipes and technologies were not widely known (confined to physicians and monks in monasteries, which were centres of knowledge at the time). However, in the following two centuries, alcoholic distillation transformed from its "medical" purposes, mostly produced in monasteries, to a globally traded commercially produced drink.[13]

One factor that contributed to this transformation was the spread of knowledge about distillation after Gutenberg's invention of the printing press in the 15th century. By the mid-1600s, several texts on distillation had been published. One of the most cited books was "*The Art of Distillation*" by John French, printed in 1651. French's (1651) book describes the distillation from wine and from vegetable seeds and grains.[14] The spread of knowledge and the growing demand for alcoholic distillation for drinking purposes stimulated private investments in distillation by wealthy individuals and alcohol production outside monasteries.[15]

As already mentioned, initially the distillation of alcohol was in the south of Europe and used wine or grapes as raw material. When distillation spread to the north, other ingredients were used. The demand for distilled alcoholic drinks may have been higher in the north of Europe because it was not possible to produce wine there and importing wine was expensive. In addition, preservation of beer, the local alcoholic drink, was difficult with the technology of the time. The introduction of hops in beer production enhanced preservation of beer, and thus trade, and the growth of commercial brewing from the 16th century onwards, but only over limited distances. Spirits had advantages for trade as its alcohol content was much higher (eight or nine times the alcohol content of wine and even more for beer) and thus easier to preserve and cheaper to trade (less bulky) than wine or beer.

The spirits markets grew rapidly. The growth and regional spread of different spirits was obviously affected by the raw materials that were used. There is a wide variety of spirits in the world and it is not possible to cover the economic history of all within the constraints of this paper. Yet it is important to provide some more specific insights on different spirits and show the crucial role played by their raw materials and geography in their economic history.

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[13] The prohibition movements in the 19th and 20th centuries led to the re-birth of spirits as "medical use". For example, the US Prohibition (1920—1933) laws allowed medicinal use of alcoholic beverages. Hence, herbal liqueurs or "medicinal whisk(e)y" were sold as "medicine" in the pharmacies (and survived the US Prohibition) (Griffenhagen, 1987; Jones, 1963).

[14] "*Now this spirit or aqua vitae is in all vegetables as you may see in malt and vegetables that are putrefied before they are distilled which then yield a burning spirit. Yet it is in wine more than in any other liquors. I say liquors, for if you take eight gallons of sack and as much wheat, which is a solid body, and the wheat being malted will yield more aqua vitae than the sack.*" (French, 1651, Book V).

[15] In France, the privilege to distil was granted to the guild of vinegar makers (in 1514 by Louis XII) and to the victuallers (in 1537 by Francis I) (Braudel, 1981).

Therefore, we discuss here the development of markets of three important (groups of) spirits: brandy, gin and rum.

From Brandewijn to Brandy and Cognac

Several authors point at the important role that the Dutch played in the growth of spirits markets in Europe (Huetz de Lemps and Roudié, 1985). After the Dutch became independent from Spain in 1648, they soon became the largest market of spirits distilled from wine—which became known among the Dutch as *brandewijn* (literally meaning "burnt wine") from which "brandy" later derived (Hanson, 1995: 8). The Dutch not only liked *brandewijn* for consumption in Holland but, as it was easy to transport and preserve, also to feed their growing fleet of ships and sailors. Their saying was that it gave extra courage to the sailors—hence the expression "Dutch courage" (Enjalbert, 1985; Gough, 1998).[16]

An important factor why the Dutch preferred to import *brandewijn* rather than produce spirits based on local raw materials, such as *jenever* from grain, was that grain used for alcohol competed with grain for bread. The government discouraged the use of spirits distilled from grain, in order to have sufficient grain supply for producing bread (Faith, 1986). Interestingly, earlier in the 17th century, during the 80-year Independence War of Holland with Spain, it was the Spanish Government which banned the production of *jenever* (in 1601) in the Southern Low Countries (today's Belgium) because of concerns about a food shortage caused by wars with Holland and the use of grains for *jenever* production. A result of this ban was the migration of Flemish distillers to Holland (and to other regions).

As the Dutch became the most important spirits merchants in the 17th century, they were continuously looking for new sources of supply. Initially they sourced wine as raw material from the French wine regions of Bordeaux, La Rochelle, and the Loire region. However, since it was cheaper and easier to ship spirits (*brandewijn*) than its raw material (wine), the Dutch established distilling stills in the French wine producing regions to reduce transport costs. The *brandewijn* production region later expanded towards the Charente region in southwestern France (north of Bordeaux and south of Loire). The *brandewijn* from this region later developed into the famous "*Cognac*" (Braudel, 1981).[17] The growing demand in Holland for *brandewijn* thus stimulated the French Cognac industry in the 17th century (e.g., Enjalbert, 1953, 1985; Phillips, 2016; Unwin, 1991).

From Jenever to Gin

As explained above, besides *brandewijn*/brandy, distillers in Western Europe (France and the Low Countries) had been producing an alcoholic beverage from grain, often flavoured with juniper berries ('*genièvre*' (in French) and '*jenever*' (in Dutch)) since the 14th century. Except during times of grain shortages, the distilled *jenever* was popular and the industry grew significantly in the 16th and 17th centuries.

[16] Only very expensive wines were bottled. Wealthy consumers discovered that wines in bottle not only preserved better but also improved with time (Gough, 1998).

[17] The wines produced in the Loire region in Central France had to pay a heavy export duty when they passed through the town of Ingrandes and were therefore less attractive (Lachiver, 1988).

There was relatively little spirits production in Britain in the 16th and 17th century. In the 17th century, Britain was massively importing wines and spirits from France—cheap wines for the masses and expensive clarets for the elites—as well as Cognac and other brandies.

However, this changed after William of Orange, a Dutch Protestant prince, became king of England in 1688. First, with his arrival William of Orange popularized Dutch *jenever* (or *genever)*—soon referred to as "*gin*"—as a spirit drink in England. Second, soon after William became king, Britain, now under Protestant rule, went to war with (Catholic) France ruled by King Louis XIV. The war with France lasted 25 years (until 1713) and had a major impact on the British alcohol market and spirits consumption (Phillips, 2014: 208; Unwin, 1991: 210). The war effectively halted much of the British import of French wines and Cognac. Besides the obvious trade problems caused by the war itself, Britain increased tariffs on French wines from 1692 onwards. The war and the changed tariff structure transformed the British wine, beer and spirits market and trade. One result was the rapid growth of the beer (porter) industry around London (Nye, 2000). Another result was the shift from ("unpatriotic" and expensive) French wines and spirits (Cognac and other French brandies) to "patriotic" Portuguese wines[18] and Dutch spirits (*jenever*/gin) (Enjalbert, 1953; Francis, 1972: 115; Ludington, 2013).

Initially, *jenever* was imported from Holland, but between 1690 and 1720, the British parliament started encouraging the production of spirits in Britain.[19] British distillers were soon producing a British version of *jenever*, "gin", in large quantities and consumption grew rapidly—see Figure 2 (Phillips, 2014: 208; Unwin, 1991: 213).[20] Figure 3 illustrates how spirits consumption (mostly gin) grew from 0.36 gallons per capita in 1700 to 2.2 gallons per capita in 1745—a six-fold increase. During the first half of the 18th century, gin became so popular that it was referred to as a '*Gin Craze*' with major negative health and social impacts (see Section 5 for more on this).

From Kill-devil to Rum

By the 17th century, brandy and gin were widely produced and commercialized in Europe. Soon these spirits would spread around the world accompanying European conquests in the Americas, Africa and Asia. As the Dutch, the British and the French were setting up colonies, they took their drinks and their technological knowledge of distillation with them. Trade costs and spoilage were lower for spirits than for beer and wine and so spirits became popular on the ships and in the settler economies of the New World.

However, this globalization of spirits was not one-directional. Soon spirits from the New World became popular and found their way on the ships to the European home markets. The most well-known, and arguably most important, example of this is rum. While there is no agreement on where rum was first produced,[21] it is well documented that the West Indies

[18] From 1703 onwards, Britain drastically reduced tariffs on Portuguese wines. The wars and the changed tariff structure led to the dramatic growth of Portuguese wine exports to Britain and to the birth of Port wines in Portugal (Meloni and Swinnen, 2018).

[19] The British Parliament did not regulate distillation and anyone could distill spirits as long as they paid a low tax rate of 2 pence a gallon—by 1736, London had 1,500 stills (Phillips, 2014: 209).

[20] "Gin" got its name from *jenever*, which was corrupted to "geneva" by English soldiers and then shortened to "gin". Interestingly, vocabularies have reversed the historic events. *Jenever* is now often translated as "Dutch gin" (Phillips, 2014).

[21] There are divergent theories on how the distillation knowledge spread in the Caribbean and America. Gough (1998: 87) claims that the complex technologies for extracting the sugar cane juice and ferment it were introduced

(Caribbean Islands) became a major producer of rum, with Barbados as the largest producer.[22] From the middle of the 17th century, rum was produced in the Caribbean first under the name of "*kill-devil*", then "*rumbullion*"—which was shortened to "rum" (Watts, 1987).

Initially, the European settlers in the Caribbean (English, French, and Dutch) consumed imported spirits and (often spoiled) wine and beer. In the 17th century, with a glutted tobacco market and rising demand for sugar, the Caribbean planters turned to cultivating sugar cane and producing sugar. Molasses, a by-product or residue of sugar extraction from sugarcane, was initially considered waste and some of it was dumped in the sea to get rid of it. This changed when somebody discovered the remaining sugar in molasses was an excellent (and cheap) raw material for distillation into alcohol. The drink obtained was high in alcohol and could be preserved for an indefinite period.

Rum was born and the distillation of molasses became a highly profitable enterprise. The immense sugar profits allowed planters to invest in technology and soon the profits from rum paid for the investments. Adam Smith wrote in *The Wealth of Nations* (1776) that "*a sugar planter expects that the rum and the molasses would defray the whole expense of cultivation*"—hence sugar sales were pure profit!

The rum industry in the Caribbean colonies was very successful and profits grew with increasing exports. The international interest in rum grew as rum became the favorite drinks of Caribbean pirates and the English Navy.[23] During the 17th century, rum became a basic drink of the English navy and the British colonies. In 1655, the ratio of beer given to the British Royal Navy's sailors was converted to a ratio of rum. Rum remained an official part of the British sailor's daily ration as early until 1970 (Phillips, 2014: 201).

With growing exports, British colonies in Australia and America became "rum states". Anderson (2019) documents how rum consumption grew rapidly and by 1850 spirits, mostly rum, made up around 80% of all alcohol consumption in Australia (see Figure 7). Rum consumption in the North American colonies also grew rapidly when ships full of rum returned from Barbados and the West Indies. In the West Indies, profitable sugar plantations covered the entire islands. Other products, such as timber, livestock, fish etc., were imported often from the North American colonies.

While rum was initially exported to the British North American colonies, soon these colonies started to produce their own rum. From 1700 onwards, ships from the West Indies to British North America were increasingly filled with molasses rather than rum and rum production grew rapidly there. The first distillery was established in what is now Staten Island (Roueché, 1963: 178). During the 18th century, the number of distilleries grew rapidly,

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by Dutch colonists expelled by the Portuguese who were reconquering northern Brazil. While Alain Huetz de Lemps (1997) argues that it is "*quite possible that the Portuguese or the Spanish had practiced [sugar cane] distillation since the sixteenth century in their Atlantic island holdings (Madeira, the Canaries) or their American colonies*."

[22] Barbados was Britain's wealthiest colony because of sugar. It produced more sugar and employed more shippers than all of the other British West Indies put together. The population of Barbados increased from 80 in 1627 to 75,000 in 1650. The city of Bridgeport in the 17th century was bigger and more prosperous than Manhattan (Curtis, 2018).

[23] Around 1720, 1500 to 2000 pirates were active in the seas between New England and the Caribbean. The pirate most associated with rum was Edward Teach, better known as "*Blackbeard*" whose fondness of rum was apparently legendary (Curtis, 2018).

especially in New England,[24] and the import of cheap molasses did accordingly. In the second part of the 18th century (time of the American Revolution, 1765-1783) rum distilling had become the second most important industry in North America, after shipbuilding.

In their search for cheap molasses, the New England distilleries increasingly passed Barbados and the British Caribbean colonies and started importing molasses from French islands, especially from Haiti. This upset the sugar barons in the British West Indies, and they lobbied the British government to intervene—arguing that the exports of French colonial molasses were helping the French (enemy) finance their military and undermining their own revenues, and also British tax revenue. The British Parliament passed the Molasses Act of 1774 that imposed heavy taxes on molasses exports from France (Haiti) to Britain (North America).

The Molasses Act was not well enforced and circumvented with corruption. Later Britain replaced the Molasses Act with the Sugar Act of 1764 and sent ships and administrators to the colonies to effectively enforce the tariffs. This triggered strong political reactions from the North American colonies. They joined in political action and succeeded in inducing the English Parliament to reducing the tariffs. Several authors have argued that this was a crucial step in the American Revolution as it was the first time that the colonies had joined together in collective action. As such, this is believed to have contributed to the North American colonies' political and military response to the tea and stamp taxes, introduced in part to replace the lower sugar (molasses) taxes (Carrington, 1987; O'Shaughnessy, 2000; Williams, 2005).

