

# Tracing and tracking wine bottles: Protecting consumers and producers

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**Abstract.** The effective tracking and tracing of wine bottles is critical to ensure consumers are receiving high quality wine from the place of origin that is stated on the label and produced from grapes grown in that place.

Wine production and its supply chain are controlled by different laws around the globe. From the International Organization of Vine and Wine (OIV) to the European Union (EU) and other national governments, suppliers and producers are required to provide specific documentation as the wines make their way to consumers.

However, the wine industry loses billions from counterfeit wine and illicit trade. That is why the improvement of the methods applied to verify the origin and the quality of wines is important to protect wine consumers and producers.

This short presentation explores what members of the Wine Origins Alliance (WOA) are doing within their respected regions to effectively trace and track their wine bottles along the entire value chain, with intelligent labeling and data recording through effective technology. Specifically, WOA provides case studies from its members that give an overview of the methods they have implemented (or are working to implement) to ensure consumers know the true origins of the wine. Their commitment to quality, traceability, and transparency are the very reasons why these regions are considered among the most renowned across the globe.

Below are a few examples of the case studies that will be presented.

- *Chianti Classico*. All the wines can be traced from the vineyard to the bottle as the entire production is monitored and recorded. Each bottle must be adorned with a government-issued label on the bottle neck, which contains an alphanumeric code that consumers can use to access the wine's official chemical analysis and quantity bottled on the open database located on the Chianti Classico website.
- *Champagne*. The General Syndicate of Winegrowers in Champagne (SGV) contracted with Advanced Track & Trace to supply the CLOE caps, which feature a unique serialized code and hologram. A QR code customized to the Champagne grower's visual identity, which appears on the exterior of the cap, offers customers "access to each bottle's unique information, concealed on the inside of the cap. That includes a serial number, signature, message and illustration of the brand, as well as the ability to check the bottle's origin."
- *Rioja*. All wine bottles produced in the region are required to include numbered seals for specific zones or municipalities. But, in the Rioja Alta zone, producers have been using artificial vision to photograph each bottle, scanning the code and marking it on the bottle with ultraviolet (UV) link and integrating it into each winery's computer systems, allowing wineries "to identify and monitor each and every bottle individually, from the moment the wine is labelled until it is delivered to every client, distributor or importer anywhere in the world."

## 1 Introduction

In recent years, digital transformation has gained importance in the agri-food sector in production and supply chain applications. Food and beverages tracking and tracing is one such trend where digital technology allows end-to-end visibility and tracking and tracing products through their lifecycle [1].

One of the drivers of this trend is a growing worldwide issue of counterfeit products and brands [2] and the wine industry is not an exception. According to the World Trade Organization (WTO, 2020), counterfeiting is characterized as the misrepresentation of the identity or the source of products to deceive the purchaser into believing that he/she is buying the original goods.

Wine is a beverage that has been enjoyed by people for centuries, and it is a product that is produced all over the world. While wine can be a source of enjoyment and pleasure, it is also a product that can be counterfeited, adulterated, or tampered with. This poses a significant risk to both consumers and producers, as well as to the reputation of the wine industry as a whole. As a result, there has been an increasing interest in recent years in developing ways to trace and track wine bottles, with the aim of protecting both consumers, producers and the wine region reputation. Thus, the effective tracking and tracing of wine bottles is critical to ensure consumers are receiving high quality wine from the place of origin that is stated on the label and produced from grapes grown in that place.

Albeit impossible to quantify illicit wine trade with precision for evident reason, the analysis of the wine market worldwide evaluates that the share of counterfeit market in wine industry falls in range of 0.2% to 1% in volume, and some estimates go as high as 4-5% [3&4]. The issue is particularly problematic in some Asian countries where counterfeit is sometime considered as art. It explains partly why the market share of counterfeit wines is so important in some countries, estimated at 20% market shares in countries where wine is also a symbol of social status. Thus, albeit never proven, it has been reported that there would be more fake than genuine Bordeaux in China.

