

SHORTER PAPERS

# Unraveling the economic impact of wine counterfeiting: An analysis of the Sassicaia 2015 scandal and its consequences

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## Abstract

This paper examines the economic impact of wine counterfeiting, with a focus on the Sassicaia scandal, publicized in 2020, regarding counterfeit 2015 vintage bottles of the iconic Super Tuscan wine. Wine fraud, documented since ancient Rome, has evolved alongside the industry, with key developments such as the Appellation d'Origine Contrôlée system aiming to curb it. The paper briefly reviews three other significant modern cases of wine counterfeiting: the Hardy Rodenstock “Jefferson bottles” affair, the Brunello di Montalcino scandal, and Rudy Kurniawan’s counterfeit operation. It then shifts to a detailed analysis of the case of Sassicaia. We combine informal analysis using data plots and a formal difference-in-differences analysis to assess the market impact of the 2015 Sassicaia scandal. We find that, surprisingly, the scandal led to an increase in the price of authentic 2015 Sassicaia, perhaps driven by perceived rarity and media attention.

**Keywords:** counterfeit wine; Sassicaia; Italy; event study; difference-in-difference

**JEL classifications:** K42; L15; L66; Q13

## 1. Introduction

In 2020, the world of wine was rocked by the news that a counterfeiting ring had been selling high-quality fake bottles of the famous elite “Super Tuscan” wine, Sassicaia, particularly the highly sought-after 2015 vintage, at roughly one-third of the price of the authentic wine. This contemporary Italian case added to general concerns raised by publicity around other recent cases involving counterfeiting of luxury wines (Gibb, 2023). Wine is a credence good, and reports of counterfeiting can undermine the market, at the expense of both buyers and sellers, by reducing buyers’ confidence in the

provenance of wine both in general and for the specific wines for which counterfeiting has been reported. The social cost will depend on the extent and duration of the effects of counterfeiting activities on the prices of affected wines. In this paper, we explore the effects of counterfeiting on wine prices using the 2015 Sassicaia scandal as an example. We combine informal analysis using data plots and a formal difference-in-differences (DID) analysis to assess the market impact of the 2015 Sassicaia scandal. Surprisingly, we find that the scandal led to an increase in the price of authentic 2015 Sassicaia, perhaps driven by perceived rarity and media attention.

## II. Economic and social history of counterfeit wines

Wine fraud is not just a modern phenomenon. In the 1st century CE, Pliny the Elder lamented the deceitful adulteration of wines with foreign substances to alter their taste, appearance, or volume (Pliny, 1950). Medieval laws, such as the 1516 Reinheitsgebot, or German Beer Purity Law, reflected broad concerns for beverage quality (Rail, 2023). As regions like Bordeaux and Burgundy emerged, winemakers began branding corks and bottles to combat forgery. In the 18th century, London wine merchants sought regulations to curb the circulation of adulterated goods (Bonney, 2020). In 1935, France introduced the Appellation d'Origine Contrôlée system, seeking to safeguard wine quality and authenticity through strict geographical and production standards (Humbert, 2011).

Recent wine fraud scandals have targeted the luxury segment. Examples include the “Th.J.” bottles, the “*Brunellopoli*” case in Brunello di Montalcino, and the forgeries of Rudy Kurniawan. The “Th.J.” bottles—which purported to be from the collection of America’s first great wine connoisseur and third President, Thomas Jefferson—entered the market with questionable provenance but were sold by major auction houses (pre-auction valuation: “inestimable”), including Christie’s, for hundreds of thousands of dollars in the late-1980s (Keefe, 2007; Wallace, 2008). Research by an owner of four of the bottles, American billionaire Bill Koch, underscored the need for more stringent verification processes in the auctioning and trading of rare wines (Gibb, 2023). In the *Brunellopoli* case, 20 firms were investigated by Italian authorities in 2008 for illegally blending their Brunello with grapes other than Sangiovese to increase their volume and marketability. Over 1,300,000 L of Brunello and 680,000 L of Rosso were subsequently declassified (Frank, 2009).

