Ca' Foscari University of Venice

Master's Degree

in International Management

Double Degree Program in **"International Business"** in cooperation with Skema Business School – Paris, France

Final Thesis

Arbitrage in the supercar market: a comparative analysis of Italy, Germany and France

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Academic Year
2023 / 2024

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Introduction

The supercar market represents a unique and fascinating niche in the global automotive industry, characterized by high-performance vehicles, refined designs, and often limited production, making objects of desire for an exclusive clientele. Supercars are often associated with the racing world, and they represent the best in mechanical and design engineering, showing a continuous improvement towards performance, speed, and sustainability.

Over the last years, the European supercar market has undergone significant transformation with new technologies and a shift in what consumers are buying. Italy, Germany, and France are leading this process, but it is not the same in every country, as economic, social and regulatory factors differ widely, depending also on the price and demand for supercars.

It is in this context that the practice of arbitrage emerges.

Arbitrage, traditionally linked to financial markets, finds an unexpected application in the used supercars market.

The idea of buying a vehicle in one market where the price is relatively low and reselling it in another market at a higher price, generating a profit, represents a unique and complex opportunity. The reasons for such price differences may range from different tax and environmental laws to cultural differences and how people perceive brands.

The thesis brings a closer insight into the arbitrage practices in the European supercar market, focusing on three key countries: Italy, Germany, and France. The specific purpose of this research is to determine how various aspects can create opportunities for arbitrage through an analysis of economic and social differences in identified markets and how the tax and environmental laws, and cultural preferences are influencing the price of supercars.

The comparative price analysis will be conducted on five different Porsche models: the 911 992 Carrera S, GTS, Turbo S, and the Taycan GTS and Turbo S, and it will include the identification of the factors affecting the market value of these cars and price anomalies that may constitute arbitrage opportunities. Most importantly, the analysis will be conducted on net prices, excluding taxes, to provide a more accurate and comparable view of the dynamics of the market.

The present study wants to offer a contribution not only from an academic point of view - through the application of established economic theories within a very niche sector - but also from a practical one, since the results can indeed prove useful insights to any industrial operator who intends to exploit market differences.

1. The supercar market: evolution, characteristics, and regional analysis

The supercars represent a special market segment in the automotive industry, characterized by high performance cars, futuristic technology and in some cases limited production units. These vehicles create extraordinary driving experiences, but also are seen as products for status and prestige, frequently associated with a rich clientele.

This chapter will firstly analyze their development from the initial 1950s icons to the most advanced hybrid automobiles in terms of technology, with a special focus on technical evolution from the racing world.

In addition, three major European countries and their peculiar markets are examined - Italy, Germany, France - by using economic and social indicators to understand more about how these super "vehicles" are perceived in these countries. These indicators also include per capita disposable income, and the number of cars owned per household. The chapter will also provide a comprehensive overview of the supercar market, revealing the economical and societal dynamics that shape the demand and supply of these unique vehicles.

1.1 The concept of supercars: a dynamic evolution

The evolution of supercars is seen as a dynamic journey that reflects technological, economic and cultural changes. Every decade saw different game-changing innovations which re-defined performances, designs and efficiency as well. Starting with the first supercar dating back to the 1950s, setting completely new standards for speed and elegance, to modern hypercars pushing to the limits of physics with the advancements in hybrid and electric technologies, today supercars have become emblems of human progress. This dynamic path has led to faster and more capable vehicles, and it has also to meet the more stringent request of sustainability and energy efficiency, in this way showing that car engineering excellence can go hand in hand with ecological innovations.

About the term "supercar" there is no universally accepted definition, but it can be described as a high-performance vehicle designed for street use, drawing inspiration from race cars. It

often boasts a far more powerful engine than a sports car and includes luxurious features that enable comfortable road driving.

If we apply this concept to cars manufactured before the Porsche 959 and the Ferrari F40, several distinct outcomes become apparent. The earliest supercar in history was the Mercedes-Benz 300SL of 1954. Arguably the most renowned Mercedes-Benz model, it revitalized the company's position of dominance and provided a glimpse into the future direction of the automotive industry. It is particularly famous for its gull-wing doors and highlighted the benefits of lightweight design, pioneering the use of fuel injection, the first production car to do so, (International, 1989) and an aerodynamically efficient shape. The Mercedes 300SL Gullwing was a significant advancement in the evolution of supercars, boasting a three-liter engine with direct fuel injection that delivered 215 horsepower. At the time, it was the fastest automobile, capable of reaching a maximum velocity of 258 km per hour (Mercedes-Benz, s.d.).

The 300SL Gullwing, being the first authentic supercar after the war, signified the rejuvenation of the entire category. After the Jaguar E-type, the Ferrari GTO had a dominant position for a while, until the Lamborghini Miura emerged in 1966.

It revolutionized the automotive industry by introducing a mid-engine configuration powered by a V12 engine (Lamborghini, 2022). The car was remarkably fast; it essentially established the fundamental structure and design that continues to characterize supercars today, and it indeed settled a guiding principle for that brand. Although branding was crucial, Lamborghini, a corporation that was founded just three years earlier, demonstrated the significant investment required to uphold their image. It quickly gained widespread recognition within a year, as the affluent and renowned individuals preferred it over Ferrari. This is likely the sole occurrence in the automotive industry where a supercar was introduced without any affiliation to racing. Furthermore, it served as a precursor to the subsequent groundbreaking innovation: once again, a Lamborghini. In 1974, amidst global fascination with the oil crisis, Lamborghini introduced the Countach, a cutting-edge supercar. The name of this vehicle is unique within the automotive industry: the term originates from a regional dialect spoken in Piemonte, Italy, and its translation literally means plague, contagion, and is used rather as an expression of astonishment or even admiration, such as "gee whiz."

Furthermore, the Countach notably signified the subsequent significant advancement, which involved the incorporation of very broad wheels and wings to enhance traction and stability. The supercar, constructed from 1974 to 1990, was an exquisite masterpiece with power ranging from 350 to 455 horsepower.

Next, there were two notable contenders: the Porsche 959 and the Ferrari F40. Both brands originated from their long-standing and esteemed racing and sports-car backgrounds. The 959 and the F40 utilized turbocharged engines, however they were not direct equivalents. While Porsche utilized an all-wheel-drive system in its vehicle, the Ferrari F40 opted for a significantly reduced weight, a substantial rear wing, and rear-wheel drive. These two exhibited a significant advancement beyond anything observed previously. Ultimately, carbon-fiber construction became popular thanks to their involvement.

However, it is not advisable to hastily embrace the current trend of acquiring the most advanced supercars, such as the Ferrari 488 GTB, McLaren, or Audi. In the 1990s, although there was limited progress in the creation of supercars, the McLaren F1 emerged as arguably the most exemplary representation of a "supercar" among all automobiles. Conceived by automotive enthusiasts Gordon Murray and Ron Dennis, the McLaren F1 pushed the boundaries of lightweight, high-performance vehicles.

After that there is the contemporary era, where supercars no longer occupy the highest position in the hierarchy. Hypercars have claimed that position, featuring captivating models such as the Koenigsegg, Bugatti (Veyron and Chiron), and the trio that serves as a spiritual successor to the 959, the F40 and the F1: the Porsche 918 Spyder, the Ferrari LaFerrari, and the McLaren P1, all three of them powered by hybrid systems.

1.2 Distinctive characteristics of modern supercars

Supercars are different from normal cars because a lot of technology applications are taken from the racing world. Every element, from engine to suspension, is designed to increase the performance at the maximum level, with solutions tested in the most competitive environments such as Formula 1, Le Mans and other international events. This continuous process in innovation makes sure that supercars not only are high-performance vehicles, but also examples of advanced engineering.

This section will now examine some of the key technical components developed in motorsport first and then brought into supercars, while highlighting how they contribute to defining the supercar's concept over the years.

Turbochargers

The implementation of the turbocharger is a prime example of race-derived technology. The Porsche 917/30, successor to the 917/10, one of the most powerful racing cars of the 1970s, demonstrated how turbocharging could dramatically increase performances. This same technology was later applied to production cars, such as the 1975 Porsche 911 Turbo, the first supercar to use turbochargers.

The real problem was that car proved to be nervous and dangerous on the road, both due to the fact that the engine was cantilevered[1] over the rear wheels and therefore the weight distribution was not optimal, and due to the so-called turbo lag phenomenon, which can be felt when pressing down on the accelerator in a turbocharged car: the power response is typically a stunted start, until, having reached a certain rotational speed (engine revs), the car delivers significantly more power, almost a whiplash for the driver.

The turbocharger consists of two basic elements: the compressor and the turbine. They consist of an impeller enclosed in a scroll-shaped body that can rotate at a considerable number of revolutions. The compressor and turbine rotate at the same angular speed as they are made integral through a shaft. The turbo is an intelligent device, as it recovers the kinetic energy of the exhaust gasses (it would otherwise be lost), transforming it into mechanical energy useful for driving the compressor impeller; the compressed air is thus fed into the intake manifold, providing a volume of air otherwise impossible for an aspirated engine (Baines, 2005).

The introduction of turbocharging technology radically changed the way engine power is generated and delivered. Thanks to it, it is possible to reduce the engine's capacity (and thus reduce its weight and the emissions) and achieve better performances.

A clear example of this is modern supercars such as the Porsche 911 and the McLaren 765LT, using turbo systems to achieve power levels impossible with a naturally aspirated engine.

[1] A rear-engine passenger car is defined as an automobile on which the engine is mounted cantilevered (i.e., immediately behind the rear axle).

Modern supercars continue to perfect the use of turbocharging. For example, the introduction of the variable geometry turbine (Feneley, 2017), first used in a supercar in the Porsche 911 Turbo 997 was a revolution. The turbo in this case has blades that can change angle. This allows it to better adapt to the flow of exhaust gas it is receiving and if the engine needs more power quickly, the TGV can adjust itself to deliver more 'blow' faster. If the engine does not need as much power, the TGV regulates consequently to keep things efficient and reduce waste.

Electric turbines are also a significant innovation. For instance, the Porsche 911 GTS 992.2 is equipped with an electric turbo system that can eliminate turbo lag.

This technology comes from the Formula 1 world (MGU-H, Motor Generator Unit - Heat).

Direct fuel injection

Direct fuel injection is a process used in engines, either diesel or gasoline, to inject fuel directly to the combustion chamber rather than mixing it with air in the intake port, as with indirect injection.

From the very beginning, the technology's development enabled multiple benefits, including a more precise control of the air-fuel mixture, which improved combustion and, consequently, engine power and efficiency. The system was originally developed in the aviation world and later adapted for car racing.

Direct fuel injection technology was originally developed during World War II, with the goal of strengthening the performance of German fighter aircraft. The major challenges for engineers were to overcome the constraints of traditional carburetion systems, which were ineffective under conditions of varying gravity, such as in extreme aerial maneuvering.

It was not too long until that same technology became adopted for motor racing. The first car to introduce it was the Mercedes-Benz W196 in Formula 1 and ruled both world championships in 1954 and 1955. (Institute)

Energy Recovery Systems

Energy recovery systems are among the most important developments in the automotive industry, deriving straight from motorsport, specifically Formula 1. These systems recapture any kinetic or thermal energy which is generated under braking or other operation and then

convert it into usable electrical energy, which improves the total efficiency of the vehicle and provides an extra power boost.

The implementation of energy recovery in Formula 1 marked a very significant breakthrough in motorsport. In 2009, the FIA approved the use of Kinetic Energy Recovery System (KERS) in Formula 1 cars. KERS enables kinetic energy that is generated during braking to be stored and later used to boost engine power. This technology not only increased the performance on the tracks, but also boosted the overall energy efficiency.

When the driver requires the extra power, all he must do is press a button on the steering wheel. At this stage the MGU no longer acts as an alternator, but rather as a motor-electric, again going to the crankshaft or transmission and returning the previously stored energy. In this phase, electrical energy is transformed into mechanical energy.

Energy recovery technologies introduced in Formula 1 have subsequently been adapted for supercars in production. For example, the Ferrari LaFerrari uses a HY-KERS system that combines an internal combustion engine with an electrical motor.

Hybrid technology in supercars

In hybrid cars, the propulsion system is composed of a mix of a combustion engine and one or more electric motors. "Hybrid engine," in fact, identifies the system consisting of the two different engines that work together. This technology, originally developed and then tested in the automobile racing context, has now become a defining characteristic of modern supercars.

From its origins, the 24 Hours of Le Mans has had a strong technological focus. For the first time in 2012, two cars in the Prototype 1 category competed with hybrid cars: Audi with a 120-degree V6 turbodiesel, supercharged with two turbines, whose maximum power output is 510 hp and Toyota with the "Toyota TS 030" combined an endothermic engine based on a 90-degree, 3.4-liter, gasoline-powered V8 with two electric units that act on both the rear and front wheels.

The engine in hybrid cars consists of a combination of an internal combustion engine (ICE) and an electric motor. The two energy sources can work together, separately, or in any combination in between to drive the wheels and generate electricity.

In practice, in a hybrid combination, the electric motor assists the combustion motor during acceleration and high load situations, while the combustion motor recharges the battery pack of the electric during deceleration and inertia driving.
The electric motor can be a "closed" system, i.e., rechargeable only by the combustion engine (thus we speak of a full hybrid car) or an "open" system, i.e., rechargeable on tap through wall-boxes or electric charging stations (thus we speak of a plug-in hybrid car).

Transmissions and differentials

Dual-clutch transmissions, largely used in modern supercars, represent an innovation deriving from motor racing. This kind of drivetrain was first developed for race cars such as the Porsche 962C, utilized in endurance races like the 24 Hours of Le Mans in the 1980s.
Dual-clutch technology, called Porsche Doppel Kupplungs Getriebe (PDK), was only introduced in production cars with the Porsche 911 Carrera 997 mk2, 2009, almost 30 years after it was first introduced in the race cars.
In dual-clutch transmissions there are two clutches on two drive shafts, one used for even gears and one for odd gears. Its operation is based on the concept of anticipation: while one clutch handles the current make, the other presets the next. When shifting, the engaged clutch is released and at the same time the other is activated, ensuring continuous traction. A control unit analyzes the driver's driving style and will try to predict whether to downshift or upshift.

1.3 Structure of supercars market

In this section, we will explore the geographical distribution of the supercar market, analyzing Italy, and comparing it with other two similar countries - Germany and France. Firstly, we will investigate the economic and social factors that affect the demand for supercars, using indicators such as average disposable income per capita, GDP per capita, and rate of owning one or more cars per household. These will provide a comprehensive and detailed insight of the structure of the supercar market, highlighting the regional trends and peculiarities of each market.

Average disposable income per capita

This indicator is presented as gross income with, and without social transfers in kind.

The term "gross" refers to the exclusion of depreciation charges from the calculation. Social transfers encompass the provision of health or education services by governments and non-profit organizations serving households (NPISHs), either free of charge or at discounted rates. (OECD, s.d.)

Non-profit organizations rely mostly on voluntary contributions from households and offer goods or services to households either for free or at costs that are not economically significant.

Gross household disposable income per capita is a measure of the total income available to each person in a household after deducting taxes and other expenses. Growth rates, expressed as a percentage change from the preceding quarter, are calculated by adjusting for the effects of price fluctuations to provide a more accurate measure of real economic growth. As discussed by de Castro (de Castro, 2006), the sensitivity of consumption to disposable income can also be an indicator of liquidity constraints, reflecting how current income influences consumption decisions in each economic context. Adjusted household disposable income, as defined in the System of National Accounts, encompasses household disposable income along with social transfers in kind. This indicator is calculated as the percentage change in per capita income, expressed in US dollars at current prices and purchasing power parities (PPPs).

Durable goods ownership

Owning durable goods like vehicles is a good indicator of households' economic well-being and spending capability. Data from 2022 show the number of homes by area that have at least one automobile as well as those with 2 or more vehicles. This indicator shows absolute numbers (thousands) and as a proportion of 100 homes having the same traits.

These data have important implications. High rates of car ownership in each area indicate high disposable income and strong household spending power. The local economy can benefit from this finding, as households with higher disposable income usually purchase durable items, thus boosting the automobile industry and other activities, including fuel and maintenance (Waldman, 2006).

Many homes with more than one automobile point not just to higher economic capability but also a potential requirement for more mobility, generally connected to a lifestyle that calls for frequent travel, like that of employment or pleasure. This may create more demand for advanced road building projects and public transit.

On the other hand, a low rate of automobile ownership might represent several realities, such as a more efficient public transit, lower spending capacity, or denser urbanization that renders private automobile ownership less required. Low rates of automobile ownership areas might gain from infrastructure and public transit expenditures to boost population mobility.

These metrics define public policy, infrastructure, and market planning. By use of this information, manufacturers may pinpoint places with maximum potential for vehicle sales, particularly premium cars.

1.3.1 Economic analysis of Italy's regions

Italy reveals significant economic inequalities by showing great variance in per capita disposable income and GDP over areas. With strong economies typified by high degrees of industrial activity and modern services, the northern shows as the richest. Based on ISTAT, 2022 figures, Lombardia shows a per capita disposable income of 25.6 PPS; Trentino-Alto Adige, by aggregating the Bolzano and Trento provinces, shows an average disposable income of 26.2 PPS (28.5 PPS for Bolzano and 23.9 PPS for Trento) (ISTAT, 2022). These areas gain from varied economies and infrastructure supporting higher purchasing capacity as well as from a strong market for luxury products. Conversely, the southern areas like Calabria and Sicilia have far lower disposable incomes, which reflect ongoing economic inequalities across the nation. While the south is still less economically rich, this data shows a concentrated economic output and spending power in northern areas.

Lombardia. With a per capita disposable income of 25.6 PPS in 2022, it is one of the richest regions in Italy. It has an extremely diversified economy, with finance, industry, and technology firms driving the economy. Milan, the regional capital, hosts large businesses and financial institutions that significantly contribute to its strong economy. The strong infrastructure, which includes excellent road and rail connections, also supports high levels

of economic activity and facilitates trade. This environment is an attractive market for luxury goods, including top range vehicles, since household spending power is considerably above the national average. Lombardia with its good economy and the high level of innovation in the firms attracts both domestic and international investment.

According to ISTAT, Lombard families with more than one automobile are 1,440,000 and with at least one car owned 3,654,000 (ISTAT, 2022). Furthermore, 32 percent of Lombard families possess more than one automobile and 81 percent own at least one. Supported by a diverse economy and modern infrastructure, these numbers show a great degree of discretionary income and a strong tendency to purchase durable items.

Trentino-Alto Adige. With autonomous provinces of Bolzano and Trento, it has an average per capita disposable income of 26.2 PPS in 2022, ranging from Bolzano at 28.5 PPS to Trento at 23.9 PPS. This area boasts a varied economy ranging from light industry to tourism and agriculture. Bolzano stands out for more economic diversity and a significant presence of high-value-added sectors because of higher per capita disposable income. Trento has a steady economy with an eye on service sectors and agriculture even though his income is somewhat modest. The great quality of living and first-rate infrastructure of Trentino-Alto Adige appeal to investors and help to create a market for luxury products. These internal conflicts inside the area reflect the several economic factors supporting its general development.

According to ISTAT, combining the autonomous areas of Bolzano and Trento, vehicle density of Trentino-Alto Adige reported a total of 395,000 residences with at least one car and 152,000 homes with more than one car. Out of percentage terms, 32% of Trentino-Alto Adige households own more than one car and 84% have at least one.

After understanding the economic power, the disposable income per capita and the rate of automobile ownership per household of the two areas, we will move to the research of the number of Porsche automobiles, considered a sport-luxury brand, registered region by region in the year 2022.

We will investigate how changes in population and expenditure capacity impact the supercar market in various regions using UNRAE (National Union of Foreign Motor Vehicle Representatives) data.

Porsche sales in Lombardia

In 2022, in this region, 1856 Porsches were registered (UNRAE, 2023), out of a total of 7282. In percentage terms it is equivalent to 25.5% of total registrations.

Lombardia, with its diversified economy and high purchasing power, is a fertile market for supercars.

Porsche sales in Trentino-Alto Adige

In 2022, in this region, 572 Porsches were registered, equivalent to 7.85%.