Tracing and tracking wine bottles involve the use of technologies and techniques that enable the identification of individual bottles and the tracking of their movements from the winery to the consumer. This can include the use of RFID (Radio Frequency Identification) tags, QR codes, and other types of labels or markings that allow the bottle to be identified and tracked throughout the supply chain. Additionally, tracing and tracking can involve the use of blockchain technology, which creates a decentralized, immutable record of each bottle's movement and history.

One of the primary reasons for tracing and tracking wine bottles is to protect consumers from the risks associated with counterfeit or adulterated wine. Counterfeit wine is a significant problem in the wine industry, as it can be difficult for consumers to distinguish between genuine and fake bottles. Tracing and tracking wine bottles can also help to protect producers from the risks associated with counterfeiting and tampering. If a producer is able to track the movement of their bottles throughout the supply chain, they can identify any points where the bottles may have been tampered with or diverted. This can help to prevent losses due to theft or damage, as well as ensure that the wine arrives at its intended destination in the condition that the producer intended.

Last but surely not least, at the regional level, tracing and tracking contribute to safeguard and enhance the conformity of the wines with its place of origin, the environmental and production characteristics stipulated in the production regulations of the selected region. It does contribute to build trust and transparency in the wine industry. By providing consumers with access to information about the provenance and authenticity of each bottle, producers can help to build a more informed and engaged customer base.

This paper is a technical paper. It explores what members of the Wine Origins Alliance (WOA) are doing within their respected regions to effectively trace and track their wine bottles along the entire value chain, with intelligent labeling and data recording through effective technology. Specifically, WOA provides case studies from its members that give an overview of the methods they are implementing. This article will cover some of the literature on counterfeit wines, including the types of fraud and some technical solution implemented in the Champagne, Chianti and Rioja regions. Their engagement for traceability and

transparency provide an illustration on how these regions are committed to quality and respect for their customers. In return, year after year, as part of their commitment for quality and integrity, they benefit from a world class reputation.

## 2 Literature review

### 2.1 Tracking and tracing wine bottles

About traceability, the most internationally recognized definition defines it as the "ability to trace the history, application or location of an entity by means of recorded identifications" (ISO 8402). There are however other definitions, such as the one contained in the General Food Law - Council Regulation (EC) No. 178/2002 and the one established by the Codex Alimentarius Commission.

More specifically, tracing and tracking wine bottles is a recent area of research with important implications for the wine industry. While there is still much to be learned about the best ways to implement tracing and tracking technologies, several academic contributions have already made a significant impact in this area. One key contribution has been the development of RFID (Radio Frequency Identification) tags, which are small devices that can be attached to individual wine bottles to allow them to be identified and tracked throughout the supply chain. RFID tags have been shown to be effective in preventing counterfeiting and tampering, as they provide a unique identifier for each bottle that can be used to verify its authenticity. Additionally, RFID tags can help to improve the efficiency of the supply chain [5] by enabling producers to track the movement of their bottles and identify any bottlenecks or inefficiencies.

From a technical viewpoint, another important contribution has been the development of blockchain technology for tracking wine bottles. Blockchain is a decentralized, immutable ledger that can be used to record the movement of each bottle throughout the supply chain. By creating a transparent [6] tamper-proof record of each bottle's history, blockchain can help to build trust and transparency in the wine industry, as consumers can access information about the provenance and authenticity of each bottle.

As for other food related industries, one of the important challenges faced by product manufacturing and distribution companies in the wine industry is the effective traceability of products along the supply chain [7]. This challenge creates a complex issue in which multiple criteria and limitations must be simultaneously considered, as well as potentially some particular requirements according to the wine region [8]. According to the wine supply chain guidelines ([www.gs1.org](http://www.gs1.org)), the wine supply chain has always been complex and fragmented and with more distant suppliers and ever-more demanding customers. Consequently, the unique characteristics of this supply chain bring challenges to implementing an effective

traceability system. Today, where the demand for products and the challenges faced by companies involved in product supply chains are clearly more intense, the use of advanced systems for effective product traceability becomes a necessity.