The most notorious case is arguably that of Rudy Kurniawan, who blended cheap table wines to recreate many rare and expensive wines, including Domaine de la Romanée-Conti, Domaine Ponsot, and Château Pétrus (Crum, 2018; Gibb, 2023; Hellman, 2018). The faux wines deceived many experts and the scheme only began to unravel when Laurent Ponsot, then manager of the family *domaine*, noticed old vintages of Clos Saint-Denis (1945–1971) at auction that predated the family’s work with the famous vineyard that began in 1982 (Mcinerney, 2016). Kurniawan was eventually raided by the FBI and sentenced to 10 years of prison in 2013, events dramatically captured in real time by the documentary film, *Sour Grapes*.

The wine industry continues to grapple with counterfeiting. Cutting-edge solutions adopted by producers include advanced labeling technologies, customized bottles, blockchain, and sophisticated traceability measures to bolster defenses against

deception. However, verifying a wine's authenticity as indicated by its label remains challenging, especially for older vintages. Anson (2022) claimed that over 20% of luxury wines in the marketplace, amounting to \$67.9 billion in 2020, may be counterfeit. Although the 20% figure is debatable, it suggests a potentially vast counterfeit wine market.

### III. 2015 Sassicaia case study

In 2020, Italian authorities dismantled a sophisticated counterfeit operation targeting the flagship Super Tuscan, Sassicaia. The operation, dubbed "Bad Tuscan," involved meticulous replication of Sassicaia bottles, particularly the highly sought-after 2015 vintage. The counterfeiters were so meticulous in their efforts that they even replicated the anti-counterfeiting holograms and the exact weight of the tissue paper used in packaging (Allen, 2020).

The investigation, sparked by a serendipitous discovery of a case of the counterfeit wine by the roadside in Tuscany, revealed a well-organized ring that produced fake wine in Sicily, used bottles from Turkey, and sourced labels and wooden cases from Bulgaria. The faux Sassicaia was sold at a roughly 70% discount, primarily to buyers in China, Korea, and Russia. While the counterfeit wine was unlikely to match the quality of the genuine Sassicaia, the operation's potential monthly turnover of €400,000 highlighted the significant economic scale of such frauds (Allen, 2020).

#### A. Conceptual model

The exposure of the Sassicaia fraud could have triggered several effects on the market. The most likely direct effect would be an erosion of confidence in the provenance of the 2015 vintage, leading to discounts by sellers striving to maintain sales. This discounting could extend to other vintages of Sassicaia if the fraud casts doubt over the brand's overall authentication processes, and buyers demanding stricter verification processes could slow down sales. On the other hand, if the majority of consumers trust that the Sassicaia they can purchase is authentic, increased media attention could paradoxically increase interest in verified authentic bottles, possibly driving up their perceived rarity and value.

The exposure of the Sassicaia fraud could have had wider effects for other elite wines. Components of such a spillover effect might include the following:

- **Buyer perception.** Changes in buyer behavior resulting from the scandal, including increased skepticism and scrutiny over high-priced wines, potentially leading to a temporary or permanent shift in buying patterns where buyers either shy away from or demand more stringent verification of premium wines
- **Market sentiment.** Negative publicity surrounding one high-profile counterfeit case might taint the broader category, affecting sales and potentially leading to a reassessment of wine valuations within this segment
- **Price influence.** Direct or indirect influence on the pricing of other Super Tuscan wines and Bordeaux wines perceived as comparable to (and potentially close substitutes for) Sassicaia. This could be manifest as price changes due to altered

consumer confidence in the authentication and quality assurance processes of similar high-end wines.

Buyers might generalize their concerns about authenticity and provenance to other elite wines, particularly those sharing characteristics with Sassicaia, potentially leading to a market-wide reassessment of prices and a surge in demand for more stringent verification measures.

### B. Analytical methods

We use a DID framework to investigate the effect of the 2015 Sassicaia counterfeit scandal on the pricing of the implicated vintage compared with other vintages of Sassicaia and selected other Super Tuscan wines. In this approach, price movements of the wine of interest (the “treatment”) are compared with those of “control” wines before and after the disclosure of the fraud. The difference in price changes over time for the treatment wine, relative to the control group, is used to isolate the scandal’s direct effects from other concurrent market and temporal influences.