Interestingly, the reason why molasses in Haiti and other French Caribbean islands was so cheap was because France had imposed a prohibition on rum production. Earlier, growing export of rum had caused political problems for France at home as rum started competing with French Cognac (Mandelbatt, 2011; Unwin, 1991: 210). As previously analyzed, the Anglo-French wars (1688-1713) had a major impact on the British alcohol market, with consumption shifting from French wines and spirits to "patriotic" Portuguese wines and Dutch spirits (*jenever*/gin). One of the consequences was that during much of the 17th century, French brandy (and wine) producers were suffering from high import tariffs on the British market. With the arrival of rum from the French Caribbean colonies, pressure on French brandy producers increased further. They lobbied the French government to intervene and the King of France in 1713 banned the production and exchange of distilled liquor fabricated from any base material other than wine in France—effectively banning rum from France and its colonies throughout the 18th century (Mandelbatt, 2011).[25]

Finally, while the American Revolution may have been stimulated indirectly by a revolt of rum distillers, it ended up hurting the US rum industry. The revolutionary war lasted several years in the 1770s-80s and crippled the rum industry as imports of molasses dried up. Afterwards, the rum industry never really recovered. Trade embargoes continued, making imports of molasses expensive. When trade with the West Indies opened up again (around 1812), sugar production in the West Indies was on the decline because of deteriorating soil productivity and the emancipation of slaves, making land less productive and labor more expensive.

[24] Rum distilling was less important in the southern American colonies (Virginia and Carolina) where tobacco plantations dominated the economy.

[25] As with the introduction of wine and chocolate regulations in France at the beginning of the 20th century, one of the main reasons for the ban was the supposed "danger" posed to consumer health by the new product.

As a result, the US switched "from rum to whiskey" in the 19th century. In the 17th and much of the 18th century, US whiskey production had been contained by cheap competition (rum) and expensive inputs (valuable grains). After the Revolution and technological innovations, expansion of US grain production took place in the Midwest. Yet exports (overseas and to the East Coast cities such as Boston and NYC) of increasing grain production was difficult with weak transport infrastructure. Hence, whiskey production provided an attractive and effective alternative to ship "processed grain" products to the East Coast at much lower cost.

5. The Water of Death: Regulations to Reduce Spirits Consumption

With the growth in spirits consumption, soon problems of alcohol abuse emerged: the water of life became the water of death. These problems have continued over time. Today, the World Health Organization (WHO) estimates that alcohol consumption contributes to 3 million deaths each year globally, as well as to the disabilities and poor health of millions of people. Overall, WHO claims that harmful use of alcohol is responsible for 5.1% of the global burden of disease. Much of this is due to the consumption of hard liquor—spirits. A recent study by Bhattacharya et al. (2013) shows that changes in spirits (vodka) consumption had significant effects on the health of the Russian population and mortality rates in Russia.

As explained in Section 2, historically spirits were initially considered positive for health, notably as a medicine and an elixir of live ("*aqua vitae*"). However, this perspective changed as spirits consumption grew and health and social problems associated could no longer be ignored. The growth of spirits consumption thus triggered important government interventions to affect alcohol consumption in general and of spirits in particular.[26] These regulations included restrictions on sales, advertising, and consumption of alcohol, and consumption taxes.

The first regulations were introduced already in the 15th century. From the mid-15th century onwards, the Russian tsars imposed a state monopoly on sales of vodka (Pokhlebkin, 1992). Around the same time, many German towns introduced regulations on where and when one could drink spirits (e.g., citizens could not drink their brandy on the spot and brandy sales were banned on feast days and during church services) (Forbes, 1956: 144; Unwin, 1991: 235). In France, brandy was portrayed as a "*bad beverage*", in contrast to "*healthy wine*". In 1677 French brandy sellers were forced to close their shops after 4 pm (Phillips, 2014: 107). Around the same time, regulations to restrict rum consumption were introduced in the Caribbean. For example, Barbados introduced licenses for "tipping houses" (pubs) in 1652 and regulations to prevent excessive rum consumption in 1668 (Curtis, 2018).

Two major developments reinforced restrictions and regulations on alcohol use from the 18th century onwards. The first was the Industrial Revolution which (a) lowered the production cost and hence price of spirits (see Section 7), and (b) created a class of industrial workers who became large consumers of spirits. Alcoholic drinks became more-readily available, stronger and cheaper. Consumption therefore grew—as did problems of abuse, especially in the industrializing regions (Gately, 2008; Phillips, 2014).

[26] A major ban on alcohol was introduced much earlier in the Middle East. The Prophet Muhammad (c.570–632 CE), founder of Islam banned the production, distribution, and consumption of alcohol (Phillips, 2014: 59). It is the longest lasting prohibition, as 1,500 years later it is still in place in many Muslim countries.

Britain, the most industrialized country, introduced several measures to reduce spirits consumption during the 18th century. Figure 3 illustrates how consumption of spirits (mostly gin) increased dramatically in the first part of the 18th century, the "Gin Craze" period. The British government implemented several "*Gin Acts*" between 1729 and 1751 to reduce spirits consumption by taxing retail sales and imposing restrictions on sellers (Nicholls, 2009; Warner et al., 2001). With these measures, spirits consumption fell significantly after 1745. From 1760 onwards, spirits consumption was back to the levels of the early 18th century: around 0.6 gallons per capita. Note that Figure 3 also illustrates that over this entire period with major fluctuations in spirits consumption, beer consumption remained almost constant.

The second important development was the growing availability of non-alcoholic safe drinks. Imports of tea, coffee and cocoa were growing and, by the 1750s, these beverages were widely drunk in Western Europe and the United States (Grigg, 2002; Wickizer, 1951). In addition, scientific discoveries during the Industrial Revolution led to the invention of carbonated soft drinks.[27] The combination of these factors increased the demand by various groups for much wider restrictions on alcohol consumption, since alcoholic drinks were no longer needed for safe drinking and since the social and personal costs of excessive alcohol use had become much clearer.

This translated into a global '*Temperance Movement'*, which led to restrictions on alcohol use in various countries. Restrictions took several forms.

Prohibition. The best documented success of the Temperance Movement is probably the Prohibition period in the United States from 1919 to 1933—the subject of many Hollywood movies—but prohibitions on alcohol consumption were imposed in several other countries as well. For example, prohibition was imposed in Russia from 1914 to 1925.[28] Norway banned spirits and beer sales in 1916; Finland banned all beverages with an alcohol level higher than 2% in 1919; and Belgium banned distilled spirits in 1918. Similar restrictions were imposed at times in Mexico, Canada, and India.[29]

State control of sales. In other cases, alcohol sales were controlled by state monopolies (Phillips, 2014). Some of these restrictions continue today. In several countries, governments still exercise exclusive control over the alcohol market or some aspect of it (import, production, distribution, retail sales). Fifty countries (30% of all) reported the use of control over the alcohol market for at least one level. Monopolies over imports (36 countries) and retail sales (35 countries) were most common for spirits (WHO, 2019)—see Anderson et al. (2018) for a review.

[27] By the 1830s there were 10 soft drink manufacturers in Britain, and more than 50 by the 1840s. Schweppes was the first, founded in Geneva in 1783 and relocated to London in 1792. Coca-Cola and Pepsi-Cola were not born until 100 years later, in the hot humid US states of Georgia and North Carolina, respectively.

[28] In the Soviet Union, Lenin banned retail sales of spirits was forbidden (sale was permitted only in restaurants) in 1914 and banned vodka altogether in 1917. Prohibition was gradually abandoned from 1921. In 1921, the government permitted the production/sale of wine, one year later of beer. In 1923, the production of low-alcohol (20%) vodka was permitted, and in 1925 regular vodka (40%) was allowed (Phillips, 2014).

[29] Many Mexican states had introduced prohibition after the 1910 Revolution, but due to lack of official support, by the 1920s, most Mexican prohibition policies were repealed. In 1927, Canada created a system of permit books (regulating alcohol consumption) which remained in force until the early 1960s. Prohibition was introduced in the state of Madras in 1937 and then was extended to other parts of India. When the country gained its independence in 1947, prohibition was included in its constitution (Phillips, 2014).

Consumption taxes. Taxation of spirits, and alcohol more generally, serve the dual purpose of raising government revenue and reducing consumption to limit negative externalities.[30] Virtually all countries tax domestic consumption of alcoholic beverages. Since the Middle Ages, alcohol taxes have been an important source of government revenue (Deconinck et al., 2016; Nye, 2007; Unger 2004, 2011). In earlier centuries, it was mostly beer and wine taxes, but as commercial markets of spirits expanded in the 17th century, spirits were increasingly taxed. The Dutch imposed taxes on spirits in the early 1600s and were soon followed by the English (1643) and the Scots (1644). The first revenue law introduced by the United States Congress was a liquor excise tax in order to finance the debt it had incurred during the American War of Independence in 1775–83 (Hu, 1950). The 1791 tax enabled the federal government to collect taxes on distilled spirits. Imported spirits (French brandy) were highly taxed, then came the spirits produced in the United States from imported ingredients (molasses from the Caribbean) and finally the spirits produced in the United States from local ingredients (Phillips, 2014: 280).

Alcohol taxes were important sources of tax revenue. In the later 18th century alcohol taxes made up around 40% of total tax revenue in Britain, with around 10% from taxes on spirits and 25% from beer taxes (O'Brien, 1988). Until Prohibition (in 1919), alcohol tax revenues also represented up to 80% of all federal internal tax collections in the US (National Research Council, 1981). The importance of alcohol consumption as a source of tax revenue was an important constraint for governments to introduce regulations to reduce alcohol consumption. For example, the Temperance Movement pressure for prohibition in the US was only successful after a major tax reform which introduced income taxation and shifted taxation from consumption to incomes (Okrent, 2010).

In today's advanced economies the main justification offered for taxes on spirits is to offset negative externalities that spirits drinking imposes on society. Taxes vary strongly across countries and across alcoholic beverages. Anderson (2019) calculated global taxes on alcoholic beverages and found that excise taxes on spirits are around 75% on average—much higher than for beer (28%) and wine (21%) (see Figure 4). These taxes vary from around 20% in Argentina and Romania to more than 200% in Iceland and Norway (Figure 5).

6. Spirits Markets from the 19th to the 21st Century

There have been significant changes in spirits consumption since the 18th century, but data to document this are limited. Anderson and Pinilla (2017) provide data on the volume of consumption of wine, beer, and spirits (expressed in litres of alcohol) that stretch back to the 1880s for a selection of (Western, high-income) countries and back to 1961 for the large majority of countries in the world. For information on consumer expenditures on spirits, we rely on Euromonitor (2019) data dating back to 1990 for a selection of countries.

[30] Some alcohol taxes, especially for wine, have also been used to protect domestic industries from foreign competition. For example, in the late 19th and early 20th centuries, French import taxes protected domestic markets from imports of wine and raisins. This strongly affected not only trade in wine throughout the Mediterranean region (which at that point accounted for roughly 80% of global wine trade), but also whole economies of the exporting countries of Spain, Italy and Greece (Meloni and Swinnen, 2016, 2017; Pinilla and Ayuda, 2002). Likewise, prior to World War II wine import tariffs were used to protect domestic producers in New World countries such as Argentina, Australia, Chile and New Zealand (Anderson and Pinilla, 2018, Chs. 11–13).

For a few countries, longer time series are available. Figures 6 and 7 illustrate alcohol consumption patterns in the United Kingdom and Australia since 1835 and 1843 respectively. In both countries, the share of spirits in alcohol consumption strongly declined in the second half of the 19th century. Declining per capita consumption of spirits—a trend that started by the end of the 18th century (see Figure 3)—combined with increased consumption of beer, resulted in the British share of spirits falling from around 54% in 1854 to 17.5% by 1915 (Figure 6). In Australia, the decline is even more spectacular. Over the course of a century—from 1850 to 1950—the share of spirits fell from around 71% to close to 12% (Figure 7). Again, beer became the dominant alcoholic beverage. However, this is not because consumers started drinking more beer, but rather that they started drinking less spirits. Figure 7 illustrates how the consumption of spirits increased dramatically in the 1840s in Australia, but after the peak around 1853 fell strongly over the next century. Over this period, the consumption of beer remained fairly constant.

Spirits consumption 1890 – 1960

Data on spirits consumption for several west European countries and Australia and the US since 1890 is summarized in Table 2 and 3. At the end of the 19th century there was substantial variation in the consumption of spirits. Whereas per capita consumption was below one litre in Italy in 1900, this was estimated to be 6.8 litres in Denmark. Similarly, the share of spirits in the consumption of alcoholic beverages ranged from around 5% in Italy to almost 49% in the US and even 72% in the Netherlands. Interestingly, while spirits appear to have been consumed widely in France and Belgium-Luxemburg with per capita consumption of 4.6 and 4.7 litres respectively, they accounted for a relatively low share of total alcohol consumption (21% and 31% respectively).

As a result of the global Temperance Movement, the 1900-1930 period was characterized by a strong decline in spirits consumption. In the Netherlands, Germany and Belgium-Luxemburg, for example, spirits consumption in 1929 was reduced to around a quarter of the level of consumption just 29 years earlier. There are very few data between 1930 and 1960. After 1960, the declining trend appears to have continued in the countries where spirits were consumed widely (such as Germany and the Netherlands). In other countries spirits consumption stabilized or increased somewhat again. However, in all countries except the US, the share of spirits in total alcohol consumption was below 25% by 1990. With spirits continuously accounting for more than 30 %, the US had the highest share of spirits for almost the entire post WWII period.

Spirits consumption since 1960

In recent years, spirits became the most consumed type of alcoholic beverage in terms of volume of alcohol. Around half of global alcohol intake was consumed in the form of spirits in 2015.[31] Figure 8 illustrates how the share of spirits has risen significantly over time. In the 1960s the three alcoholic beverages were close in global shares: 28% beer, 34% wine and 37% spirits. However, this has changed significantly. Between 1961 and 2015 the share of spirits increased from 37.2% to 49.5%.