Though the absolute count is less than in Lombardy, one should take population into account to fairly assess these numbers.

Trentino-Alto Adige, with a much smaller population, exhibits strong demand for Porsches, mostly related to its high per capita disposable income. Strong tourism and excellent quality of living in the area help to support a population with the financial means and cultural tendency to spend on luxury items.

Given the small population, Porsche registrations in Trentino-Alto Adige are very strong.

1.3.2 Economic analysis of Germany's regions

Germany distribution of disposable income and regional gross domestic product (GDP) across the regions are important elements to understand household spending capacity and economic inequalities. Said that disposable income per capita is a key indicator for assessing household purchasing power, and according to 2022 data from Eurostat, German regions show significant variation (Eurostat, Median equivalised disposable income, 2022). Regions with the highest disposable income above 25,000 PPS (Purchasing Power Standard) include Bavaria, Baden-Württemberg and Hesse, which are characterized by robust economies with high levels of industrial activity and important financial firms. At between 21,000 and 25,000 PPS, there are regions like Lower Saxony and North Rhine-Westphalia. Germany's eastern regions, such Saxony and Brandenburg, have lower disposable incomes per capita, ranging

from 17,000 to 21,000 PPS, which reflects the ongoing economic divide between the East and the West.

Germany experiences significant economic disparity within the country, with the southern and western regions having superior spending power compared to the northern and eastern regions. In fact, some areas in northern and eastern Germany are affected by deindustrialization and do not fully enjoy the benefits of the country's economic growth, thus falling into the 13,000 to 17,000 PPS category.

Analyzing now regional Gross Domestic Product, which measures economic output per inhabitant, it reveals, similarly to disposable income per capita, a concentration of economic output in the southern and western regions. Regions with the highest GDP per inhabitant, above 42.233 PPS, include Baden-Württemberg, Bavaria and Hesse (Eurostat, Regional gross domestic product (PPS per inhabitant), 2022); North Rhine-Westphalia and Hamburg, have GDP per capita between 35.333 and 42.233 PPS; regions such as Lower Saxony and Saarland, have GDP per capita between 29,700 and 35,333 PPS; eastern regions such as Saxony and Brandenburg, shows GDP per capita between 25,200 and 29,700 PPS, continue to reflect historical economic disparities.

Economic disparities among German regions imply several consequences: regions with higher per capita disposable income have greater spending and investment capacity, translating into greater demand for goods and services, including luxury goods such as supercars. Economically stronger regions tend to have better infrastructure, further supporting economic growth and attractiveness for investment.

Both in terms of disposable income per capita and GDP per capita, Bavaria and Baden-Württemberg are the richest among Germany's regions.

Bavaria. One of the richest parts of Germany, Bavaria situated in the southeast. Bavaria has great economic power as per capita disposable income exceeds 25,000 PPS. Its economy is somewhat varied, with important sectors such mechanical engineering, electronics, chemicals, and automotive. Global corporations like BMW, Siemens, and Allianz greatly help to explain its strong regional GDP—which is over 42.233 PPS.

High degree of innovation and quality of infrastructure in Bavaria draw both domestic and foreign investment there (Braunstein, 2022). The city of the area, Munich, is a financial and technical hub with a concentration of high-income people well-known for its quality of living.

Baden-Württemberg. Another important region in terms of richness and economic productivity is Baden-Württemberg, in south Germany. Mainstay of the economy, this region has a per capita disposable income equivalent to Bavaria's and a similarly high regional GDP. Major firms such as Mercedes-Benz, Porsche, and Bosch call the area home, and these businesses significantly support its economic growth.
Strong industrial basis of Baden-Württemberg is matched with a robust service industry covering financial services, consultancy, and research and development (Strambach & Klement, 2015). With a population enjoying among the best living conditions in Germany, Stuttgart, the capital of the area is a hub of culture and technology.

Automobile density in Bavaria. With 622 cars per 1000 inhabitants (Statistisches Bundesamt, 2021), Bavaria has one of the largest car densities in Germany. This amount reflects the area's high purchasing power and residents' preference for using private automobiles rather than public ones. The high number of cars per inhabitant is supported by an excellent road infrastructure, which facilitates the ownership and use of private vehicles.

Automobile density in Baden-Württemberg. Baden-Württemberg also shows a high automobile concentration, resulting in 613 cars per 1000 inhabitants (Statistisches Bundesamt, 2021). The region is known for its strong automotive sector, which not only influences the region's economic development but also consumers' predisposition to use private vehicles.

The analysis of Porsche vehicle registrations in 2022, reported by the Kraftfahrt-Bundesamt (KBA), shows that new car registrations are especially concentrated in regions with higher disposable income (Lansley, 2015). In fact, the regions of Baden-Württemberg and Bavaria show the highest registration figures, with 11.759 and 5.265 units, respectively (Kraftfahrt-Bundesamt, 2022).

1.3.3 Economic analysis of France's regions

France is subject to considerable disparities between regions in terms of disposable income and economic output. The regions with the highest disposable income are Rhône-Alpes and Île-de-France, with more than 25.000 PPS (Eurostat, Median equivalised disposable income, 2022). These two areas have solid economic prosperity, with marked levels of industrial activity and big financial firms. Île-de-France, which includes the city of Paris, is the economic center of France, with a strong presence of key sectors including finance, technology and tourism, while Rhône-Alpes is more known for the industrial sector. Other than them, between 21.000 and 25.000 PPS, there are Provence-Alpes-Côte d'Azur and Pays de la Loire. There are also regions with lower disposable incomes between 17.000 and 21.000 PPS, such as Normandy and Brittany,

Even lower disposable incomes per capita, between 13,000 and 17,000 PPS, highlight persistent economic disparities, especially in regions of northern and eastern France, such as Hauts-de-France.

In terms of GDP at the regional level, there is a concentration of economic output in metropolitan and industrialized regions: Île-de-France has a GDP per inhabitant of €62.105, while Rhône-Alpes has a GDP €35.765 (Statista, 2021). Regions of Provence-Alpes-Côte d'Azur and Pays de la Loire show a GDP per inhabitant between €32.838 and €35.273, indicating less, but still solid economic production, while the Normandy and Hauts-de-France regions reveal a GDP per inhabitant between €29.115 and 29.897. It's clear that there are also differences in terms of productivity between the regions. Strategies and implementations focused on reducing regional disparities could be a priority to promote balanced economic development.

Île-de-France. Situated in the north part of France, is the wealthiest region of the nation. It stands as the center of the French and one of the European economies with disposable income per capita of 25.000 PPS. The economy is well diversified, sectors such as finance, services, technology and tourism contribute to the power of it. Companies and financial institutions such as BNP Paribas, Société Générale and the financial business district of La Défense strongly contribute to a strong regional GDP.

Paris, the capital of the region, is a center for high-life style and high-income individuals. This kind of environment is an addressable market for selling luxury goods, as household spending capacity is significantly higher than the national average (Cvijanovic & Spaenjers, 2015).

Rhône-Alpes. Situated in southeastern France, is another important region in terms of wealth and economic output. The region is strategic for the French economy too, with a per capita disposable income comparable to that of Île-de-France and an equally high regional GDP.

This part of France is home to numerous global companies like Renault, Michelin, and Schneider Electric, which creates workplaces and generate high income individuals (Moriset, 2003). This strong industrial base is accompanied by a developed service sector, including alpine tourism and financial services.

Lyon, which is the capital, is a center of innovation and technology, with one of the highest living standards in France for its population.

Automobile density in Île-de-France. Île-de-France, with Paris as capital, considered as the richest and wealthiest region of France, has one of the lowest automobile densities in France. According to the data, 32.5 percent of households own at least one car, with 28.6 percent owning more than one (Insee, 2021). These relatively low numbers could be attributed to the efficiency of public transportation systems in Paris, which makes owning a car useless. In addition, high urbanization and population density mean more traffic jams and for that many households opt for alternative mobility solutions such as car-sharing or public transportation.

Automobile density in Rhône-Alpes. Rhône-Alpes shows a much higher rate of car ownership than Île-de-France. In the Rhône department, 75.8 percent of households own at least one car, while 48 percent of households own more than one (Insee, 2021). Contrary to Île-de-France, this indicates a strong dependence on private vehicles, but a well-developed road infrastructure too. The region, with Lyon as its economic center, having a good level of disposable income, allows households to invest in more vehicles.

In 2022, Porsche recorded more than 3.850 units sold in France, with a considerable portion of these sales concentrated in the two regions.

These different rates of car ownership between Île-de-France and Rhône-Alpes have several implications:

Infrastructure planning: Île-de-France, having a high effectiveness of public transportation (Haywood & Koning, 2015), should continue to improve it and push for an even more sustainable infrastructure for mobility. In Rhône-Alpes, on the other hand, the public transportation infrastructure should be improved but it would be wise to consider the high rate of car ownership and improve the road network and parking services too.

Mobility policies: Mobility policies in Île-de-France are further promoting public and shared transportation solutions to reduce congestion and pollution and in Rhône-Alpes, it could be useful to promote ecological strategies such as the use of electric vehicles and other sustainable solutions to mitigate the environmental impact of owning multiple cars.

Considering all of that, Rhône-Alpes represents a more promising market for luxury vehicle sellers than Île-de-France for the higher rate of car ownership per household and the predisposition to own multiple vehicles.

1.4 Distribution and sales channels

The supercar market is defined by competitive dynamics, in which the automakers' success depends largely on distribution and sales networks. According to Herbert K. Tay, to succeed there must be some ingredients: achieving competitive differentiation, high quality, cost/value and timeliness (Tay, 2003).

This section will analyze the main avenues for supercar sales and distribution, as well as the many approaches there can be, and technology utilized to increase market share and revenue.

For most supercars manufacturers, the conventional dealer network is crucial, offering a direct line of communication between the company and its customers. Especially in luxury markets, where the attention to detail and customer care are crucial, the dealerships offer a personalized shopping experience that is vital. Customers can customize their car to the

tiniest little detail at approved dealerships, resulting in spending several tens of thousands of euros more than the list price.

In addition, direct sales are growing through the expansion of online sales platforms and parent firms' need to maintain direct control over the client experience: online sales present numerous pros, such as the opportunity to include a worldwide audience, the potential for lower distribution costs, and a platform for direct customer connection. On the other hand, they tend to bring some cons too, such as the requirement to have perfect control over logistics of delivery and maintaining a high standard in after-sales care.

Another way of selling, which is growing more and more, comes from e-commerce which impacts customer purchasing patterns: especially with social media, e-commerce platforms, and targeted advertising to sell this kind of cars, digital marketing methods have become more than important for drawing in and keeping customers. It's important to consider that moving to online sales also signifies managing brand's online presence and consumer experience carefully. A crucial ingredient of it is the importance of "after-sales services" that are present in each of these distribution channels. To have satisfied customers and ensure brand loyalty, this support - including warranty, maintenance, and customer relationship management (CRM) programs - must be taken into consideration in the "equation". Indeed, parent companies are making huge investments to have the whole product life cycle followed and checked.

1.4.1 Structure and importance of traditional dealership networks

In the supercar market, traditional dealer networks are crucial, since they represent the main point of direct communication between manufacturers and customers. These networks can be made up of dealerships directly owned by automakers or run under the parent brand, with franchise arrangements. Dealerships owned by the parent company provide exclusive control over the customer experience and brand display, and on the other hand franchised dealerships are run by independent operators which have the license to sell and service brand vehicles maintaining high standards in quality and service.

Often, these networks of sales locations are paired with specialist service centers that offer maintenance, reparations, and after-sales services, crucial for preserving customer

satisfaction, guaranteeing the longevity of vehicles and adding more value to future reselling. Traditional dealer networks can offer a customized and interesting purchasing experience, since the process of purchasing a supercar is felt as a special occasion which is more about the service and the experience than just the financial transaction (Mahdavi, Barbosa, & Graham, 2024).

Local dealers, in fact, provide a quality of service very difficult to match with online channels only, by gradually developing trust and connection with customers which is significant in the market for supercars, where reputation and trust are vital, as said.

To guarantee that cars receive specialized and certified care processes that preserve optimal performance and resale value, dealers also provide after-sales support, like maintenance and repair services. Because of parent company certifications, a car that has always been maintained and repaired at the official network will hold its worth better in the used car market.

Additionally, by having actual dealers in various locations, automakers can better service local markets, catering to consumer preferences and having the possibility to know what they like based on the location they are.

Dealers, in any case, are seen as an extension of the brand (Sitienei & Makokha, 2017), supporting the automaker's image and core values by having showrooms in prime locations - many of which are based on the directives of the parent company in terms of styling and layout. These spaces improve the status and appeal of the brand, and they facilitate sales. Dealers offer insightful input on customers preferences and requirements that the car manufacturer can use to enhance the goods and services' quality they are able to provide.

1.4.2 Regional distribution

Italian, German and French car manufacturers rely on regional distribution of dealerships to achieve their sales goals.

In Italy, supercars dealerships are dispersed, with a concentration in major cities like Milan, Rome and the regional capitals. Milan, the nation's economic center, hosts several

dealerships because of its globally affluent customers, as well as its strong purchasing power. Still, other areas like Rome and Emilia Romagna are just as significant. For example, known as the "Motor Valley" of Italy, Emilia-Romagna, and in particular Modena and Maranello, are home to supercar makers Maserati, Lamborghini, and Ferrari. This area is a major market for luxury automobiles and supercars since most new Ferraris are firstly ordered and customized here by customers coming from all over the world (Ascani, 2024).

In Germany, there are dealerships for high-end cars both in large industrial centers and affluent areas with Stuttgart and Munich being the two principal hubs. Stuttgart, home of Porsche and Mercedes-Benz, is a significant center for supercars because of its robust industrial foundation and long history in the industry. Munich, furthermore, is one of the richest cities in the nation, drawing national and foreign customers with its strong economy and the presence of BMW. It's important also to consider cities like Düsseldorf and Hamburg which, however, represent booming marketplaces. With the goal in mind to provide a high-quality service that is widely available, the German distribution strategy considers the necessity of efficiently covering all prospective interest regions.

About France, the distribution of high-end vehicle dealerships is essentially concentrated in areas like Île-de-France and Rhône-Alpes. Indeed, the economic and cultural center of the nation is Île-de-France, which has Paris as its capital and is home to a sizable population of people with considerable spending power: the city is one of the main markets for luxury automobiles. This favorable atmosphere for supercars dealerships is created by the presence of financial institutions and the headquarters of international corporations. Rhône-Alpes, with Lyon as center, is an important region because of its robust local economy and concentration of automotive manufacturers. Looking south, the French Riviera, Côte d'Azur is another key location for the distribution of luxury cars since it draws affluent foreign customers to its upscale resorts, such as in Cannes and Nice.

1.4.3 Relationship with manufacturers

Relationships between dealers and manufacturers are essential to the success of both parties, since they not only affect vehicle distribution and sales, but the perception of the brand and customer satisfaction. The supercars automakers can adopt different dealership

management models, with different pros and cons, including franchising, direct ownership, and strategic partnerships.

According to the franchising model, dealers are independent and authorized to sell and service brand vehicles. This gives the possibility for manufacturers to expand their distribution network without the burden of directly managing each outlet and the financial investment. Franchised dealers benefit in terms of training, marketing and vehicle sourcing, while maintaining the operational autonomy. This type of relationship can be seen as beneficial to both parties: manufacturers will focus on production and innovation, while dealers will manage sales and customer service. The challenge is that maintaining brand consistency and service quality can be difficult, requiring regular checks and close cooperation between the parties (Dant & Gundlach, 1999).

Directly owned dealerships, on the other hand, are managed directly by automakers. This model gives total control to the parent company over the customer experience and brand presentation. These showrooms serve as brand showcases and they offer highly personalized and luxurious shopping experiences. Direct ownership searches for greater uniformity in service and management of daily operations, but also requires significant investment by the manufacturer (Deloitte).

Another relationship model is strategic partnerships between dealers and manufacturers which can range from joint ventures to exclusive distribution agreements. In this sector, strategic partnerships are useful for entering new markets or regions where the manufacturer has a limited or no presence: these agreements allow the partners' local expertise to go with the quality and innovation of the manufacturer's vehicles, in this way facilitating faster and more effective market penetration.

Another crucial aspect of the dealer-manufacturer relationship is ongoing training and support. Sports car automakers always invest in training dealer personnel to make sure that they have the skills necessary to provide high-quality service. This includes technical knowledge of vehicles, skills in sales, marketing and customer service. The parent company

support also extends to marketing, where dealerships are provided with promotional materials, advertising campaigns and other resources to help them achieve their sales goals.

Automakers monitor the dealer's performance, and this allows them to quickly identify any problems and implement immediate solutions. A regular and clear communication between manufacturers and dealers is essential to maintaining a strong and effective relationship. Common tools for aligning strategies and sharing best practices can be regular meetings, summits, and conferences.

1.5 Direct sales models

Direct sales models are becoming more and more relevant, revolutionizing the way manufacturers interact with customers. To meet growing expectations and personalization, automakers are exploring new approaches: this section will focus on key direct sales models, particularly how online sales platforms, manufacturer-owned showrooms, and temporary stores or experiential centers are reshaping sales strategies and customer experience.

Digital technologies made it possible for car manufacturers to adopt online sales platforms, giving direct and immediate access to the products to potential customers. These kinds of "digital tools" not only facilitate the buying process, but also allow customers to do a configuration of their vehicles according to their personal preferences, since they can have access to detailed information and instant support. Online sales platforms are an effective answer to the needs of a market that is increasingly focused on convenience and speed, without the risk of compromising exclusivity and quality of the buying experience.

Car manufacturer-owned showrooms are a great example of how manufacturers are trying to have control over every aspect of the customer experience. These showrooms, which are often located in strategic high-traffic locations or in pedestrian zones, offer luxurious environments where customers can interact directly with the brand and its products. This type of space allows manufacturers to give a highly personalized service, reinforcing in this way brand perception and building trusting relationships with customers. These spaces also serve as "showing innovation" centers, where customers have the possibility to experiment with the latest technologies and designs.

Pop-up stores and experiential centers are innovative direct selling strategies that aim to create significant impact in specific markets or during special events. These spaces, which can be very different from one to another, allow manufacturers to test new customer targets, promote specific models, and offer unique brand experiences. Pop-up stores and experiential centers attract new customers, but the most important point is that they also strengthen the loyalty of existing customers creating memorable and engaging experiences. Now these models will be analyzed in more detail.

1.5.1 Online sales platforms - virtual showroom

A virtual showroom is a digital simulation of a physical showroom created with 3D, AR, and VR technology. Virtual showrooms offer immersive product buying experiences from the comfort of customers' homes, eliminating the need to travel and offering convenience and immediacy. At the same time, virtual showrooms allow brands to showcase their entire product range, in all configuration options, without space restrictions (Reynolds, 2023).

These virtual spaces make it possible for customers to explore available models, configure their ideal car with all the specifications they need, view financing or leasing options, and complete the purchase online. The online configuration is one of the most popular features, allowing customers to customize every detail, from color options to interior accessories, creating a tailored buying experience. In addition, official websites often offer augmented and virtual reality tools to view the vehicle in 3D or take a virtual tour. Direct selling via their official websites makes it also possible for manufacturers to keep higher profit margins by removing the need for middlemen. Potential buyers can also connect with automobile dealers directly through the virtual showroom and book a test drive if interested.

There are no limitations on product availability, opening hours, or area requirements when using virtual showrooms. Customers are free to test any product at any moment.

Virtual showrooms have the added benefit of being able to be set up once and left online indefinitely. In contrast to physical showrooms with limited capacity, companies can publish an infinite number of virtual products online for their customers to view. Conversely, buyers only need an internet connection to visit virtual showrooms from anywhere.

Brands may also offer a customized and incredibly memorable client experience with virtual showrooms. Consequently, businesses stand to gain an advantage in the fiercely competitive retail and e-commerce sectors, as well as raise interest and brand awareness and consideration.

In addition to that, vehicle delivery logistics and after-sales service management are complex, especially for supercars that often require a high level of maintenance and service. Furthermore, the transition to online sales requires investment in digital infrastructure and staff training to make sure that the customer experience is consistent and of high quality.