In the DID analysis, the price movements of the “treatment” wine, Sassicaia 2015—directly affected by the counterfeit scandal—are compared with the prices of various “control” wines. This method is employed with the aim of isolating the effects of the counterfeit incident from other potential market and temporal influences that could affect wine prices. Let  $P_{ivt} = (1 - \lambda_{ivt})\tilde{P}_{ivt}$  be the market price of the wine-vintage pair  $(i, v)$  in period  $t$ , where  $\tilde{P}_{ivt}$  is the perfect-provenance price and  $\lambda_{ivt}$  is the probability of fraud. Assuming no spillovers, the probabilities of counterfeits are  $\lambda_{ivt} > 0$  and  $\lambda_{ivt-1} = \lambda_{jvt} = \lambda_{jvt-1} = 0$ . It is easily shown that the DID identifies the effect of counterfeiting on the perfect-provenance price:

$$\Delta P_{ivt} - \Delta P_{jvt} = -\lambda_{ivt}\tilde{P}_{ivt} + (\tilde{P}_{ivt} - \tilde{P}_{ivt-1}) - (\tilde{P}_{jvt} - \tilde{P}_{jvt-1}), \quad (1)$$

where the first term is the counterfeit effect and the second two terms cancel out in expectation under parallel trends.

The test for an effect of the announcement on the price of Sassicaia 2015 is more likely to be informative if the announcement did not also affect the price of the control wines—i.e., if spillover effects in the controls were negligible or nonexistent. That is, in this context a spillover effect exists if knowledge of wine  $(i, v)$  being counterfeited increases the market’s perception that wine  $(j, v)$  might also have been counterfeited, albeit with probability not higher than the probability of  $(i, v)$ , which adds an attenuating effect to the DID:

$$\Delta P_{ivt} - \Delta P_{jvt} = -\lambda_{ivt}\tilde{P}_{ivt} - (-\lambda_{jvt}\tilde{P}_{jvt}) + (\tilde{P}_{ivt} - \tilde{P}_{ivt-1}) - (\tilde{P}_{jvt} - \tilde{P}_{jvt-1}). \quad (2)$$

Note this relationship also holds if the baseline probability of counterfeiting is nonzero, but  $\lambda_{kvt}$  becomes the change in probability from pre- to post-period.

### C. Data

We study the impact of the exposure of the fraud using wine prices provided by Liv-ex (The London International Vintners Exchange), a prominent global marketplace for wine trading. The control wines were chosen because they, like Sassicaia, utilize Bordeaux varieties (the defining characteristic of the so-called “Super Tuscan” wines) and share similar price points: Solaia, Tignanello, Biondi-Santi, Flaccianello, Masseto, Le Pergole Torte, Ornellaia, Poggio di Sotto, and Redigaffi. Monthly average prices for vintages from 2004 to 2018 were collected from January 2014 to March 2024. If a particular vintage was not produced, it was excluded from the dataset. None of the control wines is known to have been affected by counterfeit scandals. Prices were recorded in pounds Sterling per 9 L case and converted to dollars per case using the monthly average exchange rate from the Board of Governors of the Federal Reserve System. The prices were then divided by the monthly Consumer Price Index published by the U.S. Bureau of Labor Statistics to account for inflation and ensure comparability over time in March 2024 constant (or real) dollar values.

Tables 1 and 2 summarize the data and the characteristics of the wines analyzed. This structured presentation aids in understanding the methodology and the resulting analysis. Table 1 provides a summary of the average, minimum, maximum, and number of observations of the monthly price for Sassicaia vintages from 2004 to 2018, collected from January 2014 to March 2024. Prices are adjusted to real USD values as of March 2024. The 2004 and 2005 vintages were excluded from further analysis owing to their higher average and maximum prices, likely indicative of an aging effect. Additionally, observations from January 2014 to December 2015 were dropped to ensure balanced data across vintages. Thus, the data for analysis include observations of prices of Sassicaia vintages from 2006 to 2018 observed from January 2016 to March 2024. Similarly, Table 2 summarizes the data on prices of Super Tuscan wines from January 2014 to March 2024. The top panel isolates the 2015 vintage, the bottom panel all vintages from 2004 to 2018.