On the marketing side, there have been important contributions in the area of consumer behavior and decision-making related to traced and tracked wine bottles. For example, researchers have investigated how consumers perceive the value of traced and tracked wine [9], and how this perception is influenced by factors such as brand reputation, price, and information transparency. Understanding these factors can help producers to develop marketing strategies that effectively communicate the benefits of traced and tracked wine to consumers and how trust and trustworthiness are developed in buyer-supplier relationships [10].

## 2.2 Types of wine fraud and counterfeit

Most of the commercial value of wine products relies on their brand, provenance, vintage, wine making process and typicity of the wines [11]. Adulterated food is a major issue in the food industry, and with wine product, there may be multiple forms of counterfeit, such as geographical, vintage, or varietal mislabeling [12].

According to various authors [13,14] there are multiple kinds of counterfeit wines:

- (a) Usurpation of brand identity/awareness arises when nongeographical protected wines simulating geographical protected wines or wines from prestigious regions are sold [15]. Even if cases have been reported from the 19<sup>th</sup> and 20<sup>th</sup> centuries [16], one of the most famous example of brand identity usurpation is Chablis: more fake wines with the label Chablis are sold than the total production of Chablis wines [17].
- (b) Fraud in grape varieties happens when wines of other varieties are used without being reported, such as wines made from a mixture of grape varieties sold as wines made from a single variety.
- (c) Visual deception occurs when the bottles of wine are quite similar without being an existing wine label brand. Latin alphabet versus sinograms for instance, and the inability for some Asian consumers to read the Latin alphabet, provides some room to easily maneuver around this type of fraud. In addition to the wine image damaged by the misuse of its brand, this type of misleading affects also the appellation or the region by making the expression and identification codes their own.
- (d) Fraud in blending is also a common type of counterfeit when non-authorized compounds are added such as alcohol, flavor, saccharin, or even water to some extent.
- (e) Finally, filling an original bottle with a fake liquid is certainly the most extreme one. The price of some bottles reached such a level that trafficking in

empty bottles has become a real business where empty bottles of iconic wines may be resold for hundreds of dollars [18]. This type of fraud has been more and more reported since the 2000s in the light of the Kurniawan affair which received heavy media exposure. This scandal made public opinion aware of this counterfeit wine issue and at the same time, made wine producers and wine regions aware of the economic implications not only for themselves but also for the whole wine industry.

## 3 The commitment of the Wines of Origin Alliance, illustrations through practical cases

Wine production and its supply chain are controlled by different laws around the globe. From the International Organization of Vine and Wine (OIV) to the European Union (EU) and many other national governments laws, the wine supply chain is heavily regulated. Hence, producers and distributors are permanently required to provide specific documentation as the wines make their way to the consumers. In spite of this highly regulated system, the wine industry loses billions from counterfeit wine and illicit trade. That is why the improvement of the methods applied to verify the origin and the quality of wines is important to protect wine consumers and producers.

Considering the evolution of the global wine market and the speculative demand for the finest bottles [19], and in the absence of any coordinated effort at the international level, it is to be expected that the wine trade will continue experience an arms race between fraudsters, producers and their wine regional authorities. In the same spirit, the growing interest in quality wine among regular consumers may lead to an increased risk of consumption fraud. While it is still unclear whether the anti-fraud measures discussed here will be widely implemented to combat global consumption fraud, the recent attention to the issue may lead to greater exposure and detection of collector fraud. Fraud in the collector market is typically carried out by individuals unaffiliated with producers or exporters. Since rare wines are most usually stored for a long time, and many are traded, possibilities for fraud detection are somewhat greater. There is little doubt that counterfeited wine will continue to haunt the collector market years from now. At the same time, top wine producers and the most advanced regions in terms of quality standards and traceability are actively working to prevent future fraud. It remains to be seen whether the prevention measures undertaken so far will suffice, or if new measures are to be invented due to fraudsters capacity to comply with technology innovation. For the benefit of all and truth in enjoying a wine from a determined region, it is hoped that wine enthusiasts will feel more confident in their ability to identify genuine wines from a particular vintage, thanks to improved anti-fraud measures.