These platforms are an effective response to the needs of a market increasingly focused on convenience and speed, without compromising the exclusivity and quality of the shopping experience.

1.5.2 Flagship stores

"Flagship stores are defined by three key characteristics: they carry only a single brand of product, are company-owned, and operate with the intention of building brand image rather than solely generating profit for the company" (Moore, Doherty, & Doyle, Flagship stores as a market entry method: the perspective of luxury , 2008) (Moore, Doherty, & Doyle, 2008)

A flagship store is often placed in strategic locations such as the center of large metropolises. Starting precisely from the term "flagship," it is possible to infer how these stores, usually larger and more innovative than other outlets, are meant to represent (in a more tangible and concrete way) the brand, since they are, precisely, its "flag."

In its original context, the concept of a flagship is used to refer to the best or largest ship within a fleet, the one on which the admiral sails and which carries either the flag of the admiral himself or the commander's insignia. Drawing parallels with the world of retail, the stores in question tend to be particularly attractive, distinctive in design, often functional in attracting the attention of passersby on the street and increasing brand awareness. This kind of store is often used by brands for brand positioning or repositioning, that is, to work on brand image, offering consumers certain style, concept, and associations related to the brand,

but also to nurture the bond between brand and consumers. In fact, the flagship store is a useful tool for presenting the brand, through which the company can present itself in a more tangible and appealing way and, in some cases, tell the story of the brand and related products as in a kind of museum.

This type of store can also be used for rebranding purposes when a company wants to reposition itself in the market and change its communicative style by associating itself with concepts and values different from those chosen up to that moment: in these cases, a flagship store can be inaugurated or refurbished precisely to present to consumers the new mission, new message or brands created (Arrigo, 2015).

A prime illustration of this is the Ferrari flagship store in Milan, which provides a combination of avant-garde and heritage, thereby inviting an iconic immersive experience. The space was developed in a manner that was both a continuation and an evolution of the Maranello store, beginning with the same concept as that envisaged by London-based Studio Sybarite. The retail space, which spans three floors in a period building located a few steps from Piazza del Duomo, is intended to encapsulate Ferrari's principles of performance, style, and innovation. The store spaces are interconnected, with differing functions but a single cohesive narrative that conveys the brand's essence. This narrative includes references to a legendary history, racing content, and the new fashion collections designed by creative director Rocco Iannone. A Formula 1 car, a perfect replica of the single seater in which Michael Schumacher won the World Championship in 2002, is suspended between two levels in the interior atrium, adding a visual twist. Installations and thematic exhibits alternate with garments and accessories in this emblematic location, which simultaneously speaks a powerfully contemporary language and is projected into the future, while also demonstrating an inextricable connection to the Ferrari tradition.

1.5.3 Pop-Up stores

A pop-up store is a temporary store, which serves a specific purpose, functioning by being open in short-term outlets, often to celebrate an event, to sell a particular product, to launch a new line. Generally, this type of store remains active for a period ranging from days to weeks.

This is because the concept of a pop-up store, which is a marketing technique, leverages the concept of a time limit, inducing potential customers not to miss out on what is, for all intents and purposes, an initiative offered only for a very short period.

Typically, a pop-up store is placed in high foot traffic areas such as city centers, shopping malls and busy streets to reach as many visitors as possible. In fact, it is referred to as consumers visiting the store, emphasizing the experiential nature of the initiative.

An example of a pop-up store is Porsche NOW, a retail space dedicated to fans of the Stuttgart automaker. There is possible to take advantage of sales services within a flexible space with the values and innovations of a Porsche Center. These kinds of spaces are designed according to a clean, thoughtfully designed layout that allows visitors to walk through being able to admire the new Porsche models on display up close and choosing merchandise to purchase through a refined and functional display system. The careful compartmentalization of spaces also allows visitors to meet car sales staff in total privacy, within dedicated lounges (Porsche, Porsche Now, 2023).

1.5.4 Experience centers

Experience centers are permanent or semi-permanent spaces with the aim to create strengthening brand-related experiences. These centers offer the opportunity to understand more about brand vehicles, technologies and values by doing interactive activities, test drives on the track and driving simulations. These centers are strategically located in specific environments of luxury and innovation.

In addition, they allow manufacturers to present the latest technological innovations and advanced designs of their vehicles, creating a stronger connection with customers that goes beyond the simple process of buying a car.

Most of the supercar brands like Porsche, Ferrari, Lamborghini and McLaren offer luxury driving experiences in controlled and specialized environments. Particularly, the Porsche Experience Center allows participants to do different activities like testing some Porsche models on professional tracks with customized driving programs. Ferrari also offers the

"Pilota Course," with courses on iconic tracks to upgrade driving skills under professional instructors' supervision. The "Lamborghini Academy" holds driving events on the track and in the snow, letting participants explore the vehicles' dynamic capabilities in a variety of different conditions. McLaren, with its "Pure McLaren" programs, provides drive experiences on famous circuits, combining one-on-one driving coaching sessions with high-performance driving.

Pop-up stores and experiential centers can help to meet and attract new customers, increase the visibility of the brand and create real experiences. However, creating and managing the spaces requires a significant investment in time, money and planning. Furthermore, experience offered lives up to the expectations of luxury customers so it's very important to maintain consistency with the brand image.

Generally, the dealerships' distribution in a region is determined by some important characteristics, including dealerships' visibility from the street and accessibility, the local luxury culture, and in particular the capacity to give to customers personalized shopping experiences. These considerations must be added to other factors like population density and average income. Personalized shopping experiences, such as VIP treatment and test drives, can attire customers from different areas as well. Another key point to consider is that the demand for luxury cars is heavily influenced by the culture and lifestyle of the area: dealerships find rich markets in areas like Lombardy, Italy, or Bavaria, Germany, which have a long history of supercars. Due to seasonal demand, for example cabriolet supercars often requested moments of the year, and the influx of wealthy tourists, these dealerships can also be effective in touristic locations such as the French Riviera and Alpine regions.

1.6 The impact of advertisement

1.6.1 digital marketing strategies

Marketing strategies have a crucial role in attracting and engaging customers. Sports car automakers are adopting numerous advanced digital marketing techniques to promote their products and create brand experiences (Dash & Sharma, 2019).

Traditional newspaper advertisement

Advertisements are the primary tools that shape the purchasing behavior of customers and their intention to make a purchase. Advertising expenditure constitutes a substantial component of companies' marketing expenses. They are utilized in buyer behavior models to capture client attention and create awareness (according to the AIDA model), which might potentially lead to a response. The appeals are the “stimuli” that trigger psychological motivations for making a purchase and it can be employed to specifically target a wide audience that is dispersed across different geographical locations or can be specific to a smaller target. They play a significant role in a company's communication strategy and have a powerful impact on consumers. Daniel Pope asserts that the recurrence of an advertisement creates a lasting impact on customers' minds, enhancing their ability to recall the product and increasing the likelihood of repeat purchases (Pope, 2003). The Gear model (2009) elucidates the extent to which a particular advertisement successfully accomplishes the primary goal of all advertising, which is to enhance the 'buying intent' towards the promoted brand.

Newspaper advertisements mostly serve the purpose of providing information rather than creating a transformative impact on branding and they solidify the brand identification. Competitor branding strategies can be analyzed by scrutinizing the benefits and characteristics they are promoting to their clients in newspaper advertisements.

Magazine advertisements

Magazine advertisements have an edge over conventional postal mail or daily newspapers since they can display higher quality images, providing a more distinct representation of the product and creating a stronger impact on potential customers and they frequently target a specific demographic, allowing advertisements to be tailored to a particular audience. In addition, they possess a lengthier duration of availability compared to daily newspapers because of their superior printing standards and certain individuals engage in the pastime of amassing magazines, and several magazines have established themselves as distinct brands. The level of support that the advertisement receives from the magazine's identity is directly proportional to the strength of the reader's relationship with the magazine as a brand.

Digital media

Brands can establish direct and interactive communication with potential customers to initiate a mutually beneficial business relationship. Recognizing the influence of social media, numerous high-end firms are utilizing the platform to establish a robust rapport with their clients by engaging in round-the-clock online dialogues. Luxury brands specifically utilize social media platforms for promotion and marketing purposes (Kim & Ko, 2012).

Digital media facilitates corporate communication: the primary characteristic of digital media is its independence from the sole control of product or company designers. The content can be created by users or non-users, without any limitations of time or location and it can be reproduced easily and stored at a very low or negligible cost. This allows for consumer networking and enables the content to be transferred between different technology platforms that have a digital interface (Mulhern, 2009).

Digital media facilitates branding initiatives by fostering engagement through various digital platforms, particularly the internet and mobile devices, which have a vast and extensive audience. Additionally, it is the most economical advertising medium, since several approaches employed in digital marketing include search engine optimization, search engine marketing, social media marketing, social media optimization, e-commerce marketing, and e-mail direct marketing. Social media has become the predominant medium for engaging with consumers, prompting car manufacturers to have a presence on various platforms including Twitter, Instagram, TikTok, and YouTube.

Display Events

Exhibiting events offer an efficient means to engage with customers within a specific target market. Through the process of educating customers, they effectively establish trust in the brand. Customers can gain a full understanding of the brand, product display, features, price, and other relevant information, which helps to effectively establish brand awareness. This type of branding typically occurs in public spaces such as residential complexes, shopping centers, and technology parks, depending on the specific target audience.

Corporate Branding

Internal branding is the strategic approach that enables employees to effectively promote the company's brand to potential customers as it aims to instill the company's culture and identity in employees, encouraging them to actively participate in the company's mission, recruitment methods, induction and training programs, awards and recognition, and innovation promotion initiatives. The most effective advocates for a company's brand are employees that have a strong emotional and psychological attachment to the organization. Internal branding is typically conducted within the showroom, showcasing the distinctive sentiments that employees hold towards the company.

1.6.2 Cultural preferences and brand influence on supercar prices

Cultural influencers have a significant impact on molding consumer trends. These influencers, who frequently represent distinct cultural values or aesthetics, can affect the tastes of their followers. By partnering with culturally significant individuals, brands may access well-established communities and enhance their credibility within specific cultural subgroups.

An illustrative instance pertains to the collaboration between Porsche and Dua Lipa for the unveiling of the latest fully electric Macan.

The musician served as both a co-writer and co-director for the Macan's unveiling commercial: Porsche, the automaker based in Stuttgart, conveys its message by appointing a pop culture icon as the leader of the new Macan and granting her complete freedom to narrate the story, effectively activating a “microphone” that directly targets a fresh audience and communicates in a language they comprehend. Cultural trends have a substantial impact on the development of car design and marketing techniques. Gaining a comprehensive understanding of these patterns is essential for automakers to maintain their relevance and attractiveness in a fiercely competitive market (Hartawidjaja & Agus, 2023). Consumer views about brands are influenced by functional consistency, since customers are more likely to be drawn to products that align with their ideals. Furthermore, when the brand image aligns with the consumer's internal self-image, it enhances the emotional connection between customers and the brand (Xi, Yang, Jiao, Wang, & Lu, 2022). The remarkable aesthetics and exceptional craftsmanship of high-end products serve as both a display of extravagant

spending and a reflection of consumers' personal identity. Consumer perception suggests that the consistent functionality of luxury goods can enhance a brand's personal identity. "Luxury goods are commonly regarded as symbols of social status among consumers who prioritize social connections and interactions (Gilady, 2018)". Consumers hold the belief that the higher the price of a luxury item, the greater its value and the more justified it is to make a purchase. Branding has a significant impact on consumer behavior through various channels, such as shaping consumer perception, influencing purchasing choices, and leveraging the power of peer recommendation. "Brand information quality" refers to the degree of excellence in the useful information acquired by community members. According to a study published in Frontiers, providing consumers with high-quality information can gradually increase their propensity to engage with luxury businesses. The coherence of values elucidates the perceived resemblance between the ideals upheld by individuals and organizations.

1.7 Introduction to the role of after-sales services

We will now explore how after-sales services influence brand perception and customer loyalty by analyzing the warranty and maintenance programs offered by supercar automakers and the importance of customer relationship management (CRM) systems. Excellent after-sales service can make the difference between a satisfied customer who returns for future purchases and one who chooses a competitor for their next vehicle. Supercars automakers invest significantly in their warranty and maintenance programs to ensure that each vehicle maintains its optimal performance over time and that customers have a trouble-free experience. In addition, customer relationship management (CRM) systems have become crucial tools for luxury automakers. These systems help track and analyze customer interactions, enabling companies to provide personalized and timely service.

1.7.1 Importance of after-sales support

In the supercars selling business, the range of after-sales services are extremely important to keep customers' satisfaction and brand loyalty. These activities include regular maintenance, warranty management, repairs, and provision of roadside assistance. Effective after-sales

support solves technical problems that may appear and helps to create a lasting relationship of trust between the client and the brand.

Keeping in mind that regular maintenance is essential to ensure optimal performance, well-structured maintenance programs give customers peace of mind that their vehicle will be kept in the best possible state. According to a report by J.D. Power, regular maintenance programs result in more satisfaction of customers with their vehicle and the brand than those who do not (Troy, 2024). Preventive maintenance also helps to avoid possible major problems that may arise in the future, reducing the risk of costly breakdowns.

Moreover, warranties offered by supercars manufacturers are another critical part of the after-sales support. Warranties provide customers with coverage against manufacturing defects and mechanical problems for a defined period.

Finally, roadside assistance is a service of great importance to luxury car customers, offering immediate support in case of emergency or breakdown. This service includes roadside assistance, towing, and assistance with minor on-site repairs. Ferrari, for instance, provides a 24/7 roadside assistance program that guarantees customers rapid and efficient support in any scenario, providing a replacement car immediately if necessary (Ferrari, Ferrari Roadside Assistance App).

1.7.2 Warranty and maintenance programs

Warranty and maintenance programs offered by supercar automakers generally cover manufacturing faults and mechanical defects for a specific period or mileage. They can be standard warranties, extended warranties, and warranties on the main components of the vehicle. Precisely, standard warranties are offered as part of the purchase of each new vehicle, and they cover a period of three to five years or up to a certain number of miles. Extended warranties are options on which customers can extend coverage beyond the standard warranty.

BMW, for example, provides an extended warranty option that can cover up to six years or 100.000 kilometers, giving customers added reassurance. Porsche offers a "Porsche

Approved" program, which provides a warranty for certified pre-owned vehicles like that for new vehicles, including coverage for up to 10 years that ensures the vehicle's performance and reliability. Ferrari's "Ferrari New Power," on the other hand, offers a standard three-year warranty for all new vehicles, with the option to extend coverage up to 15 years from the date the vehicle is first registered, covering major components such as the transmission and the engine. For current hybrid vehicles, Ferrari plans to substitute defective components with more technologically advanced parts in the coming years, providing additional customer care (Ferrari, 2024).

Maintenance programs are designed to ensure that these vehicles keep optimal performance over time by offering a range of preventive and corrective maintenance services. Under standard conditions, many automakers offer scheduled maintenance to vehicles. Preventive maintenance aims to prevent mechanical problems before they occur through regular inspections and replacements of wear parts. Ferrari, for example, offers a preventive maintenance program that includes annual inspections and replacements of critical parts to ensure that vehicles maintain their high performance over time.

1.7.3 Customer Relationship Management (CRM)

Customer Relationship Management (CRM) enables the management of all company interactions with both existing and potential customers. The goal is to optimize relationships to grow business, enabling companies to stay connected with customers, streamline processes and improve profitability.

CRM, in general, refers to a software system designed to keep track of every customer interaction, which can occur through sales calls, customer service interactions, marketing emails, and many other touchpoints. An effective CRM system facilitates relationship management throughout the customer lifecycle, promoting customer connection and retention and possible future sales.

CRM systems can collect and analyze a wide range of customer data, including demographic data, purchase history, maintenance management preferences, and customer feedback. In this way, the CRM system is helpful for luxury automakers to better understand customer

requests expectations and, thus, to offer personalized service (Cailleux, Mignot, & Kapferer, 2009).

Currently, for supercar automakers, creating a personalized customer experience has become a necessity to stand out in an increasingly competitive market. For example, BMW uses its CRM system to send personalized reminders to customers about vehicle maintenance deadlines or appointments through the infotainment system, offer exclusive invitations to events, and present special offers based on purchase history.

Another significant benefit of CRM systems is improved customer service. Indeed, by monitoring customer interactions, it is possible to ensure that customer inquiries are handled in a timely and efficient manner. This is especially relevant for luxury car customers, who expect a high level of service.

An effective CRM system can have a positive impact on future sales. The data collected through it enables the company to anticipate customer needs and preferences and refine sales strategy. For example, by analyzing data on customer preferences, an automaker can identify the most popular models and focus marketing campaigns on these vehicles, increasing the likelihood of successful sales.

2. Arbitrage in the European used supercars market

The concept of arbitrage, traditionally associated with financial markets, plays an important part in the supercar market, particularly in identifying and capturing wide differences in price between different geographic regions. The European market, with great diversity of consumer preferences, different economic conditions and regulatory environments, provides fertile ground for arbitrage opportunities.

This chapter analyzes the theoretical foundations and practical applications of the concept of arbitrage in the European used supercar market, with particular focus on Italy in comparison with Germany, and France, which can be very similar in terms of economic and social environment, as seen in the first chapter. Next, the chapter focuses on how arbitrage opportunities can be identified and executed, highlighting the characteristics of each country in the European market that contribute to pricing discrepancies.

Additionally, this chapter analyzes the possible motivations that create "arbitrage opportunities" in the used supercar market: factors such as information asymmetries, consumer behaviors, different economic conditions, technological advancements, and cultural differences will be examined to understand why arbitrage can continue to exist in this niche market. This chapter aims to provide a robust framework for understanding the mechanics of arbitrage in the European used supercar market, setting the stage for the empirical analysis that will be conducted in the next chapter.

2.1 Introduction to arbitrage in the supercar market

In the specific case of the supercar market, arbitrage arises with the idea that by buying a vehicle in a market where the price is relatively low and reselling it in another market where the price is higher, it is possible to obtain a profit following a careful assessment of the potential risks.

2.1.1 Understanding arbitrage

The definition of arbitrage is "the simultaneous purchase and sale of the same, or essentially similar, security in two different markets for advantageously different prices" (Sharpe & Alexander , 1990).

For it to occur, there must be a scenario where there are at least two identical assets with varying prices. Arbitrage is the act of making a profit by exploiting the discrepancy in pricing of assets across various markets. Arbitrage is the act of buying an asset in a market where its price is lower and selling it concurrently in a market where its price is higher.

This practice usually comes from financial markets, where it gets associated with financial instruments such as currencies, stocks, and bonds, and taking into consideration the European supercar selling market, arbitrage exists because of the significant differences in prices that dealers put on vehicles between the different countries - Italy, Germany, and France for our analysis. These differences are dictated by various factors that will be analyzed and that create profit opportunities for those who can identify these discrepancies. In the case of supercars, the process is much more complicated since every car is different from the other for accessories, mileage, mechanical, exterior and interior conditions.

2.1.2 Arbitrage in the supercar market in Europe

The European used supercar market is characterized by several peculiarities that make arbitrage possible. Explaining the reasons for the difference in prices of luxury cars may be different commercial policies or positioning compared to competitors sold in different markets, as well as choices based on different transportation costs. For example, studies conducted by European economic institutes have shown that taxation on luxury vehicles varies significantly between countries such as Italy, Germany and France (ACEA, 2021), going to significantly influence the final price of supercars, both new and used.

Furthermore, there are discrepancies in emissions and environmental legislation between different countries within the European Union. Certain states implement stricter regulations that might impose penalties on high-emission automobiles, often specifically targeting supercars. This can result in a reduction in demand in such markets, impacting prices and potentially generating arbitrage possibilities. Furthermore, there is variation among EU countries in terms of rules pertaining to emissions and environmental standards. Certain

states implement stricter regulations that might impose penalties on high-emission automobiles, often specifically targeting supercars. This can result in a reduction in demand in such markets, which can have an impact on pricing and potentially give rise to arbitrage possibilities.