### D. Graphical analysis

Figure 1 visualizes the monthly prices of Sassicaia and wines in the control groups. The top panel compares 2015 Sassicaia to other vintages. The bottom panel compares 2015 Sassicaia to other 2015 Super Tuscans. In each plot, the monthly prices are normalized by dividing by the corresponding monthly average of the prices of all the wines included in the plot, so they are average relative prices. Each plot features a thick red line representing the trajectory of the average relative price of 2015 Sassicaia and a dashed vertical line marking the date when the scandal was revealed, in October 2020. Both panels indicate an increase in the price of 2015 Sassicaia, relative to the controls, after October 2020. This suggests that not only did the counterfeiting incident not have the anticipated negative impact on the prices of 2015 Sassicaia but also, it might have had the opposite effect, perhaps because of an increase in the perceived rarity and value of that wine. We see the same pattern and reach the same conclusion when prices are plotted in levels rather than as relative prices.

**Table 1.** Sassicaia wines used in the analysis

Vintage	Average price (\$)	Minimum price (\$)	Maximum price (\$)	Number of observations
2004	3,909.4	2,502.4	5,686.6	140
2005	3,615.9	2,331.0	7,907.9	140
2006	3,751.0	2,704.0	5,154.5	140
2007	3,522.0	2,385.9	4,691.0	140
2008	3,284.4	2,134.8	4,331.3	140
2009	3,216.6	1,962.3	4,336.8	140
2010	2,935.8	2,058.6	3,900.2	140
2011	2,581.9	1,729.0	3,376.0	140
2012	2,611.8	1,696.3	3,433.2	140
2013	2,811.2	1,663.3	3,674.3	140
2014	2,535.9	1,708.3	3,174.9	127
2015	3,397.1	2,031.5	4,441.9	115
2016	4,729.4	4,021.0	5,141.0	41
2017	2,715.2	2,488.9	2,936.4	41
2018	3,030.7	2,529.9	3,329.7	36
<b>Total</b>	<b>3,204.9</b>	<b>1,663.3</b>	<b>7,907.9</b>	<b>1760</b>

*E. DID regressions*

We run three DID regressions: first, with prices of 2015 Sassicaia as the treatment, and with prices of other vintages of Sassicaia as controls; second, with prices of 2015 Sassicaia as the treatment, and with prices of other 2015 Super Tuscan wines as controls; third, with prices of 2015 Sassicaia as the treatment, and with prices of both other vintages of Sassicaia and other 2015 Super Tuscan wines as controls. In each case, the dependent variable in the study is the natural logarithm of the price of 2015 Sassicaia. In the two regressions that use wines from different vintages as controls, we also include a measure of wine age (year of observation minus vintage year) for each wine. The results are summarized in Table 3. The standard errors are calculated using a cluster-robust method with clustering at the wine level, accounting for potential intra-cluster correlation within each wine across different time periods.

The first DID regression in column (1) of Table 3 compares the prices of the 2015 Sassicaia with other Sassicaia vintages (as illustrated in Figure 1, top panel). Using 1,480 observations, this model includes fixed effects for dates, controlling for time-specific variations that uniformly affect all wines, and a measure of wine age. The estimates imply prices of the 2015 Sassicaia increased by approximately 19.9% after the counterfeiting was revealed, which is statistically significant at the 1% level. This result strongly suggests that the scandal had a significant positive impact on the price of the affected 2015 vintage. Column (2) compares the prices of the 2015 Sassicaia with other 2015 Super Tuscan wines (as shown in Figure 1, bottom panel). These estimates imply a larger effect of 17.7%, which is less-precisely estimated and only significant at the 10%