[31] Different sources provide somewhat different estimates. Anderson and Pinilla (2017) estimate that 51.5% of global alcohol consumption was consumed in the form of spirits in 2015 while WHO (2018) reports a share of 44.8% of recorded alcohol consumption. In both cases, the share or spirits is, however, higher than the shares of beer or wine.

The growing share of spirits is mostly due to the declining importance of wine consumption. In terms of litres alcohol per capita, wine has fallen from around 0.8 litre in the 1960s to around 0.4 litre recently. Its share was close to that of spirits in the 1960s but has declined from 34% to 13% between 1961 and 2014. The consumption of beer has increased slowly but steadily over the past decades: from 0.7 in 1961 to around 1.2 litres of alcohol in the most recent decade; and its share of total alcohol consumption increased from 28% to 36%.

Changes in the volume of spirits consumption have not been continuous. There was a strong increase in global spirits consumption between 1961 and 1980 (from 1 to 1.4 litres of alcohol per capita), that was further reflected in a rise in its share of total alcohol consumption of more than 7 percentage points. By 1987, however, the volume of per capita spirits consumption had again declined to 1.1 litres and the volume of spirits consumption remained at around 1.2 litres until 2005. The share of spirits during this period remained relatively stable. After 2005, there was a strong increase in global spirits consumption (from around 1.2 to around 1.6 litres per capita in 2014—an increase of 33%), and spirits' share of total alcohol consumption rose to more than 51%.

These general trends mask substantial heterogeneity across countries. Changes in spirits consumption globally resulted from stagnant demand in richer countries and growing demand in emerging markets. Income is obviously an important factor in determining alcohol consumption, but other factors, such as globalization, history, and local preferences also play a role (Colen and Swinnen, 2016). Traditional consumption patterns were strongly affected by local production of specific alcohol types. For example, traditionally vodka was consumed in countries such as Russia, wine in countries such as Italy and beer in countries such as Germany, reflecting local climatic conditions and resources. However, some recent studies on global wine and beer markets have indicated that these are changing with income growth and globalization and that there may be a "convergence" in global alcohol consumption patterns. In traditional wine-drinking countries (such as Italy and Spain) beer consumption is increasing and in traditional beer-drinking countries (such as Germany) wine consumption is growing (Swinnen and Briski, 2017). However, not all studies agree on this (see e.g. Alston et al 2019 on US alcohol consumption patterns).

To see whether there is conversion in spirits consumption, Figure 9 illustrates the evolution of alcohol consumption for three groups of countries: (traditionally) spirits-focused, wine-focused and beer-focused countries (as defined in Holmes and Anderson, 2017). This comparison of the evolutions in the different country-groups yields mixed conclusions. First, spirits' share of total alcohol consumption declines over time in spirits-focused countries and increases in wine-focused countries. This is consistent with the convergence argument. However, there is no increase in the share of spirits in beer-focused countries. Moreover, the decline of the share of spirits in spirits-focused countries has halted after 2006. Second, in terms of the volume, per capita spirits consumption has increased steadily in the spirits-focused countries. Moreover, after a period of very modest increases, per capita spirits consumption has been declining in beer- and wine-focused countries since 1993. In summary, these indicators suggest divergence rather than convergence.

Rapid growth in emerging countries and declines in mature markets

The growth in aggregate spirits consumption since 2000 (see Figure 8) is importantly driven by the growth in lower income markets, and in India and China especially, as illustrated in Figure 10. In both countries, nearly all alcohol was consumed in the form of spirits in the 1960s and 1970s. The quantities of spirits consumed were, however, very low during this period with per

capita consumption estimated at 0.6 and 0.5 litres of alcohol for China and India respectively. Largely as a result of rising incomes and an expansion of the population above the legal drinking age, the volume of spirits consumption has increased significantly since. In China, consumption of spirits has risen to around 3 litres per capita since 2010. In addition, consumer expenditures on spirits nearly tripled between 1990 and 2018 (see Figure 11). Similarly, spirits consumption in India rose to 2 litres in 2011 and expenditures doubled over the past 28 years. In both countries, the growth in spirits consumption was particularly strong after 2000—consistent with the growth in global spirits consumption after 2000 (see Figure 8).

It is worth noting that while in India, spirits still account for more than 90% of total alcohol consumption, the share of spirits in China had decreased to less than 65% by 2014. This is mostly due to increased consumption of beer in recent decades.

Table 4 summarizes global market shares and a comparison of consumption levels. The strong growth of spirits consumption in China and India is reflected in their growing market share of global spirits markets. In 2015 China accounted for 28% of the value and 26% of the volume of global spirits—compared to less than 16% and 20% ten years earlier. India's spirits market represented 7% of the global value and 12% of the global volume of spirits by 2015. Interestingly the share of the US in the global spirits market has also increased in terms of volume and value, albeit very modestly. With significant growth in the three main markets, the value share of the top three (China, US, and India) grew from 34.5% in 2005 to 48.8% in 2015. Their volume share was 47.1% in 2015. Hence, these three markets account for approximately half of all spirits consumption in the world both in value and volume.

Besides these countries, there was also significant growth in spirits markets in South Korea, Poland, Australia, and the Philippines. The volume of spirits consumption grew by more than 2.5% per year on average between 2005 and 2015 in these countries.

In contrast, spirits markets have been shrinking considerably in terms of volume in recent years in countries such as Brazil, Spain and Italy (average annual decline more than 2%). It is worth noting that largely as a result of rapidly rising per capita consumer expenditures on spirits (see Figure 11), the spirits market in Brazil was growing steadily in terms of value (at 4% on average annually) despite the sizeable decline in volume. The most dramatic decline in the size of the spirits market in terms of volume can be found in Ukraine (- 4.5%) and Russia (- 3.7%).

The evolution of spirits consumption in Russia over the past 25 years is of particular interest. Figure 12 illustrates the strong fluctuations in Russian spirits (mostly vodka) consumption. There are two periods of significant decline: the second half of the 1980s and after 2000. In between both periods there was a dramatic increase in spirits consumption: from less than 2 in 1987 to 7 litres of alcohol in 1995. These fluctuations were influenced heavily by (changes in) government regulations.

To halt the excessive vodka consumption in the Soviet Union in the 1980s and its negative effect on the health of the population and the economy's productivity, Soviet leader Gorbachev introduced a campaign to reduce alcohol consumption in 1985.[32] The campaign

[32] Gorbachev introduced a complex set of policies. First, various bodies (as Academy of Sciences and the Academy of Pedagogy) and media were instructed to intensify the anti-alcohol campaign. Second, new regulations restricted the hours that alcohol could be sold (only after 2:00 pm on workdays), the amount that one person could buy, and the places it could be consumed (not in public nor in the workplace). By 1986, the national

succeeded in significantly reducing spirits consumption (from around 3.5 in the early 1980s to below 2 litres of alcohol per capita after 1985). However, the campaign did not last. It was unpopular and costly and was stopped just before the collapse of the Soviet Union in 1990 (Bhattacharya et al., 2013; Tarschys, 1993).

With new leaders unwilling to intervene in a newly competitive political environment, spirits consumption in Russia soared again in the early 1990s. It took until the mid-1990s, with unprecedented levels of vodka consumption and per capita spirits consumption reaching 7 litres, before the Russian government intervened. A series of new alcohol regulations, which included a ban on advertising for spirits, were introduced. These regulations caused a strong reduction in spirits consumption, especially among young people. Deconinck and Swinnen (2011, 2015) document the dramatic shift in Russia "from vodka to Baltika" as there was a significant shift from spirits (vodka) consumption to beer (*Baltika*) after 1995. By 2014, per capita spirits consumption had nearly halved (to 3.8 litres of alcohol) and its share of total alcohol consumption had fallen to 46%. Consumer expenditures on spirits declined by more than 20% between 1995 and 2018 (see Figure 11). The shift from vodka to beer consumption was correlated with age, with younger people more likely to drink beer and less likely to drink vodka, which if these consumption patterns persist will have dynamic (long-term) effects on spirits consumption. Bhattacharya et al. (2013) show that the changes in spirits consumption had strong effects on health of the Russian population and mortality rates in Russia.

It is worth noting that despite this significant decline, with an average of 3.8 litres of alcohol consumed per person, spirits consumption in Russia remains among the highest in the world (see Figure 13). The same holds for Ukraine, another east European country and former Soviet state. Despite strong declines in spirits consumption since 2005, per capita consumption of spirits in Ukraine 2014 was estimated at 3.6 litres, close to Russia.

More generally, Figure 13 reveals that the highest per capita consumption levels are in East Asia (Japan, South Korea, Thailand) and in Eastern Europe (Bulgaria, Hungary, Russia, Ukraine) —all with more than 3 litres per capita, and some even with more than 4 (Japan, Korea and Bulgaria).

While spirits consumption has declined in Eastern Europe in recent decades, there seems to be room for further growth in Asia, also outside China and India. Apart from Japan (where the per capita consumption of spirits is already the highest in the world) spirits markets have demonstrated strong growth in Asian countries in the 2005-2015 period (see Table 3).

Trade in Spirits

Spirits are traded widely. As explained earlier, historically, spirits proved to be more suitable for long distance trade compared to beer or wine due to their higher alcohol content. FAO data reveal that nearly 28 billion dollars' worth of distilled spirits were exported around the world in 2016 (see Figure 14). While accounting for only 7% of the total volume of global exports of alcoholic beverages, spirits made up 27% of the value. This share has been relatively stable for the last two decades.

Exports of spirits are dominated by EU countries, which represent 18 billion or 66% of global exports in terms of value. Whiskies and Cognacs account for most of these EU spirits

temperance movement claimed to have 11 million members in 350,000 branches throughout the Soviet Union (Phillips, 2014).

exports (Spirits Europe, 2018). A quarter of global distilled spirits exports comes from the United Kingdom (see Figure 15). The second biggest exporters are France (17%) and Singapore (7%) respectively.

The United States is currently the biggest destination market for spirits. Yet, at the same time the country is also the fourth largest exporter. Other major importers of distilled spirits include China (7%) and Germany (6%).

Consumers' growing preferences for a wider diversity of spirits (more international and "exotic" spirits) seem to be reflected in trade patterns that are becoming more dispersed over time. For instance, the United Kingdom's share of the value of global exports of spirits was 50% in 1965 and has halved over the past 4 decades. More formally, Figure 16 shows that the Herfindahl index, a measure of concentration based on each country's share of the value of global exports of spirits, decreased considerably over time. This is likely related to the fact that niche local specialties are starting to reach beyond their respective domestic markets. An example of this '*local spirits going global*' trend is the exponential growth of agave-based spirits in recent years. This was the fastest growing category of spirits in 2017 (IWSR, 2018b) and seems to be reflected in a rapidly growing share of global spirits exports deriving from Mexico which already accounted for 5% of global exports in 2016.

7. The Industrial Structure of the Spirits Industry

The industrial organization of distilleries has changed considerably throughout history. In the middle ages, spirits production was concentrated in monasteries. In the 16th and 17th century, the spread of distillation techniques combined with a growing commercial market for spirits led to a proliferation of small distilleries. Intriguingly, by the 18th century, spirits were still essentially produced with the technology developed by the Greeks and improved by the Arabs, i.e. with the traditional "alembic (pot) still", where the fermented beverage is heated, the alcohol evaporated and then condensed through a tube into another vessel. At this point in time, distilling was still mostly a small-scale, often domestic, activity.

The Industrial Revolution changed this and transformed the spirits industry. A fundamental innovation was the introduction of a new technology, called "column distilling" (see Figure 17). Column distilling was patented in 1830 by Irishman Aeneas Coffey (1780–1852).[33] In column distilling, the alcohol-containing liquid is heated in a column made up of a series of vaporization chambers (Rothery, 1968). The new technology was more effective and allowed for distilling on a larger scale. From then onwards, the new technology stimulated spirits production to shift to large-scale factory production with continuous stills that could produce higher volumes at a lower cost compared to the traditional pot still (Forbes, 1947; Phillips, 2014: 217).[34]

[33] An important predecessor in Coffey's work was Jean-Baptiste Cellier-Blumenthal (1768–1840) who started development of process equipment (Kockmann, 2014).

[34] The technological change also had important gender implications. Before the Industrial Revolution much of the spirits were produced by women in small-scale distillation operations. Distilling was largely a domestic, small-scale activity and women were in charge of the household activities. However, with the new technology spirits production shifted from home-based hand manufacturing to large-scale factory production. During the 18th century "gin Craze" women were still prominent gin-sellers in Britain, with "*a quarter of licensed sellers and perhaps a third of unlicensed traders were women, and a disproportionate three-quarters of gin-sellers jailed in 1738–39 because they could not pay the £10 fine*" (Phillips, 2014: 217).

During the 20th century mass marketing, improved transportation networks and urbanization contributed to further consolidation (Kinstilick, 2011). This was reinforced by the fact that several countries put regulations in place that prohibited or constrained small-scale production in an attempt to control excess consumption of spirits.

The dramatic consolidation of the spirits industry in the United States is illustrated by Figure 18. While there existed around 6000 (legal) distilleries in the late 19th century, this number declined rapidly at the beginning of the 20th century. By 1916—before the Prohibition period (1919–1933)—there were only around 500 left. During Prohibition, there were no legal distilleries. After Prohibition, around 300 distilleries were active, a number that declined further to less than 100 by the end of the 20th century.