Today, most EU countries levy car taxes partially or totally based on the CO_2 emissions and/or fuel consumption of a vehicle and/or on power output. Several countries still tax cars on their power, price, weight, cylinder capacity, or a combination of these factors.

General economic conditions, such as the level of income per capita and the propensity to consume luxury goods, also differ among European countries. According to Eurostat data, there are significant discrepancies in purchasing power between nations, which can be reflected in the demand for and prices of used supercars (Eurostat, 2021).

2.2 Theoretical approach to arbitrage

Arbitrage is profoundly embedded in the economic related theories that explain the dynamics and conditions of its existence. In this context, the theoretical analysis gives a comprehensive framework for how and why arbitrage occurs in the market for used supercars in Europe. Market behavior, inefficiencies, and information asymmetries are factors that affect the potential for arbitrage trades.

An influential theory in this regard is Eugene Fama's efficient market hypothesis (EMH). Based on this idea, asset prices accurately represent all the information that is currently accessible. As a result, theoretically, there should be no opportunities for arbitrage (Fama, 1970). Nevertheless, the theory acknowledges that in markets that are not completely efficient, such as the supercar market, exploitable inefficiencies may arise.

Another important theory is related to the principle of intrinsic value, which is crucial in determining the worth of used supercars. This concept is based on the notion that each asset possesses an inherent value that varies from the prevailing market price. As a result, it presents various possibilities for arbitrage when the market price considerably diverges from the estimated intrinsic value. When it comes to supercars, elements like scarcity,

condition, and history can play a role in determining the inherent worth, which in turn can lead to lucrative purchasing and selling prospects.

This section will provide a comprehensive analysis of these ideas, demonstrating their practical application in comprehending the dynamics of arbitrage in the European used supercar market.

2.2.1 Efficient markets hypothesis (EMH)

The efficient markets hypothesis (EMH) asserts that market prices accurately incorporate all accessible information. Early theoretical developments are due to Samuelson (1965) and Mandelbrot (1966). In Fama's (1970) definition, a financial market is efficient if at each instant the price of traded assets fully reflects the relevant information available so that no further arbitrage is possible: competition ensures that asset returns are at their equilibrium levels, that is the equality of supply and demand (Blume & Durlauf, 2007).

According to a formalization proposed by Eugene Fama in 1970, there are three distinct hypotheses of market efficiency:

1. Efficiency in a weak form: the prices observed in the market reflect all the information contained in the historical price series itself; it is not possible to formulate a trading strategy with an expected return - possibly risk-adjusted - higher than that of the market based only on the information contained in the historical price series.
2. Efficiency in a semi-strong form: market prices reflect not only the information contained in the historical price series, but also any other public information; therefore, it is not possible to formulate a trading strategy with an expected return - possibly risk-adjusted - higher than that of the market based only on the information in the public domain.
3. Strong-form efficiency: market prices reflect, in addition to what was seen before, any private information; it is not possible to formulate a trading strategy with an expected return - possibly risk-adjusted - higher than that of the market based on any private/privileged information.

Within the context of the used supercars industry, the concepts of weak form and semi-strong form hold particular significance. Nevertheless, the supercar market exhibits features that

deviate from the ideal conditions of an efficient market, as posited by the Efficient Market Hypothesis (EMH) theory. That is the reason why market inefficiencies arise due to variables like illiquidity, asset heterogeneity - each supercar possessing distinct characteristics and histories, and asymmetric information between the buyer and the seller: a collector may have knowledge regarding the history of a vehicle in his/her possess that is not easily available to other prospective purchasers, resulting in an informational edge that can be utilized for arbitrage opportunities.

Furthermore, the emotive and subjective nature of the value attributed to supercars contributes to the divergence of this market from the notion of efficiency. The supercar market is influenced not only by economic realities, but also by variables such as the perceived scarcity, sentimental value, and prestige connected with specific brands or models. Arbitrageurs can take advantage of market price disparities caused by the re-entry of these elements.

2.2.2 Theory of intrinsic value and market price

The intrinsic value of an asset represents the value that an asset possesses regardless of what it may acquire because of market trading (Green, 2021).

Regarding supercars, multiple factors define the intrinsic, including:

- Numbered editions and limited production: they increase substantially its intrinsic value. The intrinsic value will be higher than a model produced in large quantities. For example, the Porsche 911 S/T was produced in 1963 exemplars, celebrating 60 years since the first 911 was produced.

- Condition of the vehicle: in a used vehicle the presence of well-maintained low mileage and original parts is crucial in defining its intrinsic value.

- History and provenance: the car's history, especially if it had only 1 previous owner, can increase substantially the intrinsic value with older cars, or, for example, a supercar owned by a celebrity or winner of major races.

In some cases, the market value can differ greatly between two neighboring nations. The skill of the buyer is in understanding that the intrinsic value is higher than the sale value of the car in that country and taking advantage of the arbitrage opportunity.

2.3 Technical approach to arbitrage

The technical approach to arbitrage in the supercar market begins with a collection of market data, finding the significant differences in car prices between different European countries. Note that these variations can be explained by diverse economic conditions, regulations, and different customer demand.

In addition, arbitrage requires a detailed analysis of the costs associated with the transaction and effective logistics planning, including transaction fees such as custom duties, transportation and insurance costs. These costs must be compared with the potential gain to determine whether arbitrage is viable and profitable.

Another crucial aspect is the timing of the transaction. The supercar market is based on illiquid products, so they cannot be sold or purchased quickly but, rather, may take longer to purchase and have the vehicle “in hand”. Therefore, it is important to plan the arbitrage transaction carefully to minimize risks associated with sudden price changes or changes in market conditions.

Finally, risk management is a component to be considered in the technical approach to arbitrage. Market risk may be related to market volatility, which sees frequent market changes and depreciation. There can also be operational risks, including transportation delays or legal complexities.

Therefore, proper planning and the use of insurance coverage can help to mitigate these risks and guarantee the successful arbitrage transaction. Another very crucial aspect is the timing of the transaction.

2.3.1 Identification of price discrepancies

As previously mentioned, in the used supercar market, price differences are not random, as costs are influenced by economic, regulatory, and cultural factors that vary across EU countries. Analyzing where differences in these factors originate serves to identify arbitrage opportunities and exploit effective buying and selling strategies.

The law of supply and demand is an economic premise that underpins most economic notions. It gauges individuals' level of interest in a specific product or service. Scarcity of supply leads to increased value. In general, a higher price for items tends to result in a lower percentage of individuals purchasing them. Several variables can impact the supply and demand. This might result in a shift in the demand-supply equilibrium on the graph, either increasing or decreasing the intersection point. Especially in supercars, differences in supply and demand conditions between local markets can therefore create opportunities for arbitrage (Nelson, 2013).

Differences in tax policies and regulations. One of the main factors influencing the price of supercars in European markets is the difference in tax policies and regulations. In some EU countries, taxation on supercars, from VAT to customs duties, can be heavier than in other states.

In Italy, from 2012 onward there has been the "*superbollo*" introduced with the law No. 214 of 22/12/2011 at Art.16, an indirect tax additional to the car tax - or stamp duty, which is levied on owners of passenger cars and motor vehicles for the mixed transport of goods and persons, which have a power output of more than 185 kW.

The amount of the "*superbollo*" is 20 euros for each kW exceeding 185 kW for a up to five years old vehicle, but as the years of seniority increase you are entitled to the following reductions:

- to 60% after five years from the date of construction,
- to 30% after ten years from the date of construction,
- to 15% after fifteen years from the date of construction,
- and is no longer payable after twenty years from the date of construction.

The periods run from January 1 of the year following the year of construction (ACI).

However, each region has introduced exemptions or reductions on the car tax due for electric or hybrid vehicles that then also apply to the "*superbollo*".

In particular, the state has decided that for electric cars the exemption applies for a maximum of 5 years after registration, after which time the "*bollo*" is paid again, but already applying the reduction provided for cars that have been registered for more than 5 years.
For hybrid cars the "*superbollo*" is exempted for 3 years in some regions, at the end the superbollo will be due only for the part of the power output expressed in kW of the part of the internal combustion engine that exceeds 185 kW. In practice, if the power of the combustion engine is less than 185 kW, the "*superbollo*" is not due even if adding the power of the electric motor exceeds this threshold.
In addition to this, there's the "*ecotax*": one-time tax for vehicles emitting more than 160 g/km of CO_2 to be paid at the time of purchase. The "*ecotax*" is equal to: 1,100€ for cars with emissions between 161 and 175 g/km of CO_2; 1,600€ for the 176-200 g/km range; 2,000€ for the 201-250 g/km range; and 2,500€ if over 250 g/km. The tax must be paid at the time of purchase of the new and used vehicle if registered after March 1, 2019.

In Germany the motor vehicle tax is a federal tax that all motor vehicle owners must pay annually. The foundation is based on the "*polluter pays*" principle: vehicle owners are required to pay for the damage they have caused to roads and the environment.
The amount of road tax is bound. This means that vehicles that emit more pollutants are taxed more heavily. For example, owners of diesel vehicles must pay a higher road tax.
The following data are needed to calculate the road tax. They can be found in Part I of the registration certificate or the vehicle registration document: CO_2 emissions, drive type, and displacement.
- Low-emission vehicles are divided into Euro 1, 2, 3, 4, 5 or 6 emission classes. Euro 6 has the lowest emissions and Euro 1 the highest.

These costs apply to individual pollutant classes:
- Euro 3 and higher (limits up to 2.5 tons): 6.75 euros for gasoline vehicles, 15.44 euros for diesel vehicles
- Euro 2: 7.36 euros for gasoline vehicles, 16.05 euros for diesel vehicles
- Euro 1: 15.13 euros for gasoline, 27.35 euros for diesel vehicles
- Euro 0 (no ozone ban): 21.07 euros for gasoline, 33.29 euros for diesel

- Euro 0 (other): 25.36 euros for gasoline, 37.58 euros for diesel

The amount of the road tax is composed of two parts:
Part 1 is based on the type of fuel and the size of the engine capacity: Gasoline cars pay 2 euros per 100 cm^3 of engine capacity or part thereof, diesel cars 9.50 euros.
Part 2 is about pollutant emissions. The date of first registration is important. Cars registered before January 1, 2012, may emit slightly more pollutants. As of 2014, the current limit for new registrations is 95 grams per kilometer. Each additional gram costs the owner two euros more in road tax (Bundesministerium der Finanzen).

In France the "malus écologique" is calculated based on the CO_2 emission of the vehicles and the relative weight. Differently from Italy and Germany, in France the tax is applied only when the car is registered for the first time.

From January 1, 2024, the trigger threshold has been established at 118 g/km of CO_2 and the utmost ceiling has been increased to €60,000.

Starting on January 1, 2022, a penalty based on weight has been imposed on new vehicles, regardless of whether they run on gasoline or diesel, if they weigh over 1,800 kg. By 2024, the minimum weight requirement for the application of this tax has been reduced to 1,600 kg. The objective of this strategy is to incentivize manufacturers to fabricate automobiles with lower weight, thus diminishing CO_2 emissions and air pollutants (Administration française).

Taking as an example a Porsche Carrera s 911 (992) with 450 hp (331,5 kW), with a 3,000 cm^3 engine and emitting 209 g/km of CO_2 (Porsche, Fuel consumption, s.d.), base price for the vehicle €143.280 (Italian price) the cost for the first year as vehicle taxes would be:

Italy - superbollo	**Germany - Kfz Steuer**	**France - malus écologique**
Base "*Bollo*" Calculation: First 100 kW: €2.58 per kW = €258.00 Remaining 231.5 kW: €3.87 per kW = €895.70 Total Base "*Bollo*": €258.00 + €895.70 = €1,153.70 "*Superbollo*" Calculation: Power above 185 kW: 331.5 kW - 185 kW = 146.5 kW €20.00 per kW over 185 kW = €2,930.00 "*Ecotassa*" una tantum: €2,000	Tax for engine displacement: € 2.00 per 100 cm^3 for petrol engines. €2.00 x 30 = € 60.00 per year. The tax is calculated based on emissions above 95 g/km, with each gram over this threshold being taxed at €2.00: 209 g/km - 95 g/km = 114 g/km €2.00 x 114 = €228.00 per year.	With 209 g/km of CO_2 emitted, total tax= €60.000
Total Annual Tax: Base "Bollo" + "Superbollo" = € 1,153.70 + € 2,930.00 + € 2,000 = € 6,083.70 for the first year.	Total Kfz-Steuer: € 60.00 (engine displacement) + € 228.00 (CO_2 emissions) = € 288.00 per year.	Total malus écologique: € 60.000 (only first year of car's registration).

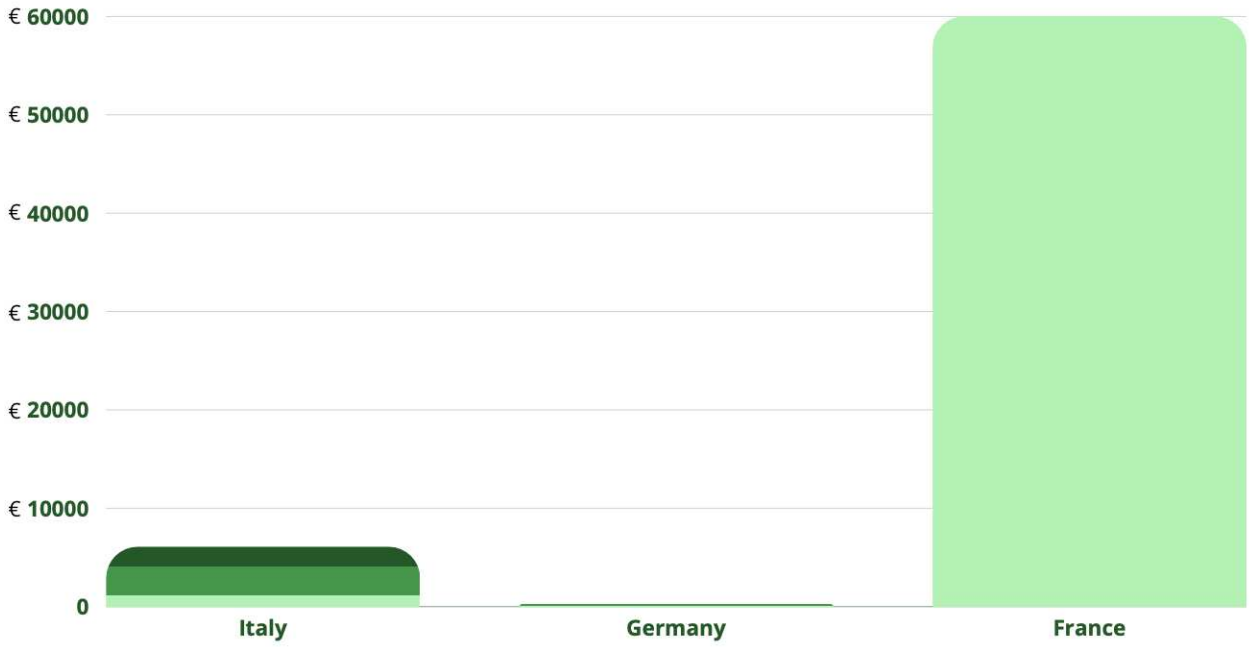

Table 1 Visual representation of the disproportion in taxes paid in the first year of ownership of a Porsche 992 911 Carrera S for Italy, Germany, and France.

For a Ferrari SF90 with 1000 hp (735 kW), with a 4,000 cm^3 engine and emitting 154 g/km of CO_2, base price for the vehicle €427.930 (Italian price), the cost for the first year as vehicle taxes would be:

Italy - superbollo	**Germany - Kfz Steuer**	**France - malus écologique**
Base "Bollo" Calculation: First 100 kW: €2.58 per kW = €258.00 Remaining 635 kW: €3.87 per kW = €2,457.45 Total Base "Bollo": €258.00 + €2,457.45 = €2,715.45	Tax for engine displacement: € 2.00 per 100 cm^3 for petrol engines. €2.00 x 40 = € 80.00 per year. The tax is calculated based on emissions above 95 g/km, with each gram over this threshold being taxed at €2.00:	With 154 g/km of CO_2 emitted, total tax= €2918

"Superbollo" Calculation: Power above 185 kW: 735 kW - 185 kW = 550 kW €20.00 per kW over 185 kW = €11,000.00	154 g/km - 95 g/km = 59 g/km €2.00 x 114 = €118.00 per year.	
Total Annual Tax: Base "Bollo" + "Superbollo" = €2,715.45+ € €11,000.00 = € 13,715.45 per year.	Total Kfz-Steuer: € 80.00 (engine displacement) + € 118.00 (CO_2 emissions) = € 198.00 per year.	Total malus écologique: € 2918 (only first year of car's registration).

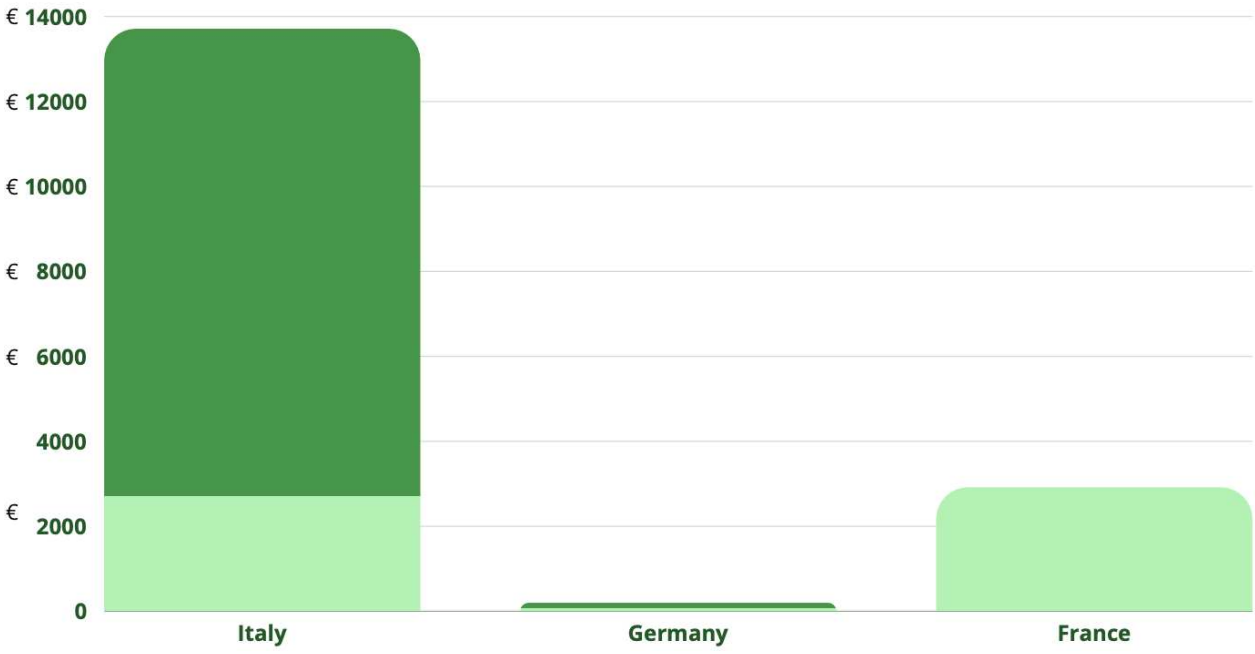

Table 2 Visual representation of the disproportion in taxes paid in the first year of ownership of a Ferrari SF90 for Italy, Germany and France.

The most important thing to note is that Germany in both cases remains the preferred and cheapest in terms of vehicle taxation. Comparing the two cases, the first of the Porsche 911 and the second of the Ferrari SF90, it is easily noticeable how in Italy taxation occurs on the power level of the car and in Germany and France it is based on CO_2 emissions. Comparing two car models with such different power outputs and emissions (one is gasoline-powered the other is hybrid) shows that taxation levels per individual car can vary by several tens of thousands of euros between three neighboring countries.