In spite of the impossibility to quantify the amount of fake wines, not even giving an objective evaluation, a report from the Wine Spectator (20) reports that the global wine counterfeit market is estimated worth \$3 billion annually. This has led to a loss of revenue for wineries and a lack of consumer trust in the authenticity of premium wines. Counterfeit wine not only affects the wine industry financially, but it can also be a health hazard for consumers. Some counterfeit wines have been found to contain dangerous chemicals, such as methanol, which can cause extreme complications for the human health.

Established in 2005, the Wine Origins Alliance (WOA) is a transnational movement to protect fine quality designations and guide consumers faced with a constantly expanding range of wines. WOA is working with both local governments and the European Community so that greater guarantees are made available against fake branding and deceptive labelling. WOA members include more than 30 wine organizations in 11 countries spanning North America, Europe, Africa, Asia and Australia that have all signed the 'Alliance's Joint Declaration to Protect Wine Place & Origin', which is a set of principles aimed at educating consumers about the importance of location to winemaking.

### **3.1 Chianti Classico, Denominazione di Origine Controllata e Garantita (DOCG)**

The *Consorzio Vino Chianti Classico* represents 96% of the denomination's producers with around 600 registered members, of whom 350 bottle their own wines. Since 2005, the *Consorzio* has considered the importance of guarantying its place of origin, the environmental and production characteristics stipulated in their appellations regulations as well as product and process traceability.

Since then, all DOCG and many DOC wines use the Government Seal, *Contrassegno di Stato* for this purpose. The Government Seals are supplied to estates in relation to the number of certified hectoliters produced. The seal is supplied by the National government body *Zecca di Stato* and distributed by the *Consorzio* when the process of checking and certifying wines for bottling is complete.

Made from an anti-money laundering material, the seal has a progressive, non-repeating alphanumeric code which provides a tool for traceability and anti-counterfeiting. In parallel, the website Chianti Classico website offers a traceability page where it is possible to verify the characteristics and origins of the wines, symbolized by the Black Rooster. The Black Rooster is the symbol that represents all the wines from Chianti Classico appellation, associating the denomination brand Chianti Classico with a visual logo. Since 2005, every bottle of Chianti Classico wine must have the Black Rooster logo on either its neck or back label. Consequently, the Black Rooster has become, along the years, a recognizable global brand, allowing the

Consorzio to claim unequivocally that if there is no Black Rooster, it is not a Chianti Classico.

### **3.2 Champagne, Appellation d'Origine Contrôlée (AOC)**

Cloé, a traceability system located on the cap of Champagne bottles, was implemented by the *Syndicat Général des Vignerons de Champagne* (SGV) in 2017 in response to the cessation of the mandatory nature of the *Capsule Représentative de Droits* (CRD) in 2018 and its deterrent effect on fraud. The CRD depicted a 'Marianne', a female figure symbolizing France, affixed to the cap of a wine bottle. Its presence on the bottle attested the payment of excise duties in France and served as a supporting document for the circulation of wine bottles within the national territory. According to the SGV, Cloé also aims to secure the flow of wines from winegrowers and even the appellation of Champagne.

The SGV did not have the necessary skills or technology to achieve this ambition alone, so it partnered with a specialized technology supplier in traceability and authentication: seal vector ATT. This technology also allows consumers to scan the cap with their smartphone and access exclusive mobile content about the wine's origin or producer.