**Table 2.** Super Tuscan wines used in the analysis

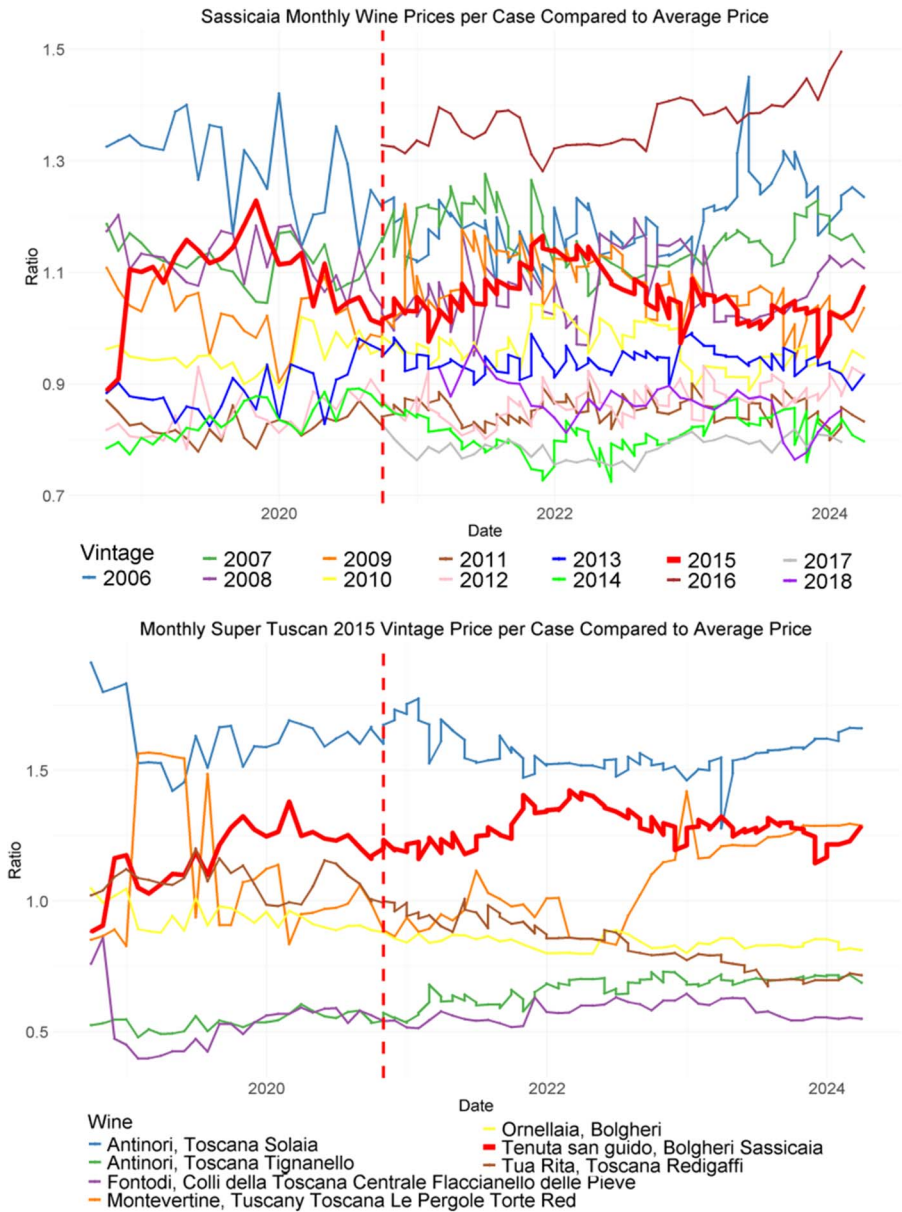
	Average price (\$)	Minimum price (\$)	Maximum price (\$)	Number of observations
<i>2015 vintage</i>				
Solaria	4,363.2	3,516.8	5,035.5	108
Tignanello	1,724.6	1,201.9	2,176.2	116
Flaccianello	1,508.5	941.2	2,073.1	72
Masseto	10,552.2	8,381.6	12,217.3	108
Le Pergole Torte	2,852.0	1,588.8	4,229.8	72
Ornellaia	2,442.0	2,098.0	5,142.6	117
Sassicaia	3,397.1	2,031.5	4,441.9	115
Redigaffi	2,498.2	1,804.5	3,088.8	125
<b>Total</b>	<b>3,737.7</b>	<b>941.2</b>	<b>12,217.3</b>	<b>833</b>
<i>2004–2018 vintages</i>				
Solaia	3,284.0	1,876.7	7,312.8	1,732
Tignanello	1,772.5	884.0	3,285.4	1,762
Biondi-Santi	5,916.4	1,874.1	12,105.2	651
Flaccianello	1,409.	45.2	5,421.1	1,134
Masseto	10,122.5	6,644.1	18,672.5	1,731
Le Pergole Torte	2,837.5	1,158.0	6,230.2	1,046
Ornellaia	2,552.2	1,502.7	5,142.6	1,761
Poggio di Sotto	2,383.1	1,099.9	7,582.7	949
Sassicaia	3,204.9	1,663.3	7,907.9	1,760
Redigaffi	2,458.0	1,271.2	4,998.5	1,754
<b>Total</b>	<b>3,603.6</b>	<b>45.2</b>	<b>18,672.5</b>	<b>14,280</b>