Cultural preferences. Another difference that can lead to different choices from customers is about their tendency to go for local products that are influenced by their views of higher local quality, and emotional factors such as the sense of loyalty to their town. Emotional motivators can encompass sentiments like ethnocentrism, patriotism, and nationalism. National cars manufacturers have the potential to establish a strong competitive edge by developing a reputation for functional characteristics such as quality and freshness, as well as by leveraging intangible factors like pride of ethnocentrism, and enmity. The expectations of customers for production quality, safety, and environmental effect are closely linked to their views of certain country attributes and image. The perception, image, and connections of a COO (Country of Origin) can influence consumer views, but it could not lead to a direct impact on consumer choices. Some people, for example, prefer to get a used car from the country where they live, rather than buying it by importing it. It is as if they prefer a used car from a former compatriot owner.

These inclinations may come from a multitude of emotions. Ethnocentricity, nationalism, patriotism, and within-group support can influence individuals to place a greater importance on local output. Conversely, nationalism or enmity might cause individuals to devalue cars that are coming from another country. For instance, it was discovered that Japanese consumers exhibited a significantly higher preference for a product manufactured in Japan, even if the product seemed to fall short of the quality requirements set by the market (Gürhan-Canli & Maheswaran, 2000).

This case suggests that the perception of quality can be influenced by the emotions experienced towards the Country of Origin (COO). Therefore, feelings towards a particular

Country of Origin (COO) influence decision-making indirectly by impacting perceptions and directly by generating satisfaction or dissatisfaction linked to the alignment between the COO's image and consumers' personal and social identities. If the image of a Country of Origin (COO) has a significant impact on both social identity and self-identification, it has the potential to entirely alleviate any concerns about quality, if there are any. Therefore, despite the difficulty in distinguishing local production based on product quality alone, it is still possible to establish a local brand if the local identity offers certain psychological and social advantages (Heiman & Just, 2021).

2.3.2 Transaction costs in supercar arbitrage

Transaction cost economics (TCE) studies how various formal and informal institutions help people manage uncertainty. The basic premise of TCE is that costless transacting is impossible because of bounded rationality and opportunism. Bounded rationality asserts that although human actors intend to be rational, they can only be limitedly so. Most contracts are therefore incomplete, and especially long-term contracts must be continuously adjusted to unforeseen changes in circumstances (Williamson, 2008).

Transaction costs, which can be divided into coordination costs, such as monitoring the conditions of the supercar during shipment and delivery, planning transportation routes and delivery timelines, communication between the seller, buyer, and transporter to coordinate the sale and delivery, bargaining over the final price, sale conditions, and payment terms, and motivation costs, arising from incomplete information, information asymmetries, and lack of credible commitment, represent what it must be considered when doing supercar arbitrage. In the context of regulatory arbitrage, which is a type of regulatory avoidance behavior, these transaction costs become particularly significant. Regulatory arbitrage occurs when firms exploit differences between the regulatory measures of risk and economic measures of risk, which may lead to what some describe as "cosmetical adjustments" to their capital (Jones & Suh, 2000).

For instance, regulatory arbitrage can occur when firms move operations to markets with less regulation, thereby optimizing the cross-jurisdictional distribution of their activities and assets (Houston, Lin, & Ma, 2012). This type of arbitrage complicates the design of regulation

and reduces its effectiveness, making it one of the classic problems of financial regulation. Regulatory arbitrage is therefore defined as a contracting hazard that arises from interactions between the regulator and regulated firms, given bounded rationality and opportunism (Priest, 1993).

This means that in transaction costs not only it has to include direct expenses such as taxes associated with purchase, transportation and resale, but also inefficiencies, as seen before, that can influence the decisions to proceed with arbitrage transactions.

2.3.3 Transportation costs and cost-opportunity in supercar arbitrage

Particularly, when doing arbitrage with supercars, one of the first elements to consider is the cost for vehicle transportation, that depends on the distance between the place of purchase and the place of sale and on which different countries it goes through. Costs can then vary depending on the mode of transport chosen, by road, sea or air. In this case, it is necessary to consider that supercars may require specialized transportation methods, such as the use of containers or dedicated car transporters that can guarantee maximum protection.

Vehicle transportation insurance is another cost to be taken into consideration, with the high intrinsic value of supercars that requires coverage not only from damage during transport, but also specific risks such as potential theft or other unforeseen situations. The cost of these policies can depend on the insurance company, the value of the vehicle itself, and the method of transportation chosen.

Opportunity costs represent an often overlooked but highly relevant element. Opportunity cost in economics is the cost resulting from the failure to take advantage of an opportunity granted to the economic entity. This concept is fundamental to understanding economic decisions, since every choice involves a sacrifice in terms of lost opportunity. In other words, opportunity cost is the sacrifice an economic actor must make to make an economic choice.

Also, capital investment to purchase a supercar for an arbitrage opportunity must be evaluated in terms of what are the potential alternatives. Focusing on a single transaction may exclude other and potentially investment opportunities that have a better return.

Therefore, it is important to consider both the expected and potential profit from arbitrage and the alternative return that could have been achieved by investing the same resources differently.

Another crucial aspect concerns the different tax regulations within the European Union, which can generate substantial variations in overall transaction costs. For example, value added tax (VAT), customs or registration taxes are taxes that vary not only between different EU countries, but also within EU countries, and in relation to the type of vehicle (emissions level, engine power, etc.). Analysis of local regulations is essential to ensure the profitability of the arbitrage transaction. Taking for instance a supercar arbitrage transaction in a country with a lower VAT rate and subsequently sold in a country with a higher VAT rate, initially this strategy might seem advantageous, however it would be necessary to pay vat in the country of import of the car, and only then will the exporting country refund the vat paid for the purchase made.

Furthermore, making sure to adhere to different legislation in different jurisdictions necessitates focus on administrative particulars, which can contribute to making the transaction more expensive. Administrative costs encompass the necessity of guaranteeing compliance with all legal obligations, which may be both laborious and expensive.

2.3.4 Market risks and volatility in arbitrage transactions

Market risks in arbitrage transactions are significant and multifaceted when importing a supercar in a different country. One primary risk is the uncertainty in the price spread between two different countries, which can narrow unexpectedly due to changes in local conditions, resulting in smaller profits or even losses. Additionally, the illiquidity of this kind of assets poses a significant market risk in arbitrage. Illiquid assets like supercars are challenging to buy or sell quickly without the risk of a substantial change in their price. This lack of liquidity can trap arbitrageurs in positions where they are unable to sell without incurring losses, particularly in markets where the availability of buyers and sellers is limited. Another critical market risk in arbitrage is the risk of regulatory changes. As said before, different jurisdictions may have varying tax laws and regulations, which can be altered with little warning. Such changes can invalidate the assumptions underlying an

arbitrage strategy, leading to unexpected losses. The uncertainty inherent in predicting future market conditions also contributes to the complexity of managing market risks in arbitrage. Finally, the risk of economic or financial instability in the market where the arbitrage is being conducted is always present. Such instability can lead to rapid devaluation of assets, or a decrease in market demand, all of which can significantly impact the success of an arbitrage strategy.

2.4 Analysis of economic conditions, fiscal policies, and environmental regulations on supercar pricing in Italy, Germany, and France

This section provides a comprehensive analysis of how the prices of supercars in different countries - Italy, Germany and France - are impacted particularly by local economic situations, tax laws, and environmental restrictions. The investigation examines how regional economic differences, supply and demand, and transportation costs might affect change in prices of supercars. Additionally, it analyzes the impact of local rules and environmental regulations on market arbitrage, which presents opportunities but also complications for participants in the supercar market.

2.4.1 Influence of local economic conditions on supercar pricing

The economic efficiency of a transaction is influenced, to some extent, by its transaction cost. Price variations of supercars over time are significant, with prices for some specific supercar in the same markets increasing up to 40% from 2020. Imperfectly connected markets play a role in these changes, where factors like limited market activity and more and more expensive transportation costs worsen the volatility of prices.

Furthermore, the overall impact of local economic actions on market dynamics might be substantially modified by general equilibrium effects. For example, in regions where there are significant loan interventions, the resulting alterations in storage patterns and market supply might cause noticeable fluctuations in local pricing (Curdia, 2024). The fluctuation in market pricing is directly linked to local economic factors such as credit availability, but also regional income disparities, local taxation policies.

The economic inequalities between the northern and southern regions of Italy have a significant influence on the market for high-performance luxury cars. In the northern part of the country, namely in regions such as Lombardia that are known for their richness and industrialization, the costs of luxury cars, known as supercars, are sustained by a consistent demand and the ability of the population to afford them. In contrast, in the southern region, characterized by a less robust economy and higher unemployment rates, there is a reduced demand for supercars. The tax policies in Italy have a considerable impact on the economy, especially in the luxury automobile market. These laws might differ greatly between areas, which adds more complexity to the market (Business Research Insights, 2023).

Germany's strong industrial economy and stability contribute to the maintenance of high and consistent pricing for supercars, particularly in affluent regions such as Bavaria and Baden-Württemberg. The automotive sector is confronted with obstacles such as semiconductor shortages and escalating energy expenses, which have a direct impact on production and the ultimate prices of vehicles. Green incentives, such as tax benefits for low-emission vehicles, can greatly decrease the overall cost of electric and hybrid supercars in Germany, making it an appealing market for these vehicles and at the same time they can reduce the price of used internal combustion engine supercars because of the increase in supply since more people are more willingness to buy a new car with incentives.

In France, the combination of industrial and agricultural sectors leads to more significant price volatility, especially in regions that rely heavily on agriculture. For instance, in France, the implementation of green incentives results in a reduction of the final price of certain cars, making it lower than the price before taxes. Nevertheless, the imposition of taxes on the acquisition and registration of high-end automobiles can effectively maintain elevated pricing in comparison to other European nations, so constraining demand in certain areas (OEC, 2023).

2.4.2 Effects of tax and regulatory policies on supercar prices

Tax policies and government regulations are another source of price differences in European supercar markets. Value-added taxes (VAT), registration fees, customs duties, and environmental regulations play a crucial role in determining the final cost of the product.

Value-added taxes (VAT) and registration fees.

Legal compliance is essential when there are opportunities of car arbitrage. This includes proper tax reporting, payment of vat due in the country of importation, and compliance with safety regulations. Ignoring legal requirements can result in financial penalties and legal action. VAT is an indirect tax on most goods and services borne by the final consumer, not by businesses. It is charged as a percentage of the sales price and collected fractionally at every stage of production and distribution. VAT is neutral, as the tax borne by the final consumer is the same regardless of the length of the supply chain (European Commission, n.d.).

VAT varies widely among EU countries, with rates ranging from 17% to 27%. The countries with the highest VAT rates are Hungary at 27%, followed by Denmark and Sweden, with a standard rate of 25%. In contrast, countries such as Luxembourg or Germany have relatively lower VAT rates of 16% and 19%, respectively.

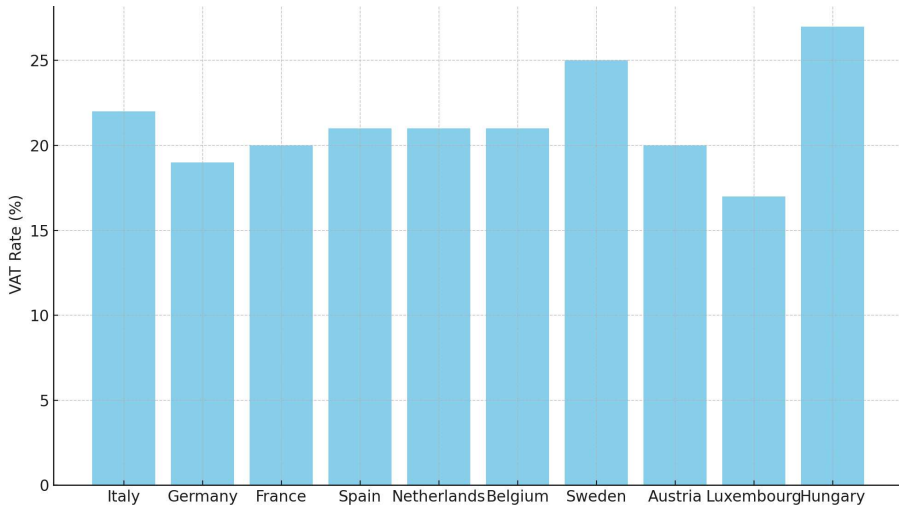

Table 3 Visual representation of VAT rates in major EU countries.

Environmental regulations

Environmental regulations are different between EU countries. This variable results in differences in demand and price of supercars. Governments can regulate automakers by setting a maximum level of emissions in gCO_2/km for each car produced and introducing penalties for those that exceed the maximum level. Market-based instruments, such as emission taxes and tradable emission permits, provide stronger incentives for innovation

than command-and-control policies. Environmental policies affect the cost of compliance for firms, potentially increasing the cost of production and, by extension, the price of the final product. In addition, differences in environmental regulations among countries can create supercar price differentials that can be exploited through arbitrage in markets with more lenient environmental regulatory opportunities, less environmentally friendly products can maintain higher market values due to lower compliance costs.

In some countries, tax and regulatory policies significantly influence the automobile market, particularly with respect to high-carbon vehicles. In France, for example, the automobiles will only be eligible for the incentive if they satisfy specific criteria: a weight of less than 2.4 tons, a maximum price of 47 thousand euros, and an "environmental score" ranging from 60 to 100. The incentive amount is 27 percent of the purchase price, which includes taxes. For individuals, the maximum bonus is 5 thousand euros, with an additional 2,000 euros for earnings below 14,089 euros (Ministère de l'économie des finances et de la souveraineté industrielle et numérique, 2023). Companies are eligible for a maximum bonus of 3 thousand euros. The carbon footprint of each vehicle will be measured by calculating the total amount of carbon dioxide (CO_2) emissions in kilograms, considering various factors related to production and logistics. These factors include the use of ferrous, nonferrous, and aluminum materials in the car's assembly, the batteries it uses, the energy consumed, and the weight of transportation. The purpose is to evaluate the environmental impact of an electric car throughout its whole lifespan, which is a level of assessment that has not been previously included in EU rules.

2.4.3 Supply and demand dynamics in supercar markets

Supply and demand are fundamental principles in economics that explain the actions of buyers and sellers in competitive markets. The law of demand posits that there is an inverse relationship between the price of an item and the amount demanded. Specifically, as the price of a thing rises, the quantity demanded decreases, and conversely, as the price of a good falls, the quantity demanded grows. The law of supply states that there is a direct relationship between the price of a good and the amount supplied. As the price of a good rises, the quantity supplied also increases. The principles mentioned have a direct application in the supercar

market, where prices are set by the interaction of supply and demand forces. As income or wealth increases, there is a corresponding increase in the purchase of luxury items, indicating their sensitivity to personal financial status. Luxury items are often seen as having a positive income elasticity of demand, indicating that their demand is highly responsive to changes in a person's income. On the other hand, if income decreases, the demand for luxury items will also decrease (Caserta, 2008).

For instance, Ferrari often uses the strategy of scarcity to increase their price power in the supercars industry. Ferrari, indeed, restricts purposely the production output for preserving the uniqueness and strong demand for its vehicles. This strategy is firmly ingrained in the brand's identity, as expressed famously by Enzo Ferrari “wherein Ferrari consistently supplies one car less than the market demand”. Looking at numbers, in 2023, Ferrari manufactured 13,663 automobiles, which is far lower than what is the demand from potential customers. Ferrari managed to generate a profitable operating income, showcasing the success of its pricing strategy that relies on creating scarcity. Porsche strategically leverages the combination of limited output and normal production cars. One example is the Porsche 911, which in most of its models is a normal production car, but for some of them, like the 911 S/T for example, the production number is limited to 1963. Here, frequently the car commands a significantly higher price on the secondary market compared to its original retail price, which is mostly owing to its restricted supply and the strong demand it generates among collectors. Porsche's deliberate manufacturing constraints result in a continual disparity between the quantity of goods available and the level of consumer demand, hence enabling the brand to charge higher prices and increase hype.

The demand for supercars can be also influenced by seasonality: for example, during spring, there is usually a higher demand for convertible car models like the Ferrari Portofino or the Porsche 911 Cabriolet, which leads to an increase in prices in the secondary markets. In this case it becomes of absolute importance for the arbitrageur to take advantage of this seasonality of demand by buying convertible cars at times when customers do not ask for them, such as in the colder months, and then reselling them when demand increases by being able to sell them at a higher price. There remains, however, another very important factor to consider, namely, the opportunity cost of the investment made.

Also, the scarcity of models can greatly increase their worth: as an example, the 1995 Ferrari 348 GTB, which was produced in only 252 units, has significantly increased in value over time because of its scarcity and the increasing acknowledgment from collectors. The interest in classic cars is currently increasing.

Finally, market competition has a crucial influence on determining the prices of supercars, with the intense competition from brands such as Ferrari, Porsche, and Lamborghini, not only in terms of performance but also in terms of brand prestige. This competition frequently has the goal of preserving market share or enticing new clients, but it can also lead to dynamic fluctuations in pricing based on the competitive environment, both on new cars from dealerships and on used cars in the secondary market.

2.4.4 Influence of speculation on the supercar market

Speculation in the luxury car market, particularly in the niche of supercars, can drive prices to significant heights. The speculative element is especially evident in markets where the supply of supercars is artificially constrained by limited production runs, creating a perception of scarcity that fuels investment demand. Such conditions often lead investors to view supercars – and in this case classic cars, too - as 'alternative assets', where value appreciation over time is anticipated. In this case, speculative buying not only inflates the initial purchase price but can also cause significant fluctuations in the secondary market, where resales can fetch much higher prices depending on market conditions and buyer sentiment. Consequently, these speculative practices could open more opportunities for arbitrage: arbitrageurs would exploit price differentials between markets, purchasing in one country and reselling in another where demand is higher or regulations more favorable, thus profiting from the price discrepancies. This effect is compounded by the limited nature of supercar production, making them prime targets for those looking to capitalize on perceived rarity and future value (Dyba, 2022).

2.4.6 Impact of logistics and transportation costs on Italy, Germany and France

Logistics and transportation costs play a significant role in determining the final price of supercars, especially when these vehicles are transported across international borders for

resale. According to the International Journal of Logistics Management, the costs associated with transporting luxury vehicles can add between 10-15% to the overall price of the car, depending on factors such as the distance, route, and method of transportation. The choice between open and enclosed transport also affects costs, with enclosed transport being preferred for high-value cars due to the additional protection it offers, albeit at a higher price (Dugger, 2024).

Additionally, seasonal variations can influence transportation costs, with prices typically rising during peak seasons when demand for shipping services surges. This increase in cost could often be passed on to the consumer, affecting the final sale price of the supercar.

The cost structure is further complicated by the geographical location of pickup and delivery points. Urban areas generally offer lower transport costs due to the higher availability of carriers, while remote areas can incur higher costs due to the limited accessibility.

Moreover, the complexity of logistics, including customs clearance and potential tariffs, adds to the financial burden, which is usually reflected in the vehicle's market price. Variations in infrastructure between countries also impact these costs; for instance, countries with advanced transportation networks like Germany may experience more stable internal logistics costs, contributing to relatively predictable pricing. In contrast, countries with less developed infrastructure might face higher logistical challenges, driving up the price of supercars in those markets.

In addition to this, we must also consider the labor cost for transportation.

Profitable enterprises have consistently adhered to a straightforward yet effective principle: maximize revenue while minimizing costs. One of the primary expense categories for any firm is the aggregate labor costs, which refer to the overall amount of money spent by employers to hire and retain people. There is a significant disparity in labor costs in Europe. The hourly labor prices vary significantly, ranging from €7 in Bulgaria to around €47 in Denmark. Most European countries implement a minimum wage policy, resulting in higher labor costs per hour. However, the cultural and legal conditions in countries such as Bulgaria provide European companies with opportunities to optimize labor costs through geographic

arbitrage (Voicu & Drāghici, 2023). The disparities in labor rules, taxation, and cultural views towards work are factors that influence the differing attractiveness of different countries for outsourcing. Although the existence of a minimum wage might sometimes result in increased hourly labor costs, the absence of a minimum wage policy, as shown in countries like Sweden and Denmark, does not inevitably lead to lower labor costs. These countries still maintain high labor costs due to other economic variables.