In recent decades, the spirits industry has experienced further consolidation across borders as a result of international mergers and acquisitions (M&As). Today, the global spirits market is much less concentrated than the global beer industry, but more concentrated than the global wine industry (Anderson et al., 2018). Small local spirits producers still account for the large majority of the market (81%) but two multinational companies have 15% of the global spirits markets (British *Diageo* with 10% and French *Pernod Ricard* with 5%)—see Figure 19.[35]

While these major spirits companies have their historic markets in OECD countries, they are increasingly focusing on emerging markets, and especially on Asia. The two main global spirits companies (Diageo and Pernod Ricard) actively sought to expand sales outside traditional spirits markets in high-income countries. Europe's share of Pernod Ricard's net sales fell from 43% in 2007 to 31% in 2017 (Pernod Ricard, 2008; 2018). The group benefited from its early presence in Asia, starting with the establishment Pernod Ricard Japan in 1988. By 2010 Pernod Ricard's subsidiaries already covered 13 major Asian markets, from the Gulf countries to Japan (Pernod Ricard, 2011).

Diageo has been slower to adjust. North America and Western Europe still accounted for 65% of its spirits volumes in 2011—compared to 47% for Pernod Ricard (Euromonitor, 2012). However, after a period of stagnating sales there, Diageo increased its presence in emerging markets through a series of acquisitions. In 2011, the company acquired the leading spirits producer and distributor in Turkey, Mey Icki. One year later, Diageo took control of Shui Jing Fang, a premium Chinese baijiu brand, Hanoi Liquor Joint Stock Company, the largest producer of branded spirits in Vietnam and became majority shareholder in India's leading spirits company, United Spirits Limited, in 2014 (Diageo, 2019). The company is also investing heavily in Africa, which—largely as a result of the rapidly increasing population at legal drinking age and rising incomes—is expected to become the next big growth region for the

[35] Diageo was formed in 1997 from the merger of Guinness and Grand Metropolitan. As a result of earlier acquisitions including the purchase of Heublein Inc, an American wine and spirits producer and distributor who owned the Smirnoff brand, Grand Metropolitan had already become the third largest wine and spirits producer in the world during the 1980s (US Department of Commerce, 1988). The merger with Guinness—whose spirits division includes the world's best-selling whiskey, Johnnie Walker, as well as Gordon's and Tanqueray gins—thus created the largest spirits company in the world (The Economist, 1997). In 2001, Diageo and Pernod Ricard bought and divided up Seagram's spirits and wine portfolio. For Pernod Ricard, the acquisition of 40% of Seagram's activity implied that the group doubled in size. With the acquisition of the British Allied Domecq in 2005, Pernod Ricard doubled in size once more and became the world's second largest spirits company. This position was reinforced with the acquisition of the Swedish group Vin & Sprit, owner of Absolut vodka, three years later (Pernod Ricard, 2019).

spirits industry (IWSR, 2018a). By 2018, Africa, Latin America and Asia Pacific accounted for 42% of net sales (Diageo, 2018).

8. Recent Developments: Premiumization, Craft and Terroir

Premiumisation

Although growth in the volume of consumption in mature spirits markets has halted, consumers in those markets do seem to spend more on higher-priced or premium spirits. Hence, despite declining volumes of consumption, "premiumisation" continues to fuel the growth of spirits sales in at least some of the traditionally spirits-focused countries.

This premiumisation trend can be observed from global data. Figure 20 summarizes the evolution of spirits consumption by price segment. At the global level, the volume of consumption of "standard" spirits (i.e., price per 75 cl bottle between $10 and $17) rose by only 1% per year between 2007 and 2017, the annual growth for "premium" (i.e., price per 75 cl bottle between $17 and $26) and "super-premium" (i.e., price per 75 cl bottle between $26 and $42) spirits was much higher: 2.6% and 3.3% respectively.

Interestingly, part of the premiumization appears to be due to a sort of "convergence in the consumption patterns of different types of spirits". That is, the dominance of traditional or local spirits tends to decline over time with consumers looking for more variety and more international drinks. In Russia, for example, consumers have moved away from vodka not just to beer but also to other spirits. Cognac and whisk(e)y are gaining terrain as they are viewed as more fashionable and more premium spirits. Similarly, in France, a disaffection for traditional local pastis and strong digestives such as Cognac, Armagnac, and Calvados has coincided with strong growth in the consumption and sales of rum, gin, and whiskey. In the US, the strongest growth in spirits sales between 2012 and 2017 was recorded for tequila (Euromonitor, 2018a, b, c).

The Growth of Craft Spirits

Following the consolidation trends, the spirits industry is currently experiencing a "craft" revolution. Craft spirits are becoming increasingly widespread across a range of more mature markets including North America and Western Europe. Gin, vodka and whiskies are the biggest categories within craft spirits, as well as local country-specific liqueurs. It is worth noting that although common elements involve restrictions on the quantity of production and independent ownership, there is no consensus on how to define craft spirits (Euromonitor, 2018d).

In the United States the number of active craft distilleries grew from 204 in 2011 to 1,835 in 2018 (see Figure 21).[36] Whereas their market share was only 0.8% of value in 2010, it reached 4.6% of value in 2017 (see Figure 22). Interestingly, the craft distilling market itself is rather concentrated with roughly 2% of the producers being responsible for almost 60% of the production volume in 2017 (ACSA, 2018). Investments in crafts spirits production in the US have more than tripled in the past years; from $189 million in 2014 to 593 million in 2017 (ACSA, 2018).

[36] The American Craft Spirits Association (ACSA) defines "active craft distillers" as licensed US distilled spirits producers, removed 750k proof gallons (or 394,317 9L cases) or less from bond, market themselves as craft, are not openly controlled by a large supplier, and have no proven violation of the ACSA Code of Ethics.

These trends are likely to be further amplified by recent tax reforms (i.e. Craft Beverage Modernization Act) resulting in a reduction in federal excise tax on distilled spirits for the first 100,000 gallons produced or imported annually. While of course beneficial for all producers, this tax cut will have the largest impact on smaller distillers.

The rise of craft distilleries has also been particularly strong in the United Kingdom and Australia. The evolution of the industrial organization of the UK spirits industry bares some similarities to that of the US. As previously seen, while in 1690, William of Orange adopted an act for encouraging the distilling of spirits from corn that allowed anyone to start producing spirits, the "Gin Craze" that followed resulted in the Gin Act of 1751 which outlawed distilleries using a still with a capacity below 18 hectolitres (Dillon, 2002). A milestone moment for the craft distilling movement was therefore the repeal of this regulation in 2009 (HMRC, 2018).[37] Afterwards, the number of distilleries soared. There were 116 registered distilleries in 2010, and 361 in 2018 (see Figure 23). Between 2016 and 2018, on average, two new distilleries were licensed every week (HRMC, 2019). Much of this growth is driven by gin production. The number of UK gin brands grew from around 40 to 95 between 2010 and 2017. A plausible explanation for the popularity of craft gin distilleries, is the spirit's relatively fast distillation time. However, similar rising trends can also be found in the number of Scotch and vodka distilleries and brands in the UK (WSTA, 2018a).

Australia also appears to be amid a craft spirits boom. Following a complete ban of all distillation activities, the Distillation Act from 1901 still prevented distilleries using a still with a capacity below 27 hectolitres to obtain a license. This law was overturned in Tasmania in 1989 and the first new licensed distillery since 1839 was set up in 1992 (The Australian Business Review, 2014). Soon after, other states followed. Today, approximately 195 craft distilleries are active in Australia and the government has committed to support this growing industry (Australian Distillery Directory, 2019). Since 2017, Australian craft distilleries can, for example, access a refund of excise paid. This measure extended the excise refund scheme that was already in place for craft brewers (Australian Government, 2017).

Similar trends in craft spirits production can be observed in several countries across the world. The resurgence of Irish Whiskey has, for example, spurred impressive growth in distilleries in Ireland where the number of whiskey distilleries grew from 4 to 20 in 2017 with at least 26 more are at planning or construction stage (ABFI, 2017). Craft spirits are also expected to gain momentum in South Africa, where 53 craft spirit producers were active in 2016, with another 47 in the pipeline (SACDI, 2016).[38]

Whereas the big brands' response to the craft beer movement was relatively slow, the large players in the spirits industry now try to avoid losing market share by actively investing in craft distilleries. There has already been a host of acquisitions of small craft distillers by leading multinationals. Diaego, for example, partnered with Distill Ventures that invests in

[37] It is worth noting that the procedure to obtain a license is still different and somewhat more demanding for distilleries using a still with a capacity below 18 hectoliters.

[38] Craft distilleries are defined here as "*a legally registered micro-manufacturing liquor producer with an annual production of less than 100,000 litre pure alcohol per year that does not have an integrated automated/computerised system in place to control production processes and is managed and operated by a craft distiller, with more than 25% ownership (each) of the distillery and is working from natural raw materials to produce more than 50% of its annual alcohol production*" (SACDI, 2019).

start-ups (Distill Ventures, 2019). Beam-Suntory then again acquired craft spirits brands such as Sipsmith (Beam Suntory, 2019).

At the same time, big brands are also adapting their marketing messages and diversifying their product offering to adjust to changing consumer preferences. Industrial producers are, for example, increasingly creating interesting stories around their brands and producing spirits with complex taste profile and more crafty-sounding names and appearances (Euromonitor, 2018d). Moreover, since a clear legal definition of "craft" as well as associated concepts is lacking in most countries, big brands often resort to marketing their (mass-produced) products as "craft" (Johnnie Walker), "handcrafted" (Jim Beam), "handmade" (Tito's vodka) and so on. While several class action lawsuits have been brought forward stating that this terminology is misleading the consumer, the rulings so far mostly been in favour of the big brands.[39]

Interestingly, craft distilleries have been accused of misleading consumers as well. One of the challenges of starting a distillery is that the product is often not immediately available for sale since several types of spirits require time to age. It has been argued that a lot of craft distilleries therefore rely on large "third-party distillers" for their base spirit. Craft whiskey distilleries in the US in particular, have come under scrutiny for their lack of transparency on the origins of their products (Hopkins, 2018; Olmsted, 2013).

Spirits and Terroir

Quality concerns and asymmetric information on alcohol have existed as long as products have been produced and traded. The addition of water to wine, the use of cheap starches to produce beer, and home production of cheap spirits have been documented throughout history and across the globe. Authorities and producer organizations have tried to limit these problems though regulations (Swinnen, 2016, 2017). Regulations that refer to "quality" often relate to certain inputs that can(not) be used. They also often refer to the "*terroir*", i.e. the location where production takes place, or the raw material has to be sourced from.

Not surprisingly, France, where Geographical Indications (GIs) are widespread in wine and food production (see Meloni and Swinnen, 2013, 2014), has introduced some of the *terroir* regulations also in the spirits sector. French regulations define several spirits by law and impose production and labelling rules. For example, "*Cognac*" and "*Armagnac*" brandies must be made in specific geographic regions and follow strict sets of production rules.

The Cognac and Armagnac regulations have their roots in the 18th century and were reinforced in the early 20th century. Cognac producers were protected by the 1713 edict that banned the production and exchange of distilled liquor fabricated from any base material other than wine (Mandelbatt, 2011). However, some wine merchants in Cognac used cheaper wines from the Midi or Spain as raw material, distilled and sold them as "spirits from Cognac". In 1791, in order to protect their profits and "quality" of the spirits produced, the large producers of Cognac decided to only buy (and distil) wines from the local provinces of Saintonge and d'Angoumois. The Cognac producers maintained this as a private standard and, in 1875, Cognac became "the largest vineyard in the world". Economic and political upheavals in the French wine markets in the late 19th and early 20th centuries led to the introduction of a series

[39] Beam Suntory successfully defended its "handmade" and "handcrafted" credentials for Jim Beam and Makers Mark Bourbon respectively and lawsuits against Tito's "Handmade" Vodka were dismissed (Carruthers, 2015; Hopkins, 2015).

of regulations in the French wine sector. It was the birth of the Geographical Indications system in France (a system that later expanded to the rest of Europe and the world)—see Meloni and Swinnen (2018). At the beginning of the 20th century, in 1909, along with "Bordeaux" and Champagne" also "Cognac" and "Armagnac" were protected as "Appellations of Origin" (*Appellations d'Origine*–AO) products (Enjalbet, 1953; Huetz de Lemps and Roudié, 1985). These regulations included the guaranteed sourcing of raw materials for Cognac and Armagnac from local producers and local distillation.

Such regulations have also been introduced by other countries for certain spirits. For example, strict regulations exist in Scotland (for Scotch), South Africa (for certain brandies), in the United States (for example for Tennessee whiskey) and in Mexico (Tequila). For instance, 'Scotch' is short for 'Scotch Whisky' and refers to whisky exclusively made in Scotland, subject to very strict regulations (as the type of grain used, the minimum aging in oak barrels, or minimum alcoholic strength…). In the United States, 'Bourbon' or 'Tennessee' are American whiskeys which also need to comply to certain regulations in order to be labelled 'Bourbon' or 'Tennessee'. In Mexico, Tequila is a distilled alcoholic beverage made from fermented juice of Mexican agave plants. Therefore, like 'Cognac', 'Tequila' only comes from certain regions of Mexico, and exclusively uses Blue Agave plants; all others are labelled 'Mezcal' and produced with other agave plants grown in other regions in Mexico (e.g., the Oaxaca region).[40]

There are also interesting regulations related to rum production. While rum was first produced from molasses as residues from sugar production from sugar cane, molasses can also result from sugar beet processing and these can also be used for rum production. This was the case in several countries which did not have sugar cane but produce sugar beet, such as several continental European countries. However, over time regulations have been introduced to prohibit this and to only recognize "rum" as a product which uses molasses from sugar cane.