One of the challenges encountered in implementing a global project for the Champagne appellation was the third-party ownership of data by ATT, which remains a sensitive issue for organizations in charge of controlling. Despite internal obstacles, it was decided to accelerate the development of Cloé to meet the needs of markets and supply chain. As of 2023, Cloé had accounted for 20 to 25 million caps out of a total of over 50 to 55 million Champagne bottles shipped by the Vignerons.

According to the SGV, the main difficulty encountered in continuing the development of Cloé and generalizing it to all producers is the artisanal nature of many properties and the challenge in industrializing their processes. As is often the case with technological change management issues, the stakeholders' adoption of the process is a key success factor. In collaboration with authentication services and cap manufacturers, the SGV is working on the necessary technology upgrades to enable implementation among producers.

### **3.3 Rioja, Denominación de Origen Calificada (D.O.Ca.)**

In Spain, Rioja has always been at the forefront of engagement in favor of the defense of its appellation. Accordingly, since 1925, Rioja wines have been certified by means of a serial and numbered guarantee seal, with the consequent traceability of the wine, identifying it with its producer of origin. Nowadays, the DOCa Rioja Control Board (*Consejo Regulador de la Denominación de Origen Calificada Rioja*) employs a security system in order to guarantee the authenticity of

Rioja wine. Rioja has always been at the forefront of Spanish quality wines. It began certifying ageing processes in 1974 and in 1980 the categories and the vintage.

In 2000, this guarantee of authenticity was reinforced with a metallic-looking strip using diffractive optical technology and manufactured in Germany. This element is incorporated into the guarantee seals by hot stamping. It contains both visible and invisible security features. Each bottle of Rioja wine sold, more than 350 million a year, carries a guarantee seal with all these security elements. It is an official element exclusively provided by the *Consejo Regulador de la Denominación de Origen Calificada Rioja*, and compulsory on any bottle.

Here, the system involves an optically variable device, *Rioja Trustseal*, which consists of a small metallic-looking strip depicting parts of the logo and the word *Rioja*. Its design, glossy sheen, sharply-defined edges and optical effects enable consumers to identify the label as genuine, even under poor lighting conditions. It is the same system that has been used on European banknotes and would, according to the *Consejo Regulador de la Denominación de Origen Calificada Rioja*, make back guarantee seals virtually impossible to forge. In 2019 traceability has been extended integrating more information such as zones, villages and vineyards of provenance and varieties.

More specifically, some producers have been using artificial vision to photograph each bottle, scanning the code and marking it on the bottle with ultraviolet (UV) link and integrating it into each winery's computer systems. Thus, it allows wineries to identify and monitor each and every bottle individually, from the moment the wine is labelled until it is delivered to every client, distributor or importer anywhere in the world.

## 4 Discussion

### 4.1 The complexity of the wine supply chain

The wine supply chain is a complex and multifaceted process that involves a range of actors and stakeholders, including growers, producers, distributors, and retailers. As stated, the wine industry faces a number of challenges, including the need to manage complex supply chains, ensure quality control, and comply with regulatory requirements [21].

One of the main complexities of the wine supply chain is the variability of the product itself. Wine is a highly variable product that is influenced by a range of factors, including soil conditions, climate, and grape variety. These variables can impact the quality, flavor, and aroma of the wine, making it difficult to maintain the qualitative organoleptic characteristics all along the supply chain, and hence, favoring possible fraud attempts.

Another challenge of the wine supply chain is the need for effective logistics and transportation. Wine is a fragile and perishable product that requires careful handling and storage throughout the supply chain. It

must be stored in temperature-controlled environments, and transported under specific conditions to ensure the quality and safety of the product. As observed previously, some regions have put in place a monitoring system allowing to control during the shipment or once the bottle has been delivered where it transited from.

The wine supply chain is also subject to a range of regulatory requirements, including labeling and packaging regulations, as well as taxes and import/export restrictions. Compliance with these regulations can be a complex and time-consuming process, requiring close coordination between all actors in the supply chain. As understood from the WOA examples, in spite of the challenge of embarking all grape growers in a monitoring process, tracking from the start all the bottles produced within a selected region is potentially a great source of regulatory requirements optimization.