In this case, there can be a significant difference whether the importer of a supercar decides to go with a local company or a company where labor costs are lower but still transports to Italy, Germany and France.

2.5 Future of arbitrage in the supercar market

Arbitraging supercars will continue to evolve with advances in technology and practices. Trends may include increased use of automation for product sourcing, sustainability-focused practices to make arbitrage less pollutant, and international arbitrage with the growth of cross-border commerce. One way to examine the future of arbitrage in the supercar market, would be to analyze the potential use of sophisticated AI models, like those utilized in retail markets, to methodically detect pricing disparities and prospects for arbitrage.

Furthermore, the utilization of user-generated content (UGC), that comes from regular people who voluntarily contribute data, information, or media that then appears before others in a useful or entertaining way, usually on the Web might improve the detection of arbitrage opportunities (Krumm, Davies, & Narayanaswami, 2008) (Tanlamai, Khern-am-nuai, & Adulyasak, 2023). Similarly, data such as buyer evaluations, auction results, and market trends can be employed to strengthen AI models specifically designed for the supercar market. The future of electric vehicles (EVs) in the luxury car segment is particularly significant, as technological advancements, including battery technology, charging infrastructure, and autonomous driving, have made EVs more efficient, affordable, and practical (Patil, 2020). By considering criteria like rarity, historical relevance, and market demand, this would enhance the accuracy of recommendations for the best times and locations to purchase or sell vehicles.

Exploring the scalability of AI-driven models may be a potential avenue for the future of arbitrage in supercars. According to the study from McKinsey, although the model demonstrated significant profitability under controlled conditions, expanding it to a larger market may pose difficulties. In the luxury car market, especially in the $300,000 to $500,000 price range, EV penetration is expected to reach 85 percent by 2031. This shift is driven by both consumer demand and regulatory pressures, with a strong push from new regulations that promote zero-emission vehicles (Guan, Köstring, Middleton, & Möller, 2022).

Hence, forthcoming investigations in the supercar industry may concentrate on creating adaptable artificial intelligence (AI) models that uphold substantial profitability and accuracy, even when employed on extensive datasets and a wider array of vehicles.

Furthermore, it would be worthwhile for future study to explore the potential applicability of these AI-driven frameworks for arbitrage across various luxury vehicle categories, considering the intricate characteristics of supercars, which encompass their dual nature as both search products and experience goods. The capacity of these models to adjust to the distinctive attributes of supercars could have a substantial impact on the future of arbitrage in this market."

The supercar industry is anticipated to be significantly affected by upcoming European laws, particularly those that prioritize environmental sustainability. The European Union's efforts to enforce more stringent zero-emission requirements and impose more limitations on internal combustion engines may lead to a significant transition towards electric vehicles (EVs) in the premium market. The expansion of zero-emission laws, facilitated by the implementation of more city-wide bans on internal combustion engine (ICE) vehicles by 2035, is expected to increase. These bans are anticipated to be enforced in places where affluent individuals normally reside. This growth can be attributed to the strong political support and changing preferences of consumers.

The division of markets because of varying regional restrictions may intensify pricing differences, creating favorable conditions for arbitrage. The evolving market conditions, characterized by a rising demand for electric vehicles (EVs) and a decreasing availability of

classic combustion-engine supercars, will necessitate a reconfiguration of the regulatory framework. This will have a significant impact on the dynamics of the supercar business, affecting both production and arbitrage opportunities (Perlin, Dufour, & Brooks, 2014).

The distribution of value pools is changing as electric car disrupters find ways to generate revenue during the entire lifespan of their vehicles. This enables electric vehicle disruptors to reach a point where their income matches their expenses, even if they may incur a financial loss when making the original purchase. Examples of innovative strategies that can boost profitability by over 7 percent by 2026 include radical levers, new business models like direct-to-consumer (DTC), EV- and battery-as-a-service, advanced driver-assistance systems (ADAS), and smart-connectivity features.

3. Economic, regulatory, and managerial implications of arbitrage in the supercar market: impact on official and unofficial dealers

In the third chapter of this thesis, an empirical analysis will be made for price differences of supercars on leading Italian-, German- and French-based online car trading platforms. The market for supercars is among the most dynamic and globalized economic contests. Supercars, as high-performance exclusive luxury vehicles, provide a great case-study in how different factors like taxation, supply & demand and local regulation can affect the final cost end-users pay when purchasing them.

The analysis will be conducted on three European automotive market references: Italy, Germany and France. Not only do these countries have a rich background in automotive history, but they also are some of the most lucrative markets for supercar trading.

Firstly, the chapter will be structured around analyzing the main platforms for buying and selling used cars from each country. In the second part, we will show and consider pricing data — that is when those factors really become important with values often differing so significantly from one country to another. In conclusion, we will investigate potential arbitrage opportunities and policy implications for official and unofficial dealers.

The primary objective is to provide a comprehensive description of the empirical research's purpose, which focuses on analyzing the prices of supercar products in the Italian, German, and French markets. This analysis aims to identify the determinants that typically cause price discrepancies between the three nations.

3.1 Definition and selection criteria of supercars

To this section, a distinction between hybrid and electric vehicles, as well as internal combustion engines will be made. After that, will be discussed the reasons why hypercars are not included in the scope of the analysis and it will conclude with an explanation of the benefits of doing an analysis of prices after considering VAT.

3.1.1 The definition of a supercar: gasoline, hybrid, electric.

Having defined what a supercar is in the previous chapters, we will now see the difference in internal combustion engine, hybrid and full-electric supercars.

Internal combustion engine supercars are characterized by a full internal gasoline powertrain that produces horsepower ranging from 400, and a weight ranging between 1000 to 1800 kg.

Hybrid electric supercars (HEVs) integrate a traditional internal combustion engine (ICE) system with an electric propulsion system (hybrid drivetrain), often developing much more horsepower than the ICE competitors but at the same time carrying more weight due to the battery pack installed inside the vehicle. They usually are built on a "skateboard platform" (Golson, 2022), defined when having a flat central part in which to arrange the batteries and the wheels at the corners of it. Despite having more weight to carry, the hybrid powertrain is designed to either improve fuel efficiency compared to a traditional car and enhance performance.

These hybrids can have different configurations regarding the power and role of the electric motor: mild hybrid and full hybrid vehicles.

In mild systems (or MHEVs) its use is limited, and it is not possible to travel with the heat engine off, whereas in "full" hybrids it takes on a completely different importance, allowing consumption to be cut down more significantly, albeit with greater complexity and therefore a higher cost, while still allowing one to move (for a few kilometers and at city speeds) with zero emissions.

Finally, electric supercars are vehicles powered by electricity, meaning they use electricity to operate the motor, independent of the specific source of electricity. They often have a better 0-100 km/h because the electric motor is ready to deliver 100% of its power.

3.1.2 Exclusion of the Hypercar class: arguments and reasons

As said, this empirical study focuses on the valuation of supercars in European markets but intentionally excludes hypercars. There are other factors contributing to this exclusion, some of which are linked to the distinctive characteristics of hypercars. As a result, hypercars are

considered a distinct category from traditional supercars in terms of market dynamics and pricing patterns.

A hypercar can be defined as a high-performance vehicle that goes beyond the technological edge of engineering in an evolution of the supercar concept. It represents the latest technologies and mechanics of the automotive industry, showcasing performance and rarity. Over time, the concept has acquired a more expansive definition, encompassing highly powerful vehicles designed in the style of endurance racing cars. As an advancement, hypercars surpass supercars in every element, including price, rarity, performance, drivability, and aesthetics. A hypercar is characterized by its exceptional lightweight construction and handling. During the design process, weight is meticulously minimized to optimize performance and fully exploit the immense power generated by the numerous horsepower.

Given these attributes, it is unsurprising that hypercars are frequently constructed by hand using valuable and costly materials, and then marketed in extremely restricted quantities.

These hyper-vehicles are only accessible to a small, specialized group of purchasers, often already individualized before, whereas other automobiles are readily available in the market for a larger number of buyers. Hypercars are designed for a small, exclusive group of collectors and enthusiasts. This makes it more challenging to consistently compare them to supercars, as they do not adhere to the fundamental rules of supply and demand that drive the supercar industry.

Furthermore, the hypercar market exhibits significant fluctuations in prices. The pricing dynamics for vehicles are mostly controlled by variables that are unrelated to car performance or general automotive market conditions. The costs of cars can vary significantly due to factors such as their rarity, the availability of limited editions, the reputation of the brand, and even the unique story behind each individual car. This unpredictability adds an additional layer of complexity to the use of conventional analytical criteria that are often used for supercars.

Hypercars, moreover, are typically distributed directly by the manufacturer to a select group of high-profile consumers, as well as through alternate channels that avoid traditional markets for new and used automobile sales. Mainstream automobile trading platforms rarely

see hypercars, if at all. This situation limits the access to comparable information, which in turn reduces the usefulness of an empirical investigation that relies on digital platforms.

3.1.3 Reason for excluding VAT (Value Added Tax) in the comparative analysis of supercar prices

Examining the pricing of supercars without the inclusion of value-added tax (VAT) in the final price is especially beneficial when comparing different markets like Italy, Germany, and France, since VAT rates differ significantly in these countries, resulting in an impact on the ultimate price paid by the consumer. Italy has a basic tax rate of 22 percent, while Germany has a rate of 19 percent and France has a rate of 20 percent. These percentual differences across different markets lead to distortion when comparing the prices. but if we exclude VAT, the comparison is based on only net prices, specifically related to costs of production, distribution, and market dynamics. Tax-exempt prices will be useful in arbitrage practices, since they serve as a more dependable reference point for spotting profitable opportunities and accurately evaluating price disparities between markets.

Furthermore, the exclusion of VAT in analyses ensures tax neutrality and enables fair comparisons of markets without the influence of varying consumption tax rates.

Established that the analysis will be conducted on net prices, it is important to understand how the VAT payment process works when the car is imported into Italy, for reasons that we will see later in the analysis.

The European standards that classify vehicles as new or used for import are mainly defined by the Council of the European Union Directive 2006/112/EC, which governs the common system of Value Added Tax (VAT) within the EU:

- Factory new, when the vehicle appears to have never been registered, i.e., never had a license plate.
- Fiscally new, when the vehicle appears to be already registered (i.e., has had a license plate), but has not traveled more than 6,000 km or was purchased before 6 months from the date of first registration abroad.
- Fiscally used: when a vehicle is already registered, has covered more than 6000 km and was purchased after 6 months from the date of first registration abroad.

For factory-new and fiscally new cars, In the country of origin the company pays the net price and receives the invoice, which must be supplemented by paying 22% VAT via F24 when imported. If the purchase is made in an EU country with Invoicing with VAT at the margin it means that the VAT has been paid in the country of origin and therefore included in the price of the car. Consequently, it will be up to the Italian dealer to fulfill the legal tax obligations, paying any differences in % VAT with the foreign country compared to Italy in the percentage established by the local authorities.

If, on the other hand, the purchase is made with a net price, the modalities are the same as for a new car: one is required to pay VAT in Italy, and the car is registered with Italian license plates.

These conditions mean that countries with a low tax burden are to be preferred when buying used cars (for example, when deciding to import a car from Germany, where VAT is 19 percent); while those with a high tax burden, such as Denmark (VAT at 25 percent), are for buying new cars. It is crucial, however, that those who buy a new car from abroad check that the invoice issued by the foreign seller does not already include VAT, because then they risk paying it twice.

3.2 Introduction to price analysis

To the analysis, the prices of the Porsche 992 911 Carrera S, Carrera GTS, and Turbo S models have been compared in three specific markets: Germany, Italy, and France. The prices gathered from online platforms for buying and selling vehicles, precisely the official Porsche used car website for cars coming from the dealership, Autoscout24 for Italy, Lacentrale.fr for France, and Mobile.de Germany.

Octoparse, an automated data extraction tool, was utilized to extract the information and data about every vehicle that was on the market, with model, price, mileage, and registration year. The choice to stay on one brand - Porsche - is since, in addition to a good number of ads for all 5 models chosen, the difference in target customers for each model can be easily identified.

In fact, the prices for the 5 models taken into analysis start from: the Carrera S 992 €143.280,00, the Carrera GTS €161.733,00, and the Turbo S €254.885,00, Taycan GTS

€147.904,00 and Taycan Turbo S €190.977,00. These are some of the most popular models on the used market, so the ones that are suggested will provide a better idea of the size of the price differences between the European markets, providing a good foundation for analyzing potential arbitrage opportunities.

Having chosen the different models and extracted the information needed, it was decided to compare the prices of cars without the VAT rates in each country differ. This makes cost comparisons more logical, since it does not alter the final prices that customers would pay.

This analysis has three objectives:

- Determine how much the prices of Porsche 911 models can be so different in each of the three markets.
- Investigate for factors that may be causing these price variations, such as local laws, supply and demand, or the condition of the vehicle—its mileage, manufacturing year, etc.
- Seek out data spikes that are significantly higher or lower than the average price of the market; these may indicate opportunities for arbitrage.

A free and open European market enables potential customers to take advantage of price differences and import vehicles from countries with lower prices, such as the price of a Porsche Carrera S, where prices for certain supercars vary significantly between nations. Therefore, this research has a deal of relevance for comprehending price fluctuations and the factors that influence them to identify opportunities for cost savings.

3.3.1 Average, median, and standard deviation of prices with box plots: in-depth analysis for arbitrage of Porsche 992 Carrera S, GTS, and Turbo S

The thing that becomes most apparent when looking at the prices in Italy, Germany, and France for a Porsche 992 Carrera S, Carrera GTS, and Turbo S is that average, or median, prices in this case carry little relevance for arbitrage, although they may be helpful in gaining an overall sense of the market trend as we will see later. The real profit potential is not with general trends, per se, but in finding those vehicles whose cost comes in much lower than the average market price. That means more emphasis shall be placed on finding the lowest price opportunities rather than average prices.

Average and median: why are they not crucial in arbitrage? The mean would give the average price of a Porsche in each market, and the median gives the middle value of the range, but the numbers do not catch real chances for arbitrage. What is important here, for example, is to identify one car that has a much lower price than average in such a way as to bring it from Germany to Italy if someone in Italy wants to buy a Carrera S from Germany. In that case, what will be important is whether the overall German price level of Carrera S cars is somewhat higher or lower than the Italian one.

Model	**Country**	**Minimum net price in €**	**Average net price in €**
Carrera S	Italy	€ 97,541	€ 109,317
Carrera S	Germany	€ 96,555	€ 117,940
Carrera S	France	€ 99,992	€ 115,890
Carrera GTS	Italy	€ 127,049	€ 144,248
Carrera GTS	Germany	€ 120,084	€ 142,076
Carrera GTS	France	€ 148,250	€ 174,146
Turbo S	Italy	€ 178,688	€ 204,826
Turbo S	Germany	€ 174,638	€ 218,487
Turbo S	France	€ 191,658	€ 255,417

Table 4 Minimum net price and average net price in € of Porsche 992 Carrera S, Porsche 992 Carrera GTS, and Porsche 992 Carrera Turbo S in Italy, Germany and France respectively.

Analyzing the table above, an arbitrage opportunity example is observed by looking at the minimum prices of the Porsche Carrera GTS in the three markets considered:

Minimum price in Italy:	127.049€
Minimum price in Germany:	€120.084
Minimum price in France:	148.250€

Here, a clear price difference emerges between the three countries. Germany has the lowest minimum price for the Carrera GTS, at € 120.084, €7.000 less than Italy and €28.000 less than France.

Here, a buyer who wants to take advantage of an arbitrage opportunity by reselling cars would look for just one car that is the cheapest in Germany - not the average or middle-priced one. There is no difference if all of Germany's market offers lower prices than, for example, Italy or France; it is enough to find one car much cheaper compared to other ones. That would mean that this € 120,084 priced car in Germany could be imported and then sold domestically in another country. For instance, in France the low price listed for the same model across the border is €148,250, so there could be the possibility of a profit exceeding €28,000. Unfortunately, in this precise case, importing the car into France and registering it there would require paying the malus écologique, since the car is neither hybrid nor electric and emits a large amount of CO_2 emissions.

Theoretically, this only means, in an arbitrage operation, that it doesn't matter if the average or median value is there. What really counts is to find some kinds of vehicles offered much cheaper in one country than the target market and make good use of this price gap between countries by creating a profit margin.

3.3.2 The importance of identifying outliers and singular opportunities

A box plot graphically helps to understand how the market is now, and it can be useful for finding arbitrage profit opportunities in a market. Each part in the box plot carries different useful information:

Median: this is the line within the "box" pointing out the median. In this context, it means that 50% of cars are more expensive and 50% of cars are less expensive. It helps to understand at what point the median car price lies within the marketplace.

First quartile or Q1 and Third quartile or Q3: the bottom of the box represents the first quartile, that is, Q1, which means that 25% of data falls below it, while the top of the box represents the third quartile - Q3, which means that 75% of the data falls above it. Regarding the prices, the box encompasses 50% of the average car prices. If the box is narrow, the prices are grouped around a small area, whereas a wider box would show that prices are more variable.

Whiskers: These are the whiskers extended from each side of the box and represent the range of "normal" data. This whisker can go up to 1.5 times the IQR that is between Q1 and Q3. Anything falling below or above this limit is considered normal. In case the price of a car lies within the whisker, it will be considered being priced reasonably against the entire range.

Outliers: These are points lying outside the whiskers, representing actual players for the arbitrage. These far-off values may then indicate cars put up for offer at prices much lower or even much higher than the market average. In this respect, from the buying-for-resale standpoint, an outlier priced lowly compared to the rest of the market would mean a less expensive purchase opportunity and highly ideal for resale in a more expensive market. On the other hand, for cars that fall within very high prices, there could be special features that explain why they are so expensive.

While the mean and median provide a general overview of the price distribution in a market, the real value for arbitrage opportunities stands in the capacity to make the identification of cars that lie below average or median price. Especially in the used supercar market, this concept is important because prices can fluctuate high, and the box plot may highlight the good opportunities for beating competition. Hence, comparing the lowest price with the value of the car in export markets is the key secret to good arbitrage strategy.

In this strategy, box plots are some of the most important visual tools, because they include the capability to emphasize such outliers, allowing the ability to point out just where the best buying opportunities are for resale into more profitable markets.

Having extracted the data with Octoparse, it was possible to create some boxplot representations of the prices in Italy, Germany, and France.

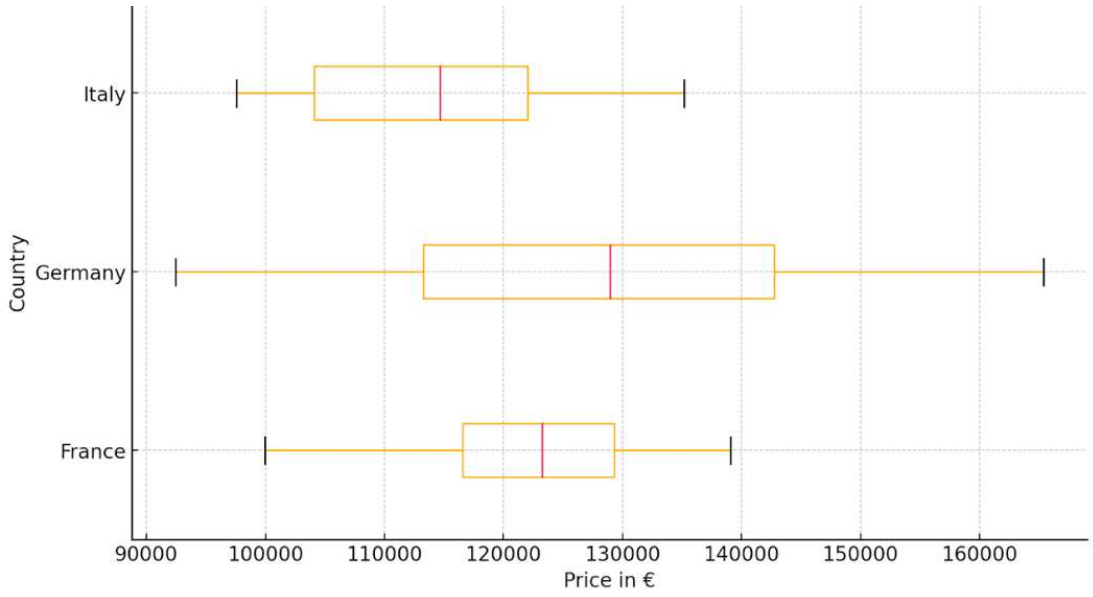

Table 5 Comparison of Porsche 992 Carrera S prices in Italy (n=30), Germany (n=90), and France (n=170) represented in a box plot.