9. **Summary and Conclusions**

This paper is the first to analyse the global development of spirits technology, its markets and the industry. Around 50% of total alcohol intake in the world is consumed in the form of spirits, high-alcohol beverages whose alcohol content has been increased by distillation. This includes products such as vodka, rum, tequila, cognac, whisk(e)y, baijiu etc. These different "spirits" are produced from different raw materials, such as wine and grapes (brandy and grappa), grains (gin and baijiu), potatoes (vodka), sugar or molasses (rum), etc.

The production of spirits started later in history than beer and wine because the technology to produce spirits is more complex. The production process involves distillation and cooling technologies. Anthropological studies document distillation in China, the East Indies, the ancient Greek and Egyptian empires more than 2,000 years ago. However, it took

[40] Rum produced with the distillation of molasses from "sugar beet" was produced in, for example, the Czech Republic, France, Germany and Slovakia. For instance, in the second half of the 19th century, France and Germany were producing rum from the molasses of the beet-root sugar factories. However, EU regulations no longer allow this. Since they joined the EU in 2004, the Czech Republic and Slovakia have not been able to export and sell the rum made from sugar cane as "rum". They had to comply with stricter EU regulation which stipulates that only sugar cane-derived spirits can be labelled as "rum". For instance, "Tuzemský rum" (meaning "domestic rum"), a traditional Czech rum produced from the distillation of sugar beet or potatoes, can now only be sold under other names as "Tuzemák" or "Tuzemský" (and not "Tuzemský rum") (Williams, 2005).

innovations by the Arabs to produce alcoholic spirits as we know them today. In Europe spirits production was limited until the 8th century when contact with the Arabs improved knowledge of distillation and the spread of more advanced technologies.

Spirits were initially produced for other purposes than as a regular drink. Distillation was used to search for better perfumes, for cheaper ways to produce gold, and for eternal life ("*aqua vitae*"). In the Middle Ages, spirits were used mostly for medical purposes. Only from the 15th and 16th centuries onwards was distillation increasingly used to produce drinks such as brandy, whiskey, gin, vodka, etc.

The growth in spirits production and consumption accompanied European conquests across the world. Spirits were more suitable for long ocean voyages than wine or beer because their high alcohol content meant they took up less space, did not spoil as fast, and leftovers could be sold at the destination. Soon new spirits, in particular rum, were also produced in the colonies and exported throughout the, especially British, colonial empires.

The Industrial Revolution transformed the production and consumption of spirits. Technological innovations and the associated scale economies in production reduced spirits' prices. Scale economies in production and, later in marketing, contributed to significant consolidation in some of the spirits industries in the 20th century.

The Industrial Revolution also stimulated demand in growing urban areas among industrial workers. The combination of lower prices and growing demand contributed to widespread alcoholism and associated health and social problems. Growing alcohol-related problems in industrial areas and the potential for raising tax revenue led to a series of regulations on spirits and consumption tax increases from the 18th century onwards. Some countries prohibited the sales and consumption of spirits.

Still, over time global consumption of spirits has increased and spirits are now dominating global alcohol markets. Over the past 50 years, the share of spirits in global alcohol consumption increased from around 30% to around 50%. In the past decades, there was strong growth in emerging markets, including in China and India. At the same time consumption has stagnated in mature markets in terms of volume. Growth in these markets has taken the form of higher priced and specialty spirits. In the 21st century, craft spirits are also gaining in importance, especially in high income markets.

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Tables and Figures

Table 1: Types of spirits, their raw material and "country of origin"

	Raw Material	**Country of Origin**
Baijiu	Grains (sorghum or rice)	China
Brandy	Wine or grapes	France, Low Countries*
Calvados	Apples	France
Gin	Grains and juniper berries	England
Grappa	Grapes	Italy
Jenever/Genever	Grains	Low Countries*
Ouzo, Pastis, …[1]	Grapes or grains and aniseed	Southern Europe (Greece, France, …)
Rakija	Fruit (plums, apples, apricots, pears, …)	Balkan
Rum	Sugar(cane) and molasses	Caribbean
Tequila	Agave	Mexico
Vodka	Potatoes and grains	Russia, Poland
Whisk(e)y [2]	Grains	Scotland, US

Sources: Phillips (2014); Thomas and Shipman (2016); The Editors of Encyclopaedia Britannica (2007; 2019a; 2019b).

* Today's Belgium and the Netherlands.

[1] Similar anis-based spirits include oghi (from Armenia), mastika from Bulgaria and North Macedonia, rakı from Turkey, pastis (France), and arak (from the Levant). Its aniseed flavour is also similar to the anise-flavoured liqueurs of sambuca (Italy) and anís (Spain) and the stronger spirits of absinthe (France and Switzerland). Aguardiente (Colombia), made from sugar cane, is also similar.

[2] 'Whiskey' in e.g. the US and Ireland, 'Whisky' in e.g. Scotland and Japan.

Table 2: Spirits consumption per capita since 1890 in Western countries

	France	Italy	Bel-Lux	Denmark	Germany	Netherlands	Switzerland	UK	Australia	US
1890	4.3	0.7	4.6	6.8	4.7			2.6	2.6	2.7
1900	4.6	0.6	4.7	6.8	4.4	4.1	2	2.9	2.1	2.5
1910	3.5	0.7	2.6	5.7	2.8	2.6	2.6	1.5	1.4	2.7
1920	2.5	0.7	0.9	2	1.3	1.1	0.9	0.8	0.7	
1929	2.6	0.6	1.3	2	1.2		1	0.8	0.7	
1940									0.4	
1950	2.7			1.4		2.6		0.5	0.7	2
1961	2.2	1.2	0.8	0.7	2.1	1.2	1.6	0.8	0.8	2.3
1970	2.3	1.8	1.4	1.3	3.0	2.0	2.0	0.9	1.1	3.0
1980	2.3	1.9	2.4	1.5	3.0	2.7	2.0	1.8	1.1	3.0
1990	2.3	1.0	1.2	1.3	2.2	2.0	1.8	1.8	0.9	2.3
2000	2.2	0.9	0.9	1.1	2.2	1.7	1.6	1.6	1.6	1.9
2010	2.2	0.7	1.3	1.2	1.8	1.3	1.5	1.9	1.0	2.2

Source: Anderson and Pinilla (2017)

Table 3: Share of spirits in total alcohol consumption since 1890 in Western countries

	France	Italy	Bel-Lux	Denmark	Germany	Netherlands	Switzerland	UK	Australia	US
1890	26.6	6.2	35.5		45.6			29.4	43.7	48.5
1900	21.2	4.7	31.3	61.2	40.9	72.1	12.0	30.2	42.1	45.5
1910	17.2	6.5	18.8	58.5	34.2	65.8	21.5	21.3	33.5	41.2
1920	12.5	4.2	9.7	34.7	30.7	53.3	10.9	14.5	17.0	
1929	11.2	4.3	11.0	42.5			10.7	17.9	18.4	
1940									11.6	
1950	14.4							11.3	12.3	39.2
1961	11.3	8.3	9.3	15.1	24.5	42.6	15.7	14.6	13.9	43.2
1970	14.1	12.1	13.1	17.3	25.1	37.1	17.9	14.7	12.3	45.0
1980	15.9	14.6	19.7	16.3	22.7	30.8	18.2	20.9	10.9	37.9
1990	18.5	10.9	11.5	13.3	17.9	24.4	17.0	22.5	10.5	31.8
2000	20.3	11.0	8.9	12.1	19.9	20.5	17.4	19.7	19.5	29.5
2010	23.5	12.1	13.9	14.1	18.6	16.9	17.9	22.6	13.3	32.8

Source: Anderson and Pinilla (2017)

Table 4: Market shares and growth in main spirits markets 2005-2015

	Value			**Volume**			**Cons. p.c.**
	Market share (%)		*Growth (%)*	*Market share (%)*		*Growth (%)*	*lal*
	2005	2015	Avg. ann.	2005	2015	Avg. ann.	2014
China	15.5	27.8	16.0	20.1	26.2	5.4	1.9
US	14.3	14.5	4.7	8.1	8.9	3.1	2.5
India	4.7	6.5	10.3	6.4	12.0	12.2	0.8
Japan	7.5	4.7	-1.0	6.4	4.8	-1.2	4.5
France	5.0	3.9	1.4	2.0	1.8	0.6	2.0
Germany	5.6	3.7	-0.5	2.7	2.2	-0.5	1.8
UK	4.9	3.6	0.7	1.6	1.5	0.8	1.7
Russia	4.5	3.0	-0.4	11.7	6.1	-3.8	3.8
Brazil	2.6	2.5	4.0	8.0	4.9	-2.6	1.8
South			1.1				4.2
Korea	2.9	2.2		6.0	6.5	2.7	
Spain	4.2	1.9	-3.6	1.6	0.9	-3.0	2.3
Mexico	2	1.8	3.3	1.2	1.2	2.0	0.8
Italy	3.5	1.8	-2.5	0.9	0.6	-2.2	0.7
Canada	1.8	1.6	3.7	0.8	0.7	1.5	1.7
Poland	1.3	1.2	3.6	1.4	1.6	2.9	
Thailand	1.0	1.2	6.8	3.7	3.5	1.4	3.9
Australia	0.9	0.9	4.8	0.3	0.3	2.5	1.0
Philippines	0.3	0.4	13.8	2.4	3	5.3	2.3
Ukraine	0.7	0.3	-3.5	2.3	1.1	-4.7	3.6

Source: Holmes and Anderson (2017)

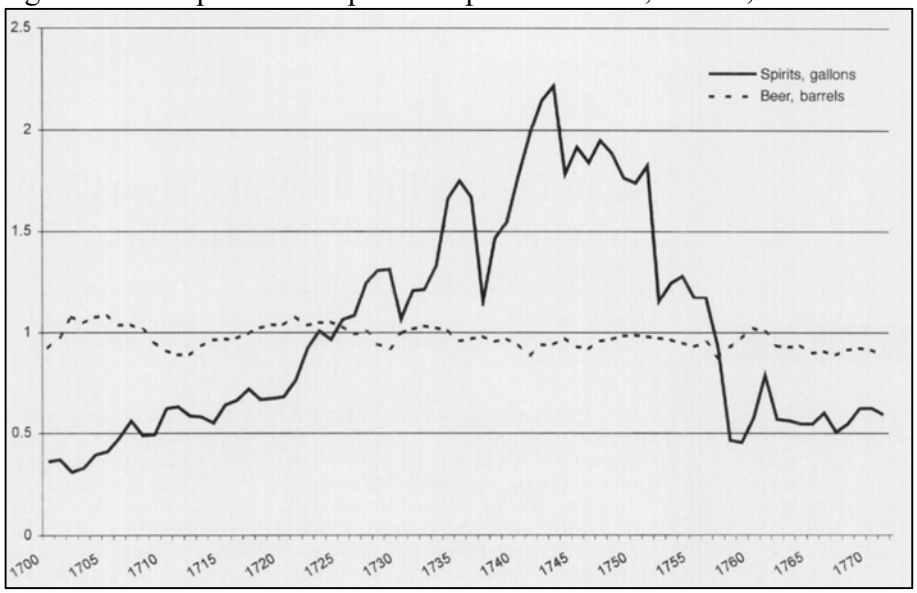
Figure 1: Early distilling technology: the alembic (pot) distillation

Source: British Library (2017)

Figure 2: Modern pot distillation

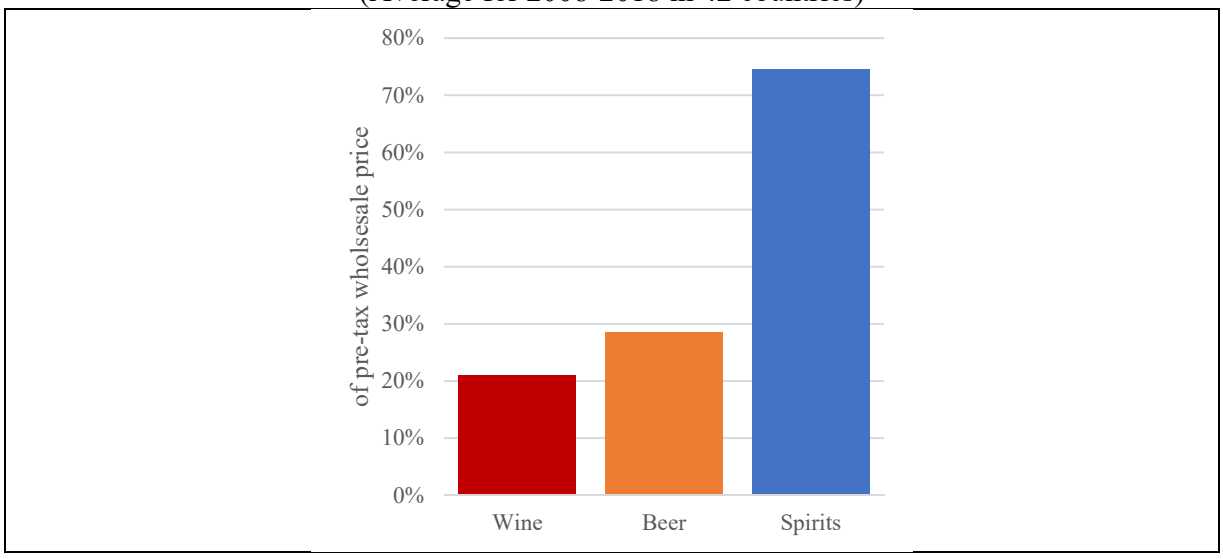
Source: Wikipedia "Pot Still" (2004)