In addition to these challenges, the wine supply chain is also affected by changing consumer preferences and market trends. Consumers are increasingly interested in sustainable and ethical sourcing practices, and are willing to pay a higher price for products that meet these criteria. As a result, wine producers are under increasing pressure to adopt sustainable practices and demonstrate their commitment to social responsibility. Here again, the capacity of a wine region as a whole, to provide a traceability system where the customer can find all the information needed about the provenance and the viticulture practices reflects with no doubt a commitment to transparency and corporate responsibility.

To address these challenges, WOA as a transnational alliance protecting the integrity of fine wine quality designations, is committed to exploring the use of technology and innovation to improve the efficiency and transparency of the supply chain. Chianti Classico, Champagne, Rioja were the three examples addressed in this contribution, however we could have cited the case of the Rhône Valley, Porto and Douro PDO, Bordeaux and many other regions.

Because of the living nature of the wine, the wine supply chain is specific and it requires careful management and coordination between all actors involved. The sensitivity of the wine towards temperature and light for instance, the different national or regional regulatory requirements, and the evolving consumer preferences all add to the complexity of the wine supply chain. This is why, any wine regions concerned by wine quality standards and corporate social responsibility should consider the implementation of traceability system. Permanent innovation and recent technology development can help to address these challenges, providing greater efficiency to the industry and the final customer.

### 4.2 Obstacles for implementing counterfeit measures

As highlighted with the example of Champagne, wine producers may exhibit hesitancy in adopting anti-

counterfeiting technology, despite the significant economic implications involved. Concerns over implementation costs serve as one factor contributing to this reluctance, although it is not the sole reason. Comparing the costs of implementing various systems is a complex task, given the distinct characteristics of actors and parameters unique to each supplier. Consequently, even among the three regions examined, which share similar technology adoption, the final choices slightly diverge, with certain producers raising doubts about the system's security. The integration of anti-counterfeiting technology into the production and bottling processes can present limitations to its widespread implementation.

Notably, as observed in the case of Rioja, the evolution of these technologies transcends mere technical solutions to encompass marketing service platforms, often facilitated through the internet. This raises pertinent questions regarding the amount of information provided to customers. However, from a producer's perspective, this represents a paradigm shift that may not always be wholeheartedly embraced. Consequently, consumers are increasingly becoming the focal point of these technologies, designed not only to instill confidence but also to inform and enhance their overall customer experience. It is evident that not all producers share the same vision regarding these aspects, although there is widespread agreement on the necessity for protection against fraud.

Maintenance issues have been reported, particularly due to the rapid pace of technological advancements. Some vintners, particularly those less inclined towards technology adoption, which constitutes a significant portion of the industry, may argue that their role has evolved considerably over time. From being wine-growers, they have transformed into wine-makers and now have to assume the role of wine marketers. The question arises: are they all willing to transition from the traditional agricultural model to an entrepreneurial model, where factors like supply chain management, brand protection, consumer expectations, and customer service are crucial drivers of performance?

Only time will reveal the answer. However, it is certain that those who pioneer in embracing these opportunities are likely to become the brand leaders of tomorrow's global market. This is precisely why wine region organizations have a vital role to play in supporting anti-counterfeiting initiatives and guiding wine producers through this transformative journey. By offering support and guidance, these organizations can assist wine producers in navigating the complexities of the evolving industry landscape.

The challenges ahead are multifaceted, encompassing technology, mindset shifts, and embracing new business models. However, for those who are willing to adapt and seize the opportunities presented, the potential rewards are substantial. By addressing maintenance concerns, fostering a culture of innovation, and providing resources for education and skill development, the wine industry can collectively

pave the way towards a future where counterfeit wines are minimized, and authentic brands thrive.