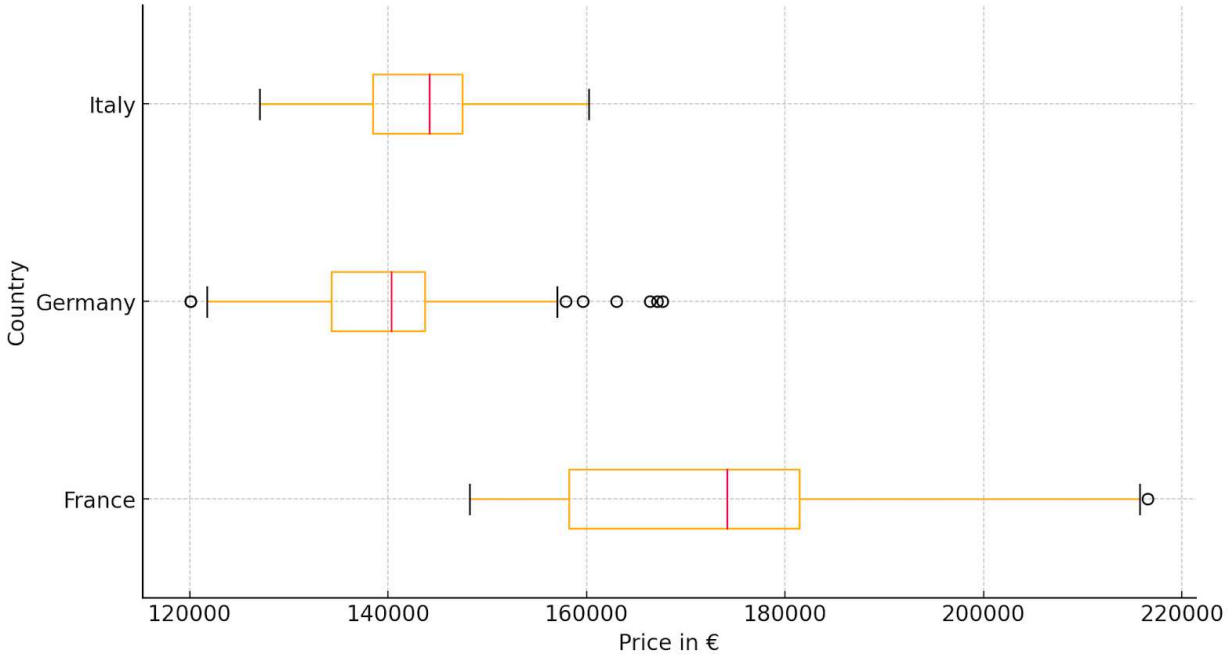

Table 6 Comparison of Porsche 992 Carrera GTS prices in Italy (n=28), Germany (n=87), and France (n=29) represented in a box plot.

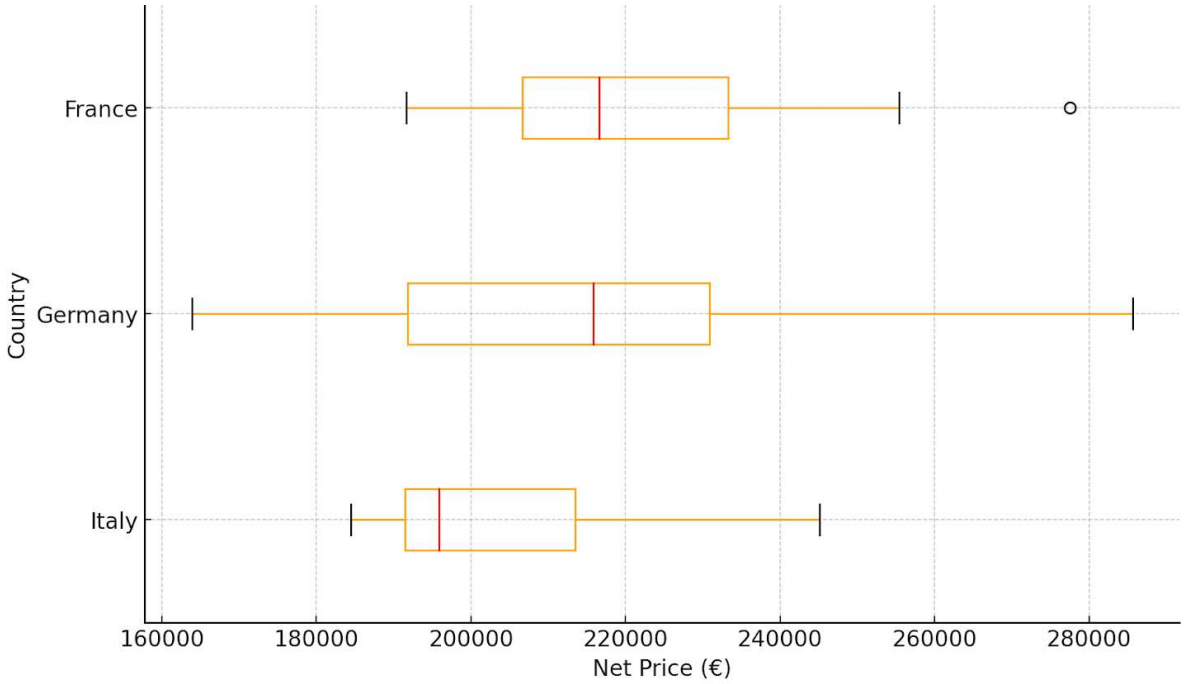

Table 7 Comparison of Porsche 992 Carrera Turbo S prices in Italy (n=17), Germany (n=84), and France (n=34) represented in a box plot.

Germany has the widest price range and can give the best chances for profit; Italy and France are, in general, more stable, with higher prices, especially for low mileage cars, preferable for selling cars at good prices bought at lower prices in Germany. Therefore, it is relevant to determine how price and mileage are related using scatter plots and box plots, helping find the best buying and selling chances in the Porsche 992 market.

Having overviewed the prices of Porsche 992 Carrera S, Carrera GTS, and Turbo S in countries like Italy, Germany, and France, some differences are notable; therefore, this can create an opportunity for arbitrage. In Germany, though, the variance in prices is wide, especially regarding Carrera GTS. Actual beginning prices in Germany for the Carrera GTS models are around €120,000, with Italy and France setting minimum prices for the same at €127,000 and €148,000 respectively (net VAT). In fact, this difference increases even higher to provide an opportunity for an overwhelming margin; a price as high as €210,000 could be viable in France.

The German outlier has prices that are way below the average in Italy and France. This raises an opportunity to buy a Carrera GTS at much cheaper prices, resell it in another country, like Italy where prices are higher, and make profits.

Looking at the boxplot, it helps to show the greater change of prices on the German market. Though at the same time, it gives big opportunities to find some good deals. It is for such reasons that considering the German market for the Carrera GTS, because of a low outlier price, exposes an opportunity to gain from price differences among Germany, Italy, and France. The opportunity of the outlier in the market right now may lead to good profit for the arbitrager, considering that prices in France and Italy are quite high, as well as the fact that Germany is one of the most important countries for purchases within the European supercar market.

3.3.3 Relationship between price and mileage: implications for arbitrage in the Porsche 992 Carrera S, GTS, and Turbo S market

The relationship between price and mileage is a key factor in understanding arbitrage opportunities in the market for Porsche 992 models—particularly the Carrera S, GTS, and

Turbo S. By analyzing the scatter plots of prices and kilometers across Italy, France, and Germany, we can extract valuable insights about price trends and where profitable buying opportunities might lie.

These scatter plots also illustrate that price and mileage are negatively related, the lesser the number of kilometers, generally the higher the price. However, this relationship is valid between models and markets to a greater extent.

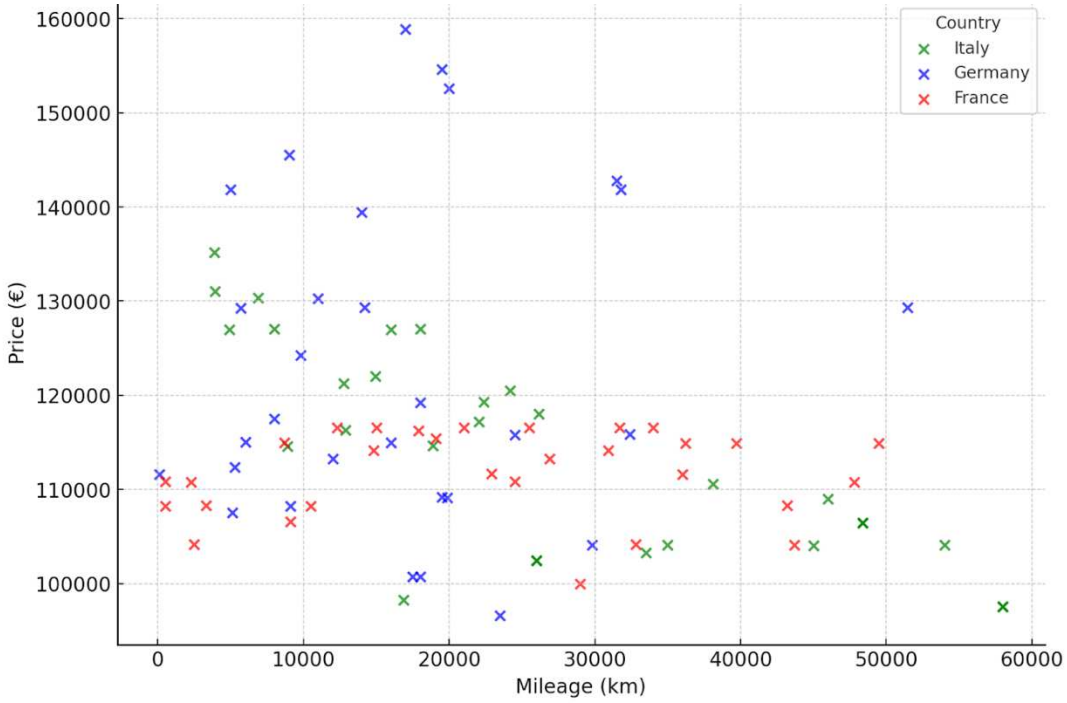

Table 8 Relation between price and km for Porsche 992 Carrera S in Italy, Germany, and France.

Prices of the Porsche 992 Carrera S are evenly matched between Italy, France, and Germany. Looking at the graph, we can see that French purchasers would pay a bit more for relatively used cars, which would give traders the opportunity to make a profit from importing the Carrera S models from either Germany or Italy, where its prices with almost the same mileage are inexpensive. Price distribution in Italy is + steady but does not have the same low pricing as in Germany. This factor will limit the potential profits compared to the German market.

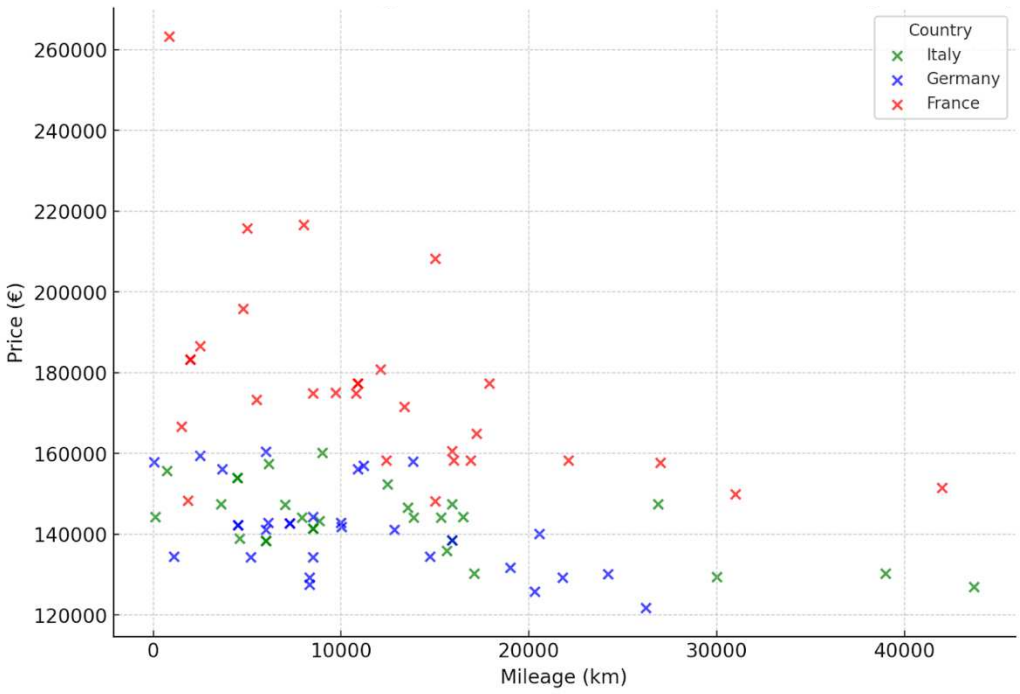

Table 9 Relation between price and km for Porsche 992 Carrera GTS in Italy, Germany, and France.

Porsche 992 Carrera GTS creates good buying and selling prospects in three countries. Such a big difference supposes wide space to make money on the consideration that starting prices for those from France and Italy can be way higher. Such a car in France can be sold as high as €200.000 + VAT mainly if the mileage is low. The huge price discrepancy is a clear opportunity for arbitrageurs to buy GTS in Germany and sell it for good profit in either France or Italy.

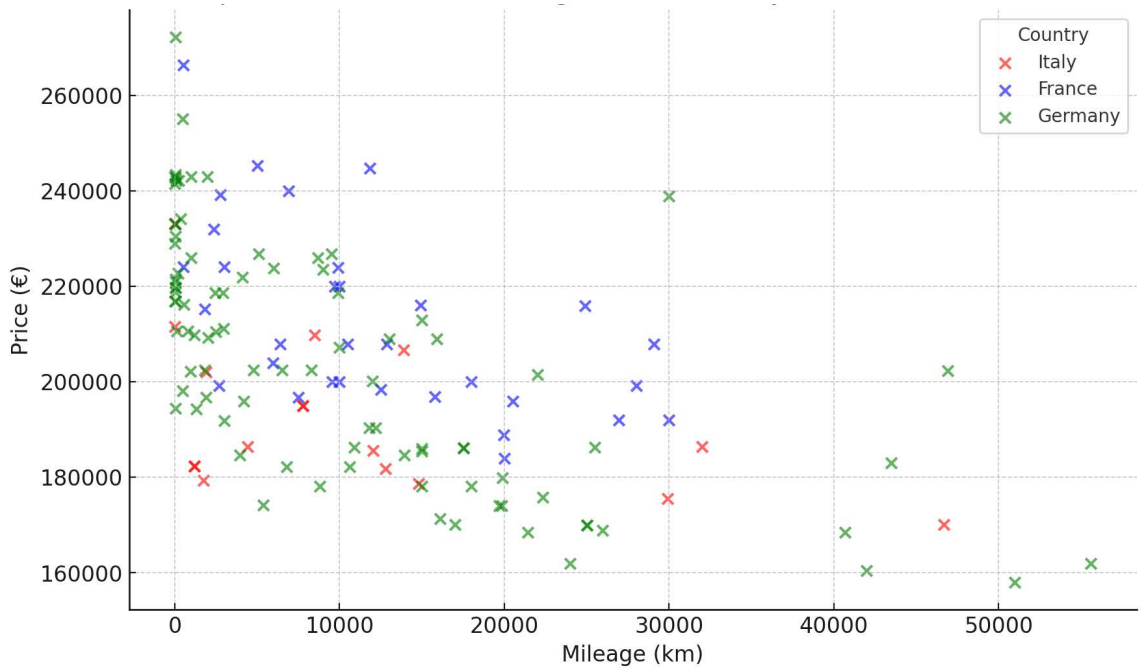

Table 10 Relation between price and km for Porsche 992 Carrera Turbo S in Italy, Germany, and France.

The scatter plot of the Porsche 992 Turbo S displays closely knitted prices, and for mileage, there are a few recorded to be extremely low. Price differentials in the German market are wider, as most of the cars are offered at prices over averagely low. That is supposed to indicate that good deals could be done in Germany, for then importing the car in Italy or France.

In general, profit-making through buying and selling arises mainly from huge price differences relative to the mileage. A good opportunity for the buyer who wants to sell is found in Germany, where prices for Turbo S and Carrera GTS are very high with much variation. When his or her attention is drawn to outliers, the arbitrageur can then make use of these market inefficiencies for profit.

This could partly be explained by how people value different markets and by local supply and demand. For an investor or a buyer who would like to maximize his investment, the opportunity of finding a Turbo S in Germany, costing lower than that in Italy, can make a good profit upon importation and selling it either in the Italian or French market with low mileage.

3.3.4 Arbitrage opportunities and price distribution in electric supercars (Taycan GTS and Taycan Turbo S)

From the price distribution and mileage for Porsche Taycan GTS and Turbo S in Italy, France, and Germany, it is observable that there might be good arbitrage opportunities in the electric supercar market. Looking below, at both box plots of the prices and scatter plots on the relation between price and km it is notable a clear view of effective arbitrage strategies.

Box plots, especially in Germany, show several outliers, far away in price compared to others. The low prices of cars in the German market, respectably offer the profitable opportunity to purchase them for less money and then sell them in more expensive markets like France and Italy.

The price bracket is both higher than that of the Taycan GTS and the Taycan Turbo S, yet tighter. Cars from other places - especially Germany - can be sold in France at relatively higher prices. High prices, for example, in low-mileage cars, show that the buyers in France are ready to pay more money, creating an opportunity for the traders to buy cars in Germany where prices are going to be cheaper, and sell them in France with a good profit.

Italy is between the changes of prices in Germany and steadiness in France. The prices of vehicles in Italy are higher compared to Germany, whereas the spread of prices is smaller when compared with France; therefore, very high or very low prices happen very rarely in Italy, and a probability to find less expensive vehicles in a country is lower.

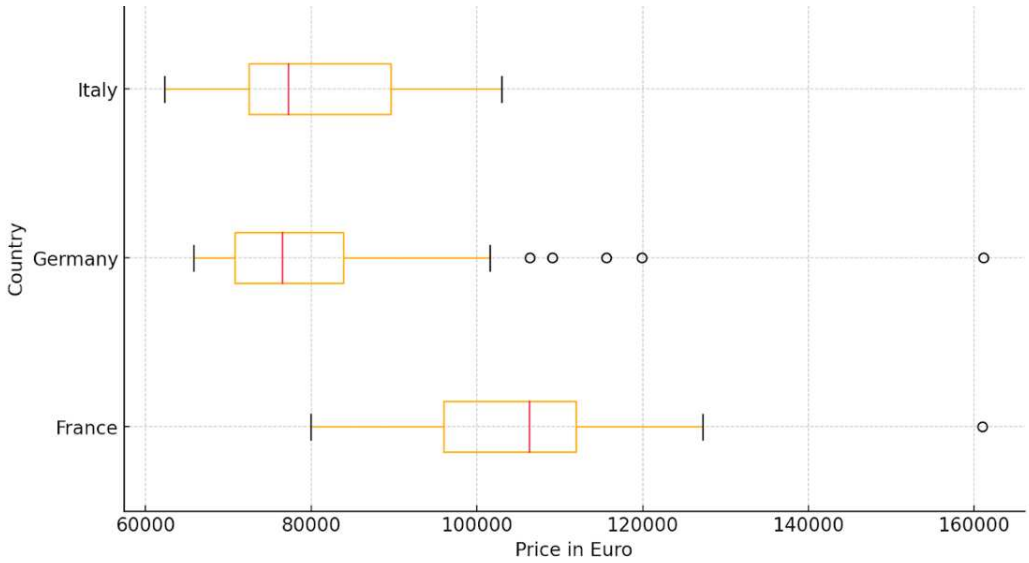

Table 11 Comparison of Porsche Taycan GTS prices in Italy (n=22), Germany (n=108), and France (n=23) represented in a box plot.