Figure 3: Per capita consumption of spirits and beer, Britain, 1700—1771



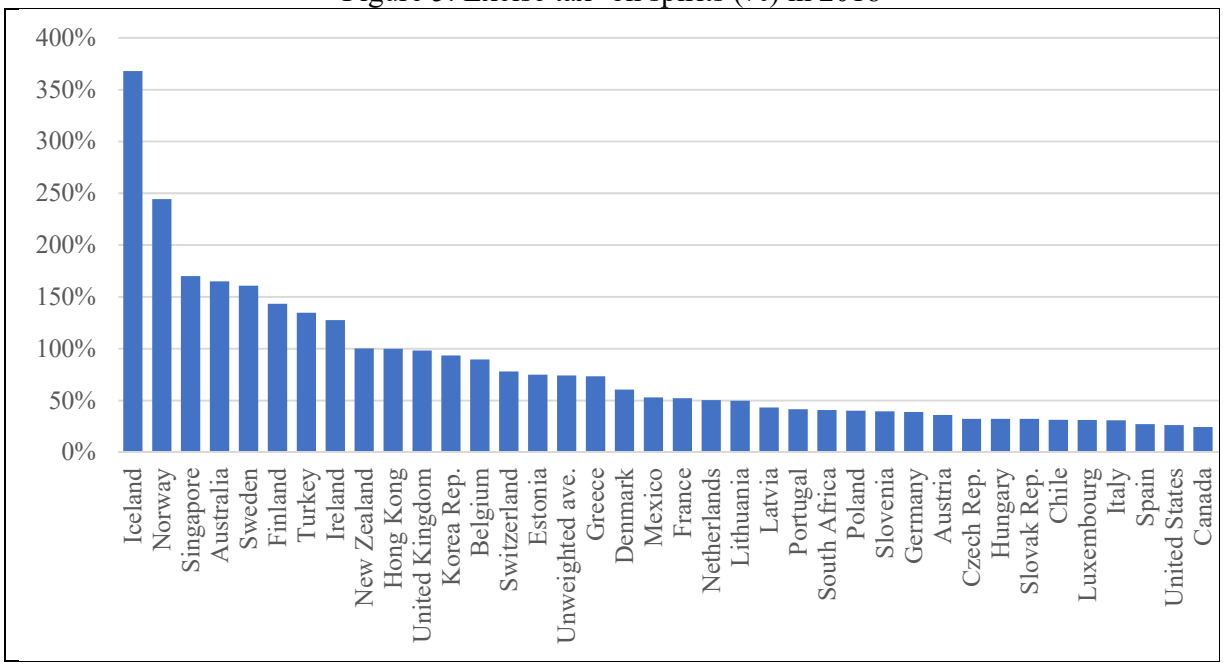
Source: Warner et al. (2001)

Figure 4: Excise taxes on wine, beer and spirits
(Average for 2008-2018 in 42 countries)



Source: Anderson (2019)

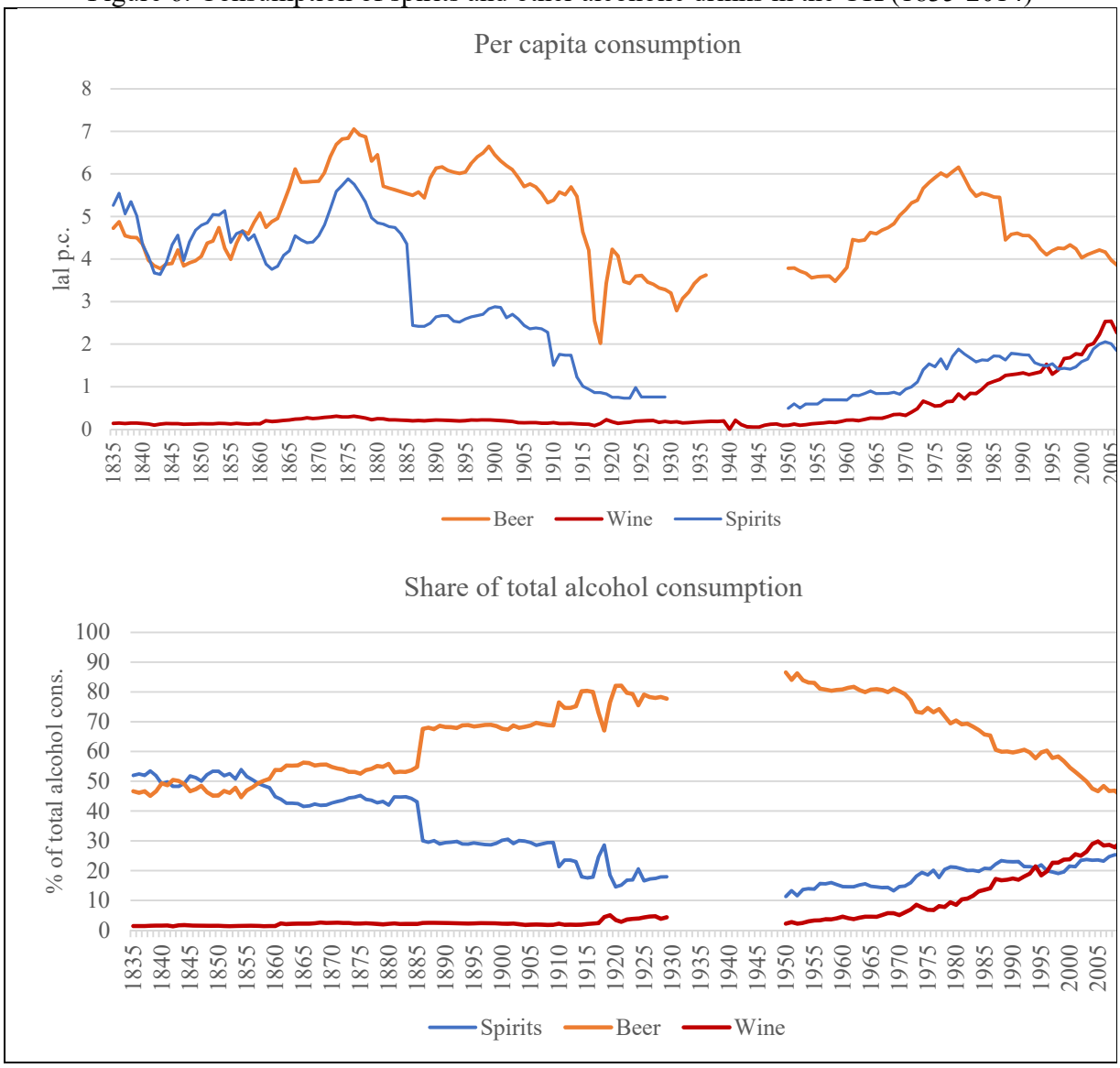
Figure 5: Excise tax* on spirits (%) in 2018



Source: Anderson (2019)

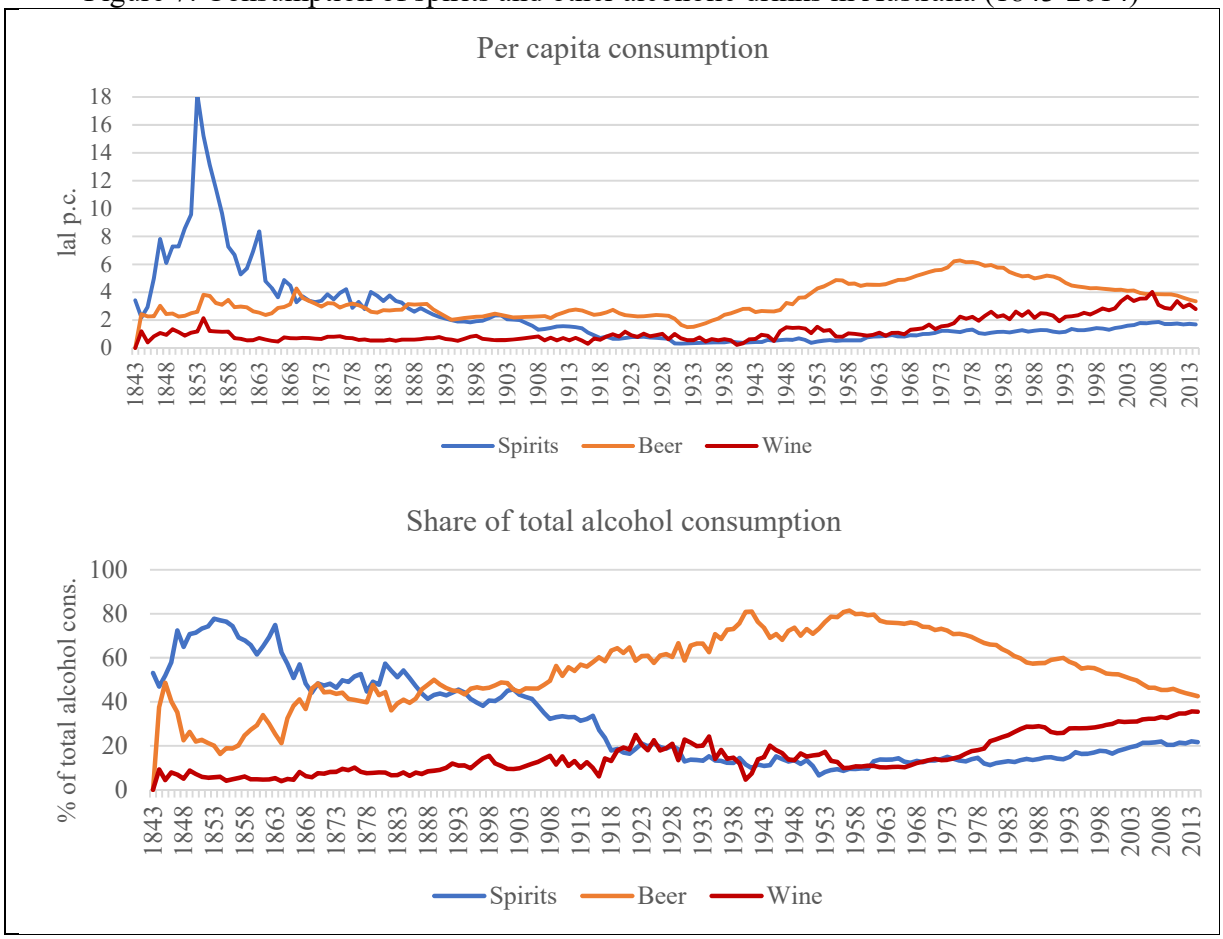
* Ad valorem consumer tax equivalent of excise taxes on spirits (wholesale pre-tax price = $15/liter)

Figure 6: Consumption of spirits and other alcoholic drinks in the UK (1835-2014)



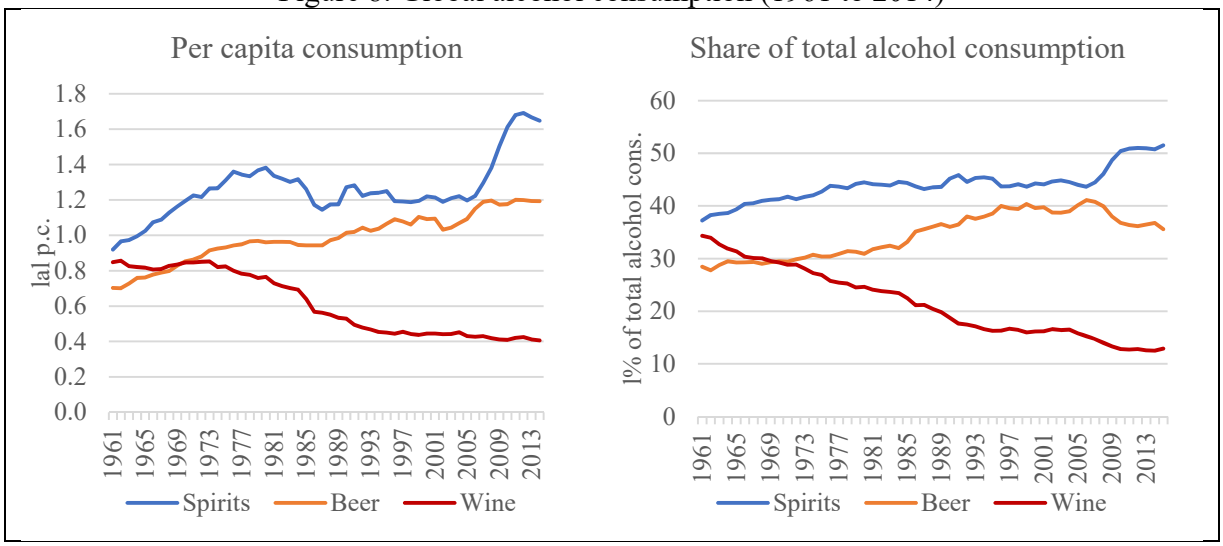
Source: Anderson and Pinilla (2017)

Figure 7: Consumption of spirits and other alcoholic drinks in Australia (1843-2014)