Ultimately, the proactive involvement of wine region organizations, alongside the collaboration and commitment of wine producers, will be instrumental in safeguarding the integrity of the industry, protecting consumers, and ensuring a prosperous future for all stakeholders involved.

### **4.3 The need for cooperation among wine regions**

As the threat of counterfeiting continues to escalate, wine regions worldwide are grappling with the alarming proliferation of fake wines. No region is exempt from the potential risks associated with this form of fraud. The implications are far-reaching, posing a significant challenge to the integrity and reputation of entire wine regions. Consequently, there exists an urgent imperative for wine regions to join forces and take a collective stand against counterfeiting.

Through collaboration and cooperation, wine regions can pool their knowledge and expertise to devise effective strategies in combating counterfeiting. The adoption of innovative technologies enables the tracking and tracing of wine from vineyard to consumer. This facilitates the exchange of crucial information and fosters a united front against those who seek to exploit undisclosed details. Additionally, this collaborative approach encourages closer cooperation between producers, distributors, and regulatory bodies.

The efficacy of the European Union's system of protected geographical indications (PGIs) and protected designations of origin (PDOs) has been well-documented [22]. Replicated worldwide with regional adaptations such as AVAs or sub-regions, these systems serve to safeguard traditional and regional products against imitation and misuse [23]. Many wine regions have embraced these protective measures, recognizing their role in preserving product reputation, supporting rural and agricultural activities, and empowering consumers to make informed choices. The battle against fraud can follow a similar trajectory, leveraging such proven frameworks.

In its unwavering pursuit of safeguarding the quality and authenticity of fine wines, the WOA is looking for stronger international cooperation. By fostering partnerships and facilitating knowledge-sharing across borders, WOA aims to bolster the collective efforts against fraud, ultimately ensuring that wine regions worldwide can thrive with enhanced protection.

In conclusion, the counterfeiting of wine represents a grave menace to the wine industry, encompassing substantial financial losses and severe damage to the esteemed reputation of wine regions worldwide. The urgency to act cannot be overstated. By coming together, wine regions have the opportunity to develop robust and comprehensive strategies that effectively combat counterfeiting and fortify the integrity of their exceptional products.

Collaboration among wine regions is key to success. Through the collective pooling of resources, sharing best practices, and exchanging knowledge and insights, wine regions can enhance their understanding of the counterfeiting landscape and identify common patterns and vulnerabilities. This collaborative approach empowers regions to develop proactive measures that not only detect and deter counterfeit operations but also foster a culture of vigilance and resilience across the industry.

Furthermore, uniting forces sends a powerful message to fraudsters and illicit actors who seek to exploit the global wine market. By presenting a united front, wine regions demonstrate their unwavering commitment to upholding the authenticity, quality, and reputation of their wines. This shared vision serves as a powerful deterrent, making it increasingly difficult for counterfeiters to infiltrate the market and erode consumer trust.

The preservation of wine authenticity and the maintenance of consumer confidence stand as paramount objectives for the wine industry. As the global market continues to expand, the need for comprehensive global collaboration becomes increasingly crucial. By fostering international alliances, sharing expertise, and aligning strategies, wine regions can establish a formidable defense against the pervasive threat of counterfeiting, ensuring that consumers around the world can enjoy genuine wines with the utmost assurance.

In this collective endeavor, wine regions play a pivotal role in leading the charge against counterfeiting. They serve as catalysts for change, encouraging producers, distributors, and regulatory bodies to collaborate and support anti-counterfeiting initiatives. By championing authenticity and embracing innovative technologies and practices, wine regions set new standards and inspire others to follow suit.

Ultimately, the fight against counterfeiting requires unwavering dedication, sustained cooperation, and a shared commitment to protect the legacy and heritage of the wine industry. As wine regions come together and forge ahead with their united efforts, they pave the way for a future where counterfeit wines are diminished, consumer trust is strengthened, and the excellence of genuine wines prevails.

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