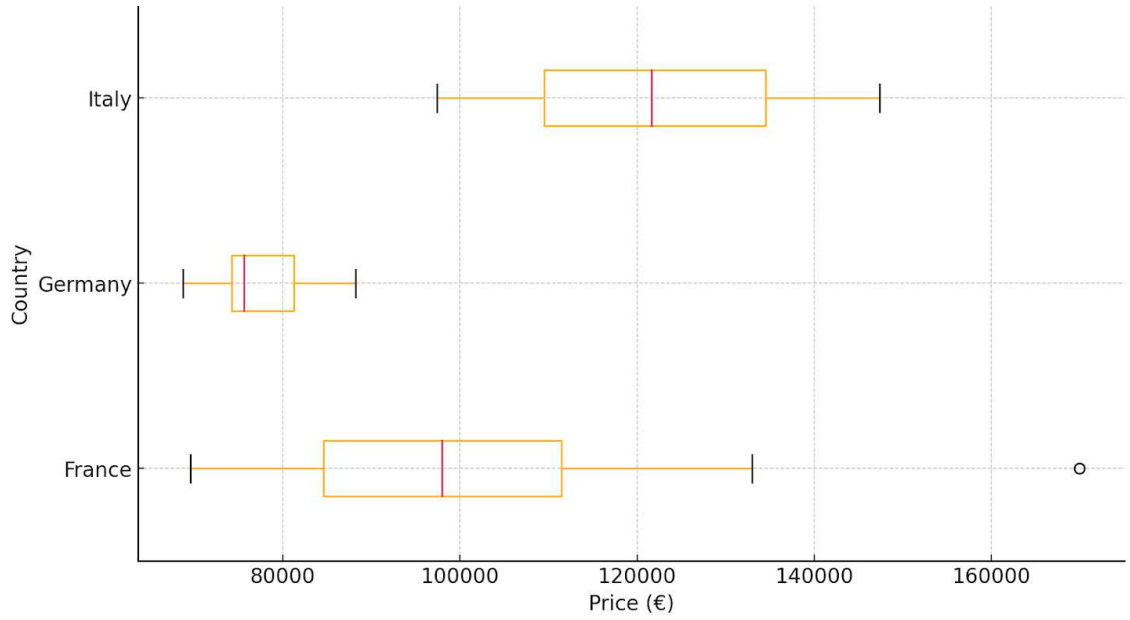

Table 12 Comparison of Porsche Taycan GTS prices in Italy (n=3), Germany (n=83), and France (n=35) represented in a box plot.

In Germany the Taycan Turbo S still cost much less compared to those from France and Italy and this implies that low mileage cars pose especially good opportunities for arbitrage since markets in France and Italy place a higher value on such characteristics of cars. The buyers who would like to exploit this opportunity can purchase cars in Germany with medium to low mileage and resell these in France and Italy. The demand conditions in both the countries justify prices which are higher for resale cars. Scatter plots for both French and Italian markets show a significant relationship between lower mileage and higher prices, confirming the fact that a well-maintained car will surely be a lot more expensive in these end points.

The trends are much more pronounced in Taycan Turbo S. For example, in Germany, there is a wider price spectrum and even more low mileage Turbo S cars, while in France, the prices are at the highest end for the low-miles range. One may capitalize on the further amount French buyers are willing to spend on less driven cars by buying less expensive cars in Germany with more driving miles on them and then selling these in France.

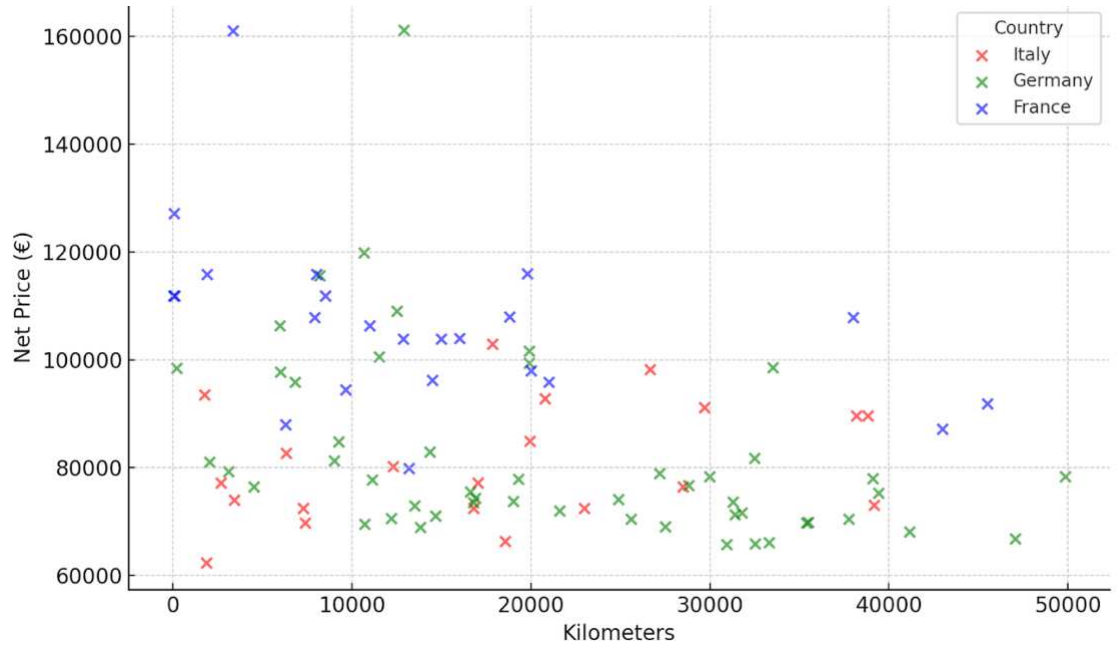

Table 13 Relation between price and km for Porsche Taycan GTS in Italy, Germany, and France.

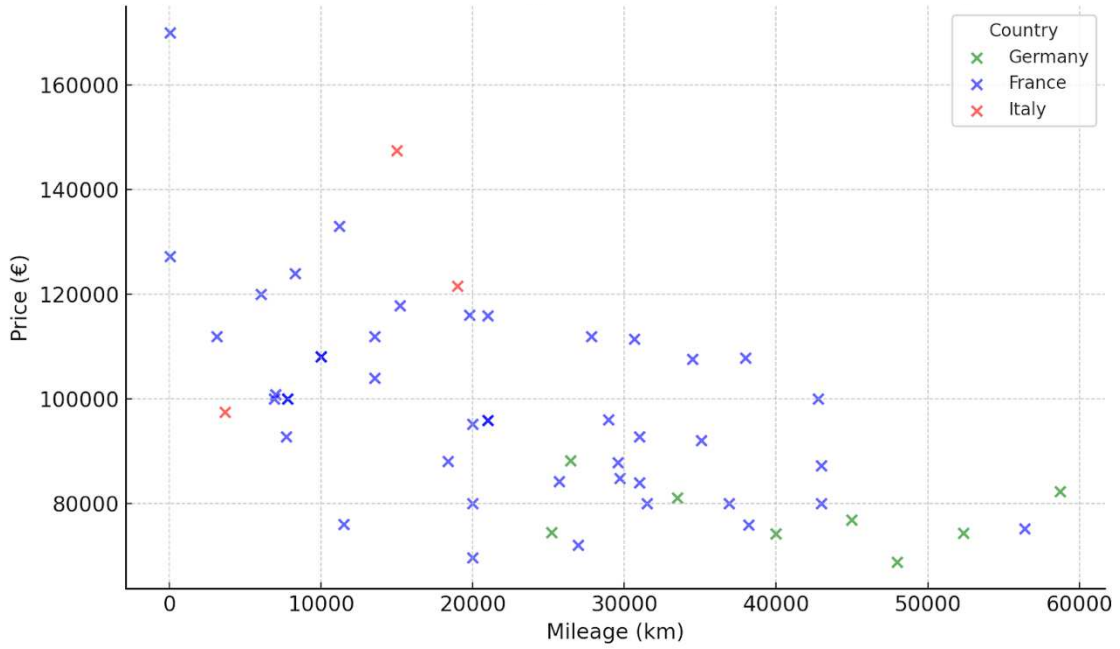

Table 14 Relation between price and km for Porsche Taycan Turbo S in Italy, Germany, and France.

The best arbitrage opportunities occur in purchasing a Porsche Taycan Turbo S from Germany and selling them to France and Italy. Arbitrageurs will use results on how price and mileage relate, and on how market characteristics of two countries differ, to assure that a profit is made by knowing when and where the purchase and resale should occur.

3.3.5 Economic, regulatory, and cultural factors influencing supercar price discrepancies in Europe

Wide differences in prices in similar supercars in Italy, France, and Germany are the results of a different variety of economic, regulatory, and cultural reasons. Each one of these factors alone contributes to shaping the market as a whole and, furthermore, changes in the price of a particular model (Santis, Sano, Gunnella, & Neves, 2022). Another derived factor from this analysis is the level of national taxes and environmental regulations that can directly affect the final retail prices of cars at their final retail stages, including luxury-type cars such as those of the Porsche brand.

One of the drivers of price discrepancy is linked to environmental taxation. This means that a car with a high-powered engine - and high CO_2 emissions - can be highly priced, and the amount goes up according to the level of pollution that causes the vehicle to reach up to €60,000. This rule adds a host of other expenses to luxury cars in France, raising their prices in comparison with similar cars in Germany or Italy where such taxes are generally lower or nonexistent.

In Italy, car ownership taxes are high—the so-called "*superbollo*"—but only on cars whose power exceeds 185 kW, with no equivalent environmental tax. That is, Italy's luxury cars cost owners less up front than those in France but have an additional ongoing expense in the form of the superbollo each year.

Germany, where Porsche is based, enjoys the price benefits of a lower VAT rate of 19% and a mature, competitive market for luxury and sport cars. With more supercars in the market today, Germany has great transportation systems and hosts the factories in which Porsche manufactures its automobiles. This means lower costs and times of delivery, probably keeping the prices down. Besides, the differences in price in these markets have been worsened by changing tax rules, environmental laws, supply chain problems, and production costs in recent times.

Supplies have been delayed in countries like Italy and France, compared to Germany. And probably that's one of the reasons prices haven't gone up to the level of Italy and France,

where longer delivery times and low stocks have significantly inflated supercar prices, because Germany is a major manufacturing house

France and Italy, that said, lack the competitive strength of Germany and do not overflow with as many products, so prices are relatively higher with less supply and less competition. One more differentiating fact will be the cultural aspects: Germany is where Porsche is native: high-performance cars drive culture. This could drive a second-hand market that is deeper and possibly stronger, meaning fewer fluctuating prices because of the increased availability of cars. Now, the economic and cultural differences are directly linked with chances for arbitrage. But what drives an arbitrage decision is not the mean or median prices, instead it's the outliers taken from the prices analyzed on the Carrera S, GTS, and Turbo S - specific cars, priced below the market average in one country and can then be resold at a higher price in another market whose prices are inflated by taxes or lower supply.

3.5 Customer price analysis for importing a supercar to Italy

For Italian buyers, the appeal of importing a supercar from Germany and France could be somewhat strong as the prices are sometimes much lower than those accessible locally. Apart from the purchase price, one should take additional elements into account while computing the whole cost of the car upon arrival in Italy. These cover extra costs and other bureaucratic needs.

The next part will explore the several elements influencing the whole cost of importing a supercar. The main points of discussion will be the procedural elements of registering and licensing automobiles in Italy as well as the several economic considerations related to international transportation logistics. Case studies will also be used to project the expenses of importing supercars relative to buying them in Germany or France. This will provide a more realistic evaluation of the cost-effectiveness connected with importing the car instead of buying one already on the Italian market, thus providing a thorough awareness of the several elements that could affect the end price of an imported vehicle.

By means of this study, we can pinpoint the regions where expenses usually increase and, on the other hand, where efficient import planning could reveal possible savings.

3.5.1 Legal administrative and bureaucratic procedures in importing supercars

Importation of a high-performance car into Italy requires lots of bureaucratic and regulatory procedures, scrupulously performed in compliance with Italian and European law. These will be very important in setting out the roadworthiness of the imported vehicle. Other factors include the final price of the vehicle and delivery time. The discussion would then become more critical to deduce the relevant steps and regulatory measures that may be invoked against the importation of such high-performance vehicles.

First, to register a vehicle an application must be presented at any "*Sportello Telematico dell'Automobilista*" for a practice to be registered into the "*Pubblico Registro Automobilistico*", both new and used. In practice, everything is done at the counter of "*Sportello Telematico dell'Automobilista (STA)*" with no further formalities at the "*Dipartimento della Motorizzazione Civile (DMC)*".

First, the CoC (Certificate of Conformity) will be needed to move the process forward; this will assure the compliance level of the vehicle with the set standards of safety and environmental concern by the EU. Proof of purchase, including invoice or sales contract, should also be provided. A tax documentation concerning this purchase should be submitted, too, including value-added tax and custom duties.

Precisely, a CoC is the key document that could make the process of vehicle homologation in Italy easier or not so complicated. In cases when the vehicle is not issued with a CoC at the time of sale, the purchaser will be held responsible for ensuring that a technical inspection is carried out in an authorized inspection center. This should give some indications whether the vehicle will meet the appropriate regulations in Italy. This can take much longer to complete the registration process, sometimes with extra technical inspection costs.

Value Added Tax and duties. The import of a vehicle within the European Union is governed by Directive 2006/112/EC, which explains the laws regarding how VAT shall be conducted between members in the EU. Regarding the above, the classification of the vehicle as "new" or "used" is importation due to its tax consequences. A vehicle shall be regarded as new, having in mind its mileage or/and the time after its registration. A vehicle is considered new

if it has less than 6,000 kilometers or has been registered for less than six months. In that case, the Italian buyer must pay VAT in Italy, currently set at 22 percent. For "used" vehicles (over 6 months and with more than 6,000 kilometers), VAT is generally paid in the country of origin, provided the vehicle was not purchased under the margin tax regime.

Depending on the VAT classification, when importing supercars from another EU country, you will be required to pay the Italian VAT. In any of the cases, however, the clear evidence of payment is necessary at the payment regarding payable VAT and connected taxes for accomplishing the registration procedure.

Once all the formalities concerning taxation are dealt with, homologation is another step of equal importance to follow to ensure that the vehicle is in a roadworthy state. Unless otherwise specified when importing vehicles from other countries holding EU CoC, the Type Approval procedure is normally a formality. Anyway, with changes on either the engine or any modification on the structure integrity for vehicles, demands of technical visits will be used to validate these with Italian standards.

The Type-approval can also be more expensive, since most unique features that come with supercars are not per se in compliance with Italian standards. These roadworthiness tests range from vehicle safety controls to environmental legislation on CO_2 emission limits.

Timing and patience are key in the process of registration. One of the critical issues concerning importation for supercars into Italy is the long time it takes for all the administrative tasks to be finished. The common delivery time for the Italian plates is from 10 to 30 working days once all documents are received, but this depends on how complicated the case is and the effectiveness of local authorities. The vehicle will remain stuck in this period without being able to circulate on public roads.

Aside from paying normal taxes, Italian supercar owners also must pay "*superbollo*", or a sort of supplementary tax imposed on powerful cars whose engine power is over 185 kW. "*Superbollo*" refers to the supplementary money supercar owners must contribute-equivalent to 20 euros per kilowatt of power over and above 185 kW. This tax can bite very

sharply at the operational cost of running a luxury car, so that's got to be included in the price of ownership.

At the time of its registration with the PRA or Public Motor Vehicle Registration Authority, the vehicle is to be paid a registration fee and car registration tax.

3.5.2 Logistical costs and transportation

Apart from administrative expenses, importation expenses to Italy define the ultimate price as well. Not only to save the car from physical harm but also to lower all possible financial risks associated with any kind of damage or loss on delivery. Forms of transportation, distance to travel, special safety possibilities, and for a supercar shipping luxury automobiles must be handled in a very particular way.

About the means of transportation, it is possible to choose between open car transporter, shared covered car transporter, and individual private trailer carriage. Every one of them has different cost, delivery time, and level of security.

When transferring a car for a significant distance, a car transporter is often used as it is less expensive, but on the other hand, the car can be subjected to varying circumstances regarding the surroundings and the possibility of damage such little scratches resulting from debris on the road. If a supercar is new or a collector's item, even the littlest damage might have a significant effect on its value. This choice ranges from €500 to as much as €2.000 depending on the distance of journey and on the number of cars transported.

A covered car transporter, which treats the vehicle with particular care and keeps it far from the outside hazards, is safer for expensive cars or, for instance, those hard to find since their condition preservation comes first. Usually falling between €1.500 and €3.000.

A third option is transportation with a private single transport trailer. In this case the car travels alone, removing any chance of harming the vehicle during handling or transportation with other cars. Usually, this would be employed by collectors or for expensive supercars when quick transportation is needed with customized service. The cost is more than all the previous options, but one can guarantee quick delivery and high degree of personal care.

Moving a valuable car comes with risks and costs that aren't usually clear. For example, another cost to be considered is the cost of insurance for the travel. The more a car is worth, the more it can cost to insure. It's important to note that most transportation companies offer insurance policies that cover a certain percentage of the vehicle's value. The extra fees that come with insurance for these supercars that cost more than 100,000 euros can be high.

One also must consider the possible delays: although there may be a delay in scheduling due of logistics, road conditions, or customs, most car transporters have several stops along the route; possibly, these circumstances could result in days of delay that are costly on the part of the buyer if the vehicle was purchased for arbitrage purposes.

Demand for private transporters in these last years has seen a modest rise in the luxury car transportation industry (Vega-Gonzalo, Gomez, & Christidis, 2023). Several transporter businesses have become specialized in services for supercar customers as emerging nations open to luxury automobile markets by providing guarantees on time connection to delivery.

Particularly in cases of a premium transport service chosen, the cost of transportation is rather considerable, accounting for even a 10% of the price of purchase. The first step in importing a car from another country is choosing the mode of transportation since it can greatly affect the price of importing and buying a car, compared with prices in the home market. High logistical costs should be taken into consideration as they might neutralize the whole advantage of importation of a supercar at the offset of the original pricing benefits of buying one from Germany or France.

3.5.3 Case Study 1: Importation of Porsche 911 Turbo s from Stuttgart, Germany to Venice, Italy.

The first case study will follow a step-by-step process and a detailed analysis to calculate the total cost of importing a Porsche 911 992 Turbo s coupe manufactured in 2021, with 21.100 km done from a dealer in Stuttgart, Germany, transported to Venice in Italy. The process of importing this car will cover the initial price down to Value Added Tax, transport, and insurance, registration, and annual taxes, including stamp tax and "superbollo". This would

provide a full-scale analysis of the economic and logistical implications regarding the financial operation.

The Porsche 911 is priced at €207.811 including 19% German refundable VAT. Since the car is being imported into Italy, the German VAT will be refunded once the Italian VAT is paid. The final price, first, will be calculated by adding at the net price the 22% of Italian VAT. From the other side, German VAT could easily be reclaimed by German authorities after presentation of the statutory tax documentation and after its control. Thereby calculation of value and VAT price was as follows:

Price excluding German VAT: €207.811,19 = €174.631,00. The Italian VAT payable at a rate of 22% amounts to €38.418,82, calculated by €174.631,00 x 0.22. The final amount to be paid, including Italian VAT, is €213.049,82.

Italian VAT is paid in the process of registering the car and later German VAT will be refunded. It must be mentioned that the German VAT refund deadlines can vary up to 30 days due to the bank practices and the efficiency of tax authorities.

Enclosed trailers are available and very suggested for exotic cars such as the Porsche 911 turbo S. Exotic cars require extra protection, and therefore, it would be right to say that these cars need to have a very safe and fully covered trailer. Thus, the same is highly recommended to avoid possible damage that might