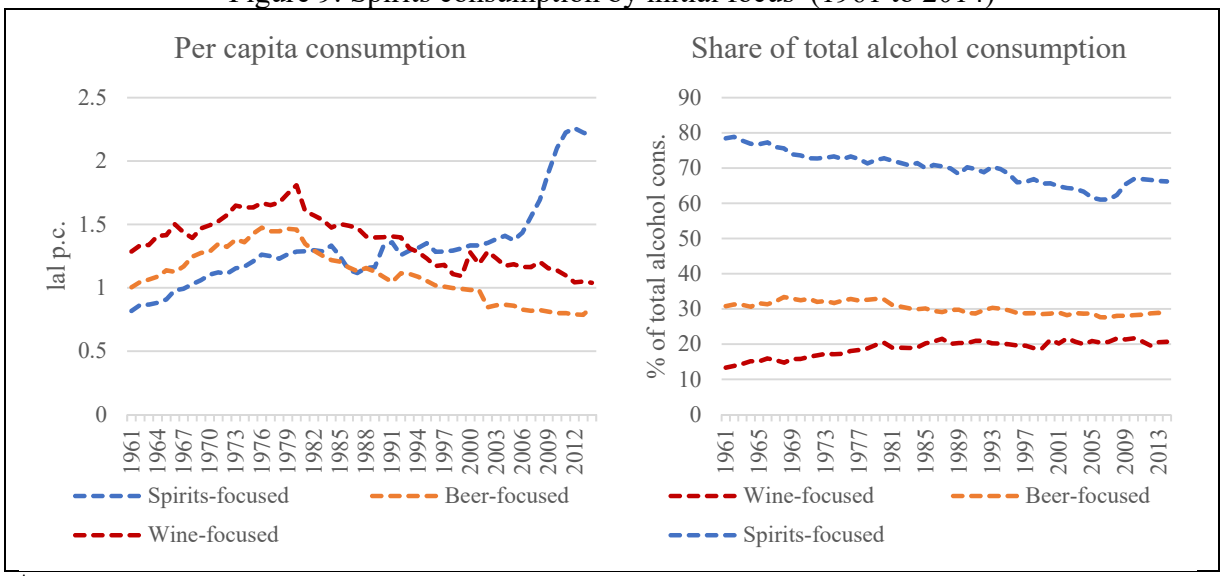
Source: Anderson and Pinilla (2017)

Figure 8: Global alcohol consumption (1961 to 2014)



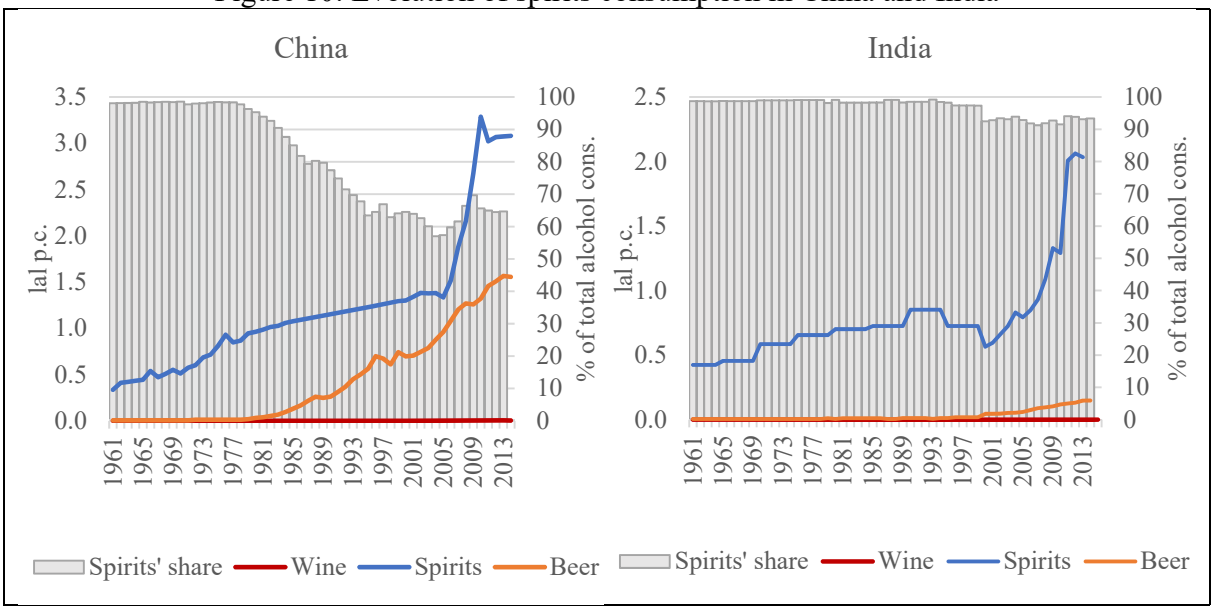
Source: Anderson and Pinilla (2017)

Figure 9: Spirits consumption by initial focus* (1961 to 2014)



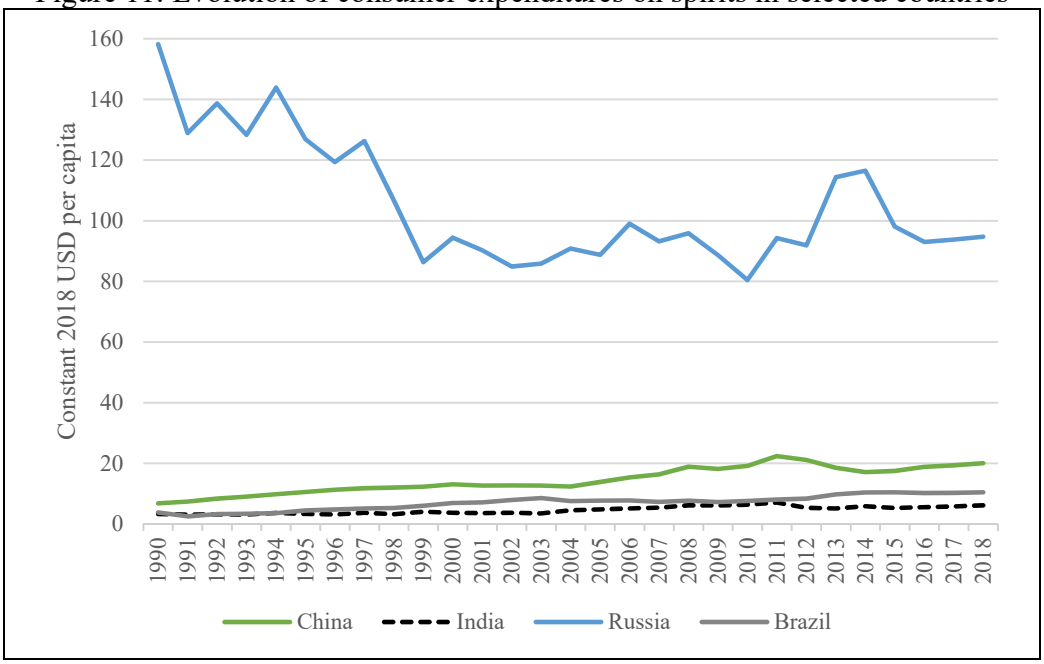
* The categorization is based on which of the three beverages had the highest share of the volume of alcohol consumption in 1961–1964.
Source: Anderson and Pinilla (2017)

Figure 10: Evolution of spirits consumption in China and India



Source: Anderson and Pinilla (2017)

Figure 11: Evolution of consumer expenditures on spirits in selected countries

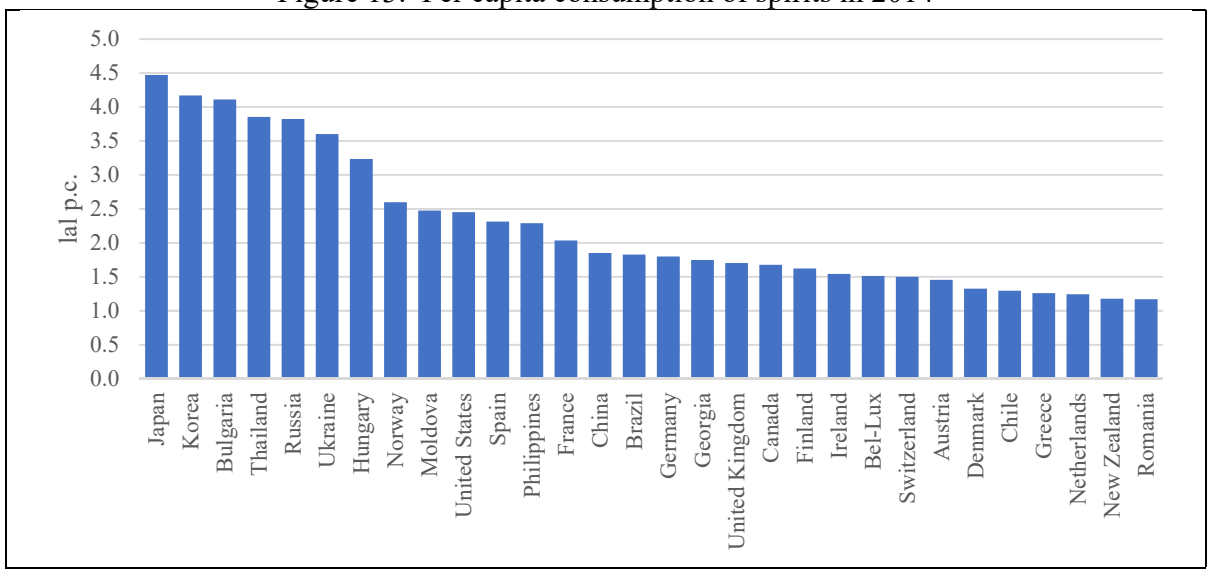


Source: Euromonitor (2019)

Figure 12: Evolution of spirits consumption in Russia

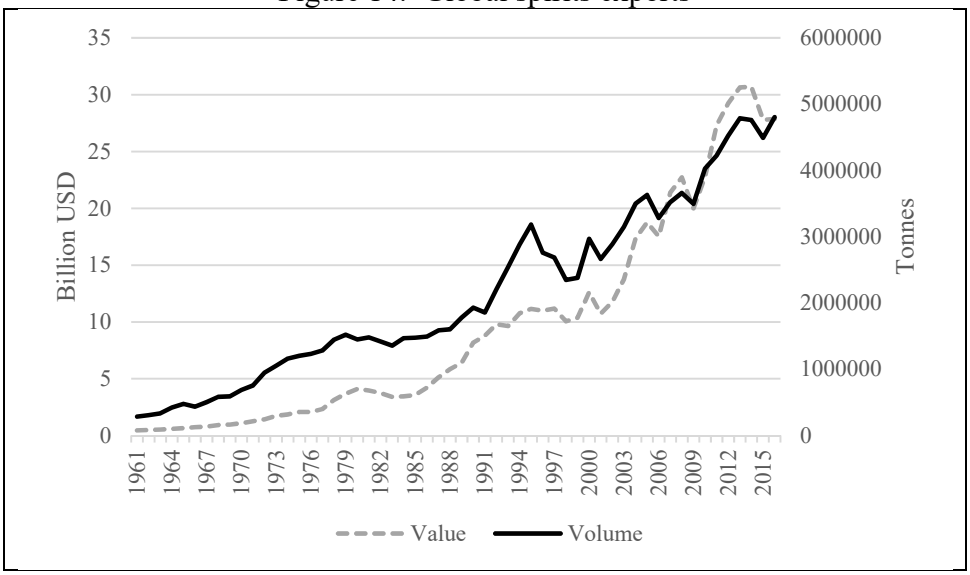
Source: Anderson and Pinilla (2017)

Figure 13: Per capita consumption of spirits in 2014



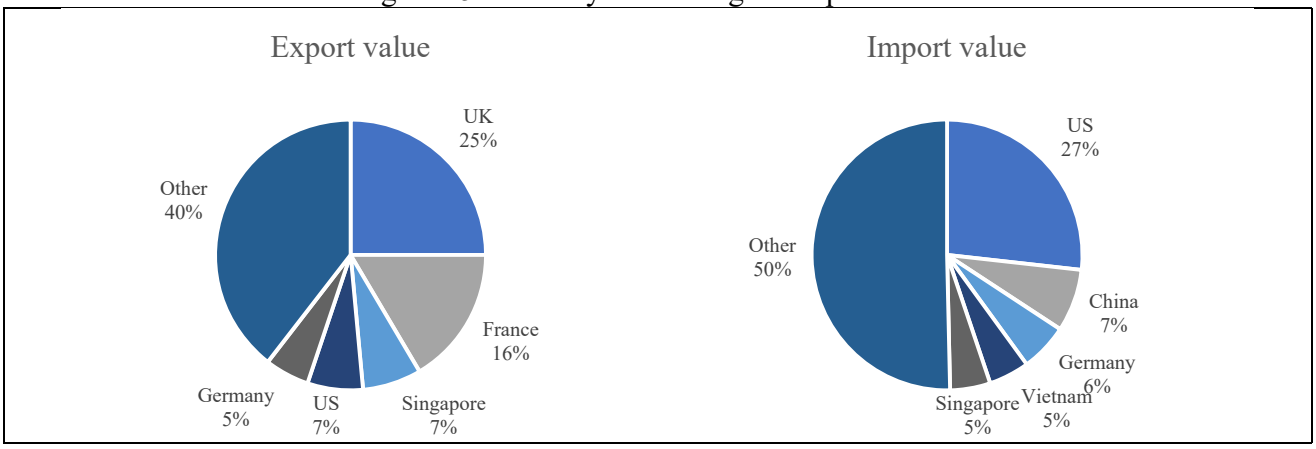
Source: Anderson and Pinilla (2017)

Figure 14: Global spirits exports



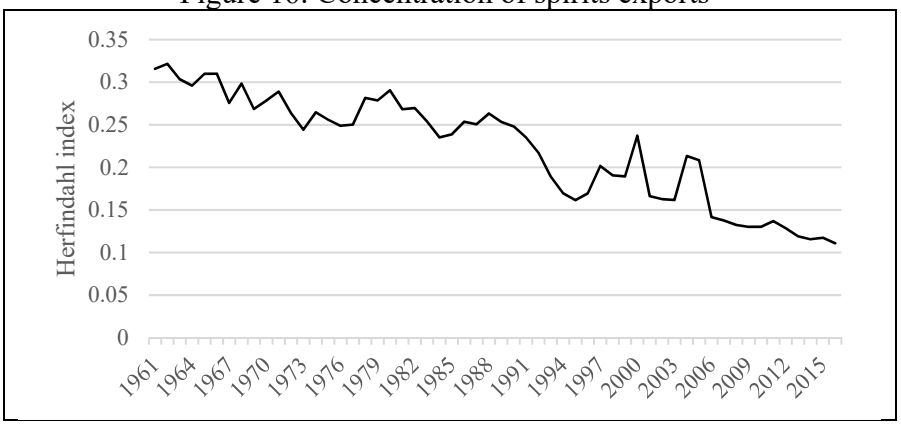
Source: Faostat (2018)