level. Column (3) of Table 3 examines the changes in price of the 2015 Sassicaia relative to both other Sassicaia vintages and other 2015 Super Tuscan wines, using a more extensive dataset of 14,280 observations. These estimates suggest an approximately 23.7% increase in the price of the 2015 Sassicaia after the counterfeiting was revealed, which is statistically significant at the 1% level. The robustness of this result across multiple comparisons seems to confirm that the scandal may have enhanced the wine's allure as a luxury good, driving up prices. In the two models that included wine age (columns 1 and 3), the coefficient on wine age is also highly statistically significant and of a plausible magnitude.

#### IV. Summary and conclusion

The findings from this study reveal a counterintuitive market response to the 2015 Sassicaia counterfeit scandal. Contrary to expectations, the publicity surrounding the event did not diminish buyer confidence. Instead, it appears to have increased demand





**Figure 1.** Relative prices of 2015 Sassicaia and control wines. Top-relative prices of Sassicaia by vintage. Bottom-relative prices of 2015 Super Tuscan. The thick red line is the 2015 Sassicaia and the dashed red vertical line is the date of the incident.

for the authentic 2015 Sassicaia, perhaps because of an increase in the perceived rarity and heightened media attention. This suggests that in the high-end wine market,



**Table 3.** Results from DID regression models of Sassicaia 2015 prices

Estimated coefficients	HP <sub>0</sub>	HS <sub>0</sub>	HT <sub>0</sub>
Post-treatment	0.1990	0.1765	0.2374
	(0.0152)	(0.0864)	(0.0234)
	[13.07]	[2.04]	[10.16]
Wine age	0.0311	n.a.	0.0311
	(0.0011)		(0.0036)
	[29.01]		[8.59]
RMSE	0.1219	0.1293	0.1851
Adjusted R <sup>2</sup>	0.72	0.86	0.90
Within R <sup>2</sup>	0.39	0.05	0.27
Observations	1,480	725	14,280
Fixed effects, Wine	1	7	10
Fixed effects, Date	99	84	99

Note: Standard errors in parentheses and corresponding *t*-values in square brackets, below the point estimates of the coefficients.

scandals can sometimes enhance the desirability of a product, particularly when its authenticity is verified.

The analysis shows that the counterfeiting event led to a significant increase in the price of the 2015 Sassicaia compared to other Sassicaia vintages and comparable Super Tuscan wines. This outcome might seem paradoxical—typically, one would expect a scandal to erode consumer confidence causing prices to be lower than they would have been otherwise. However, several factors could explain this price increase:

- **Rarity perception:** The scandal may have heightened the perceived rarity and value of genuine bottles of 2015 Sassicaia. Collectors may be willing to pay a premium for verified authentic bottles, especially in a market wary of fakes.
- **Media attention:** The widespread publicity surrounding the case may have boosted awareness of the 2015 Sassicaia, attracting more buyers and collectors. Despite the risks associated with counterfeiting, buyers and collectors may have been drawn to the prestige and narrative linked to owning a bottle from this vintage.

These results underscore the complex interplay between market perception, consumer behavior, and the economic impacts of counterfeiting scandals in the luxury wine sector. Future research could further explore the long-term effects of such scandals on brand reputation and consumer trust, as well as the potential for similar patterns in other luxury markets.

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