Figure 15: Country shares of global spirits trade



Source: Author's calculations based on Faostat (2018)

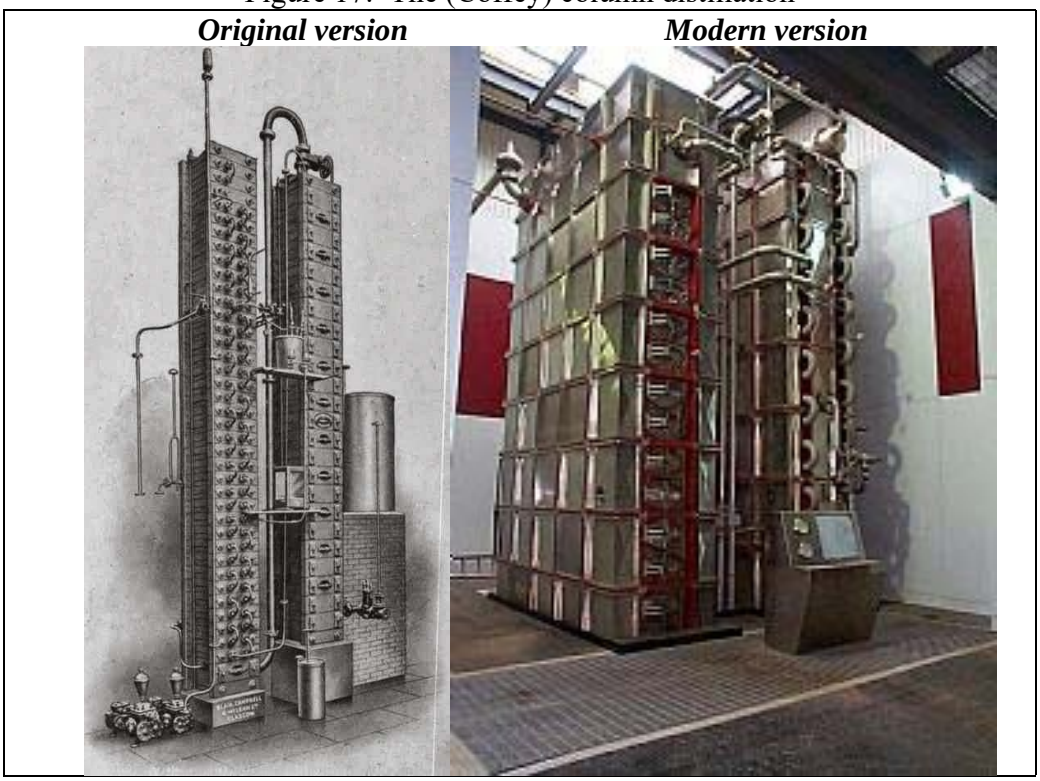
Figure 16: Concentration of spirits exports*



Source: Author's calculations based on Faostat (2018)

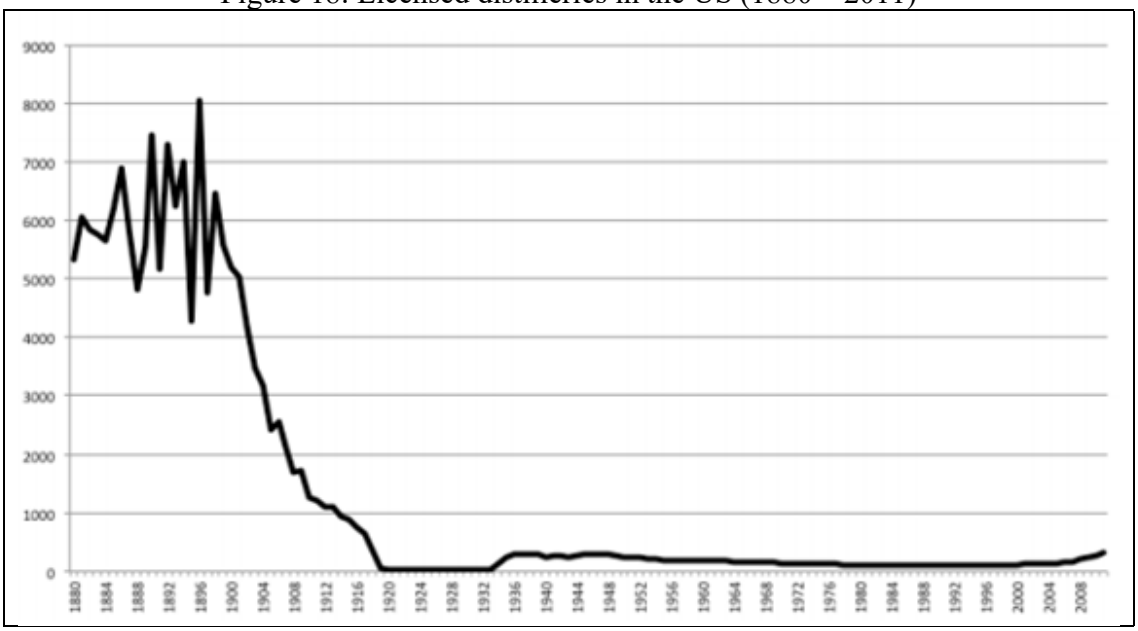
*The Herfindahl Index is calculated as the sum of the squares of each country's share in the value of global exports of distilled spirits.

Figure 17: The (Coffey) column distillation



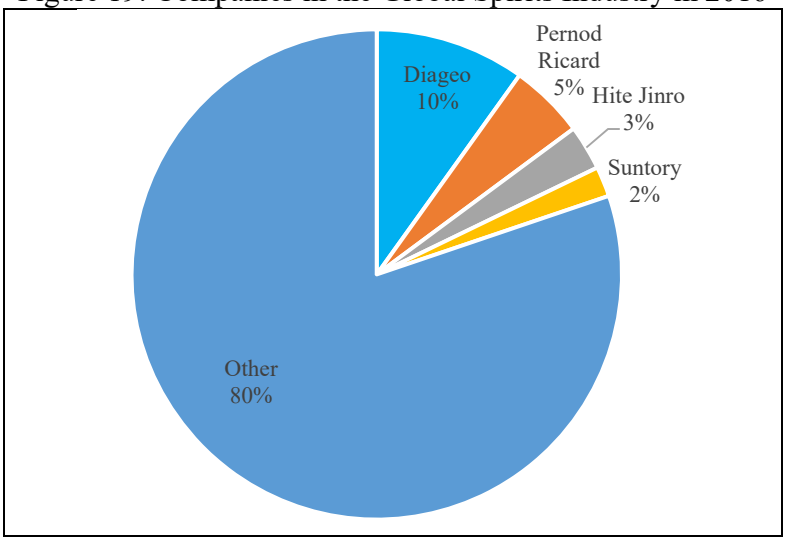
Source: http://whiskyscience.blogspot.com/2013/08/history-of-column-still.html

Figure 18: Licensed distilleries in the US (1880 – 2011)



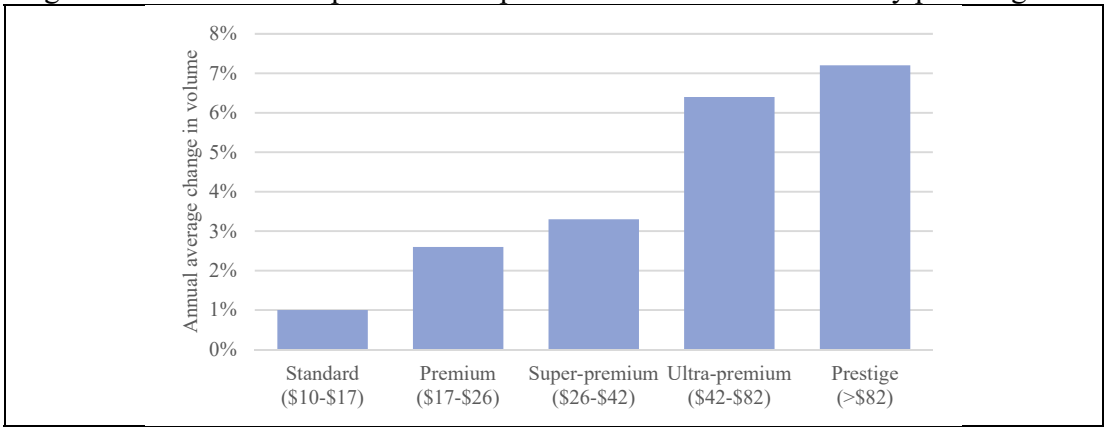
Source: Kinstlick (2011)

Figure 19: Companies in the Global Spirits Industry in 2016



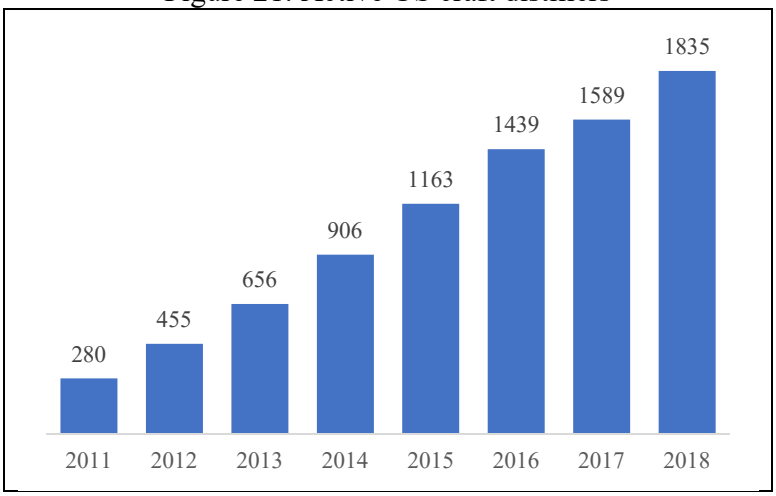
Source: IAS (2018)

Figure 20: Evolution of spirits consumption between 2007 and 2017 by price segment



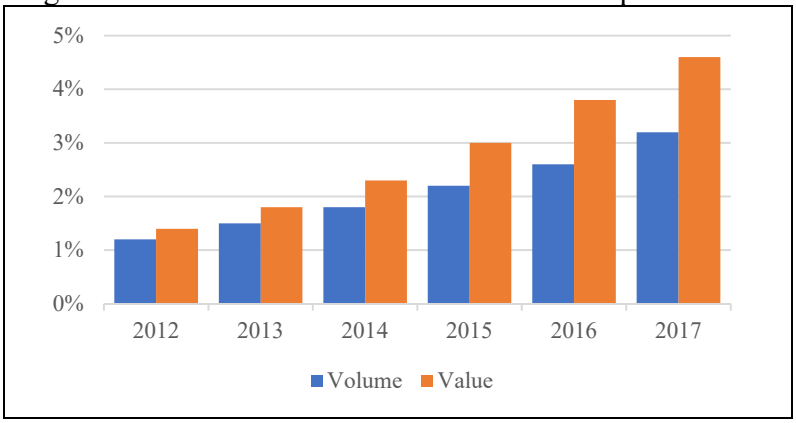
Source: The Pernod Ricard Market View, based on IWSR data at year-end 2017.

Figure 21: Active US craft distillers



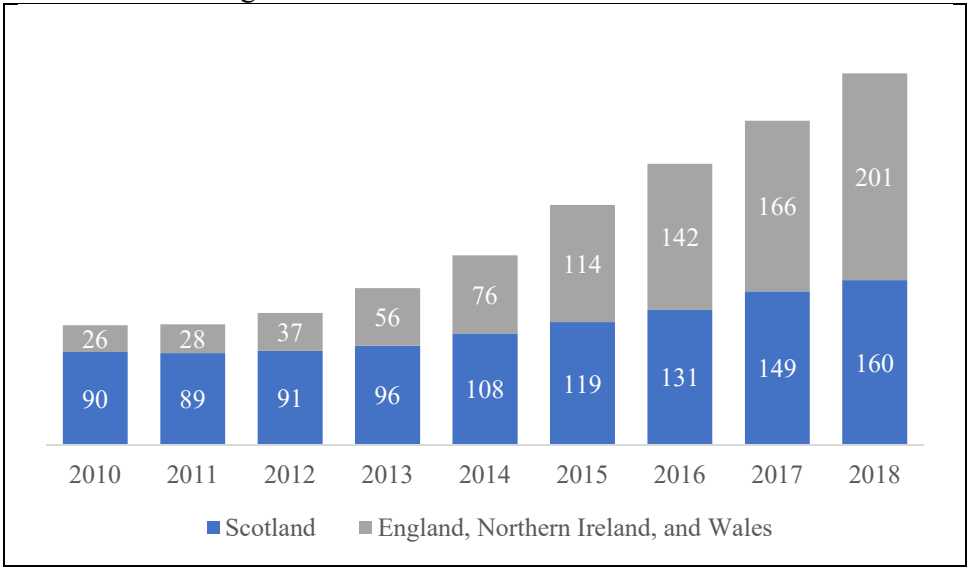
Source: ACSA (2018)

Figure 22: Craft distiller sales as a share of US spirits market



Source: ACSA (2018)

Figure 23: Number of distilleries in the UK



Source: WSTA (2014; 2016; 2017; 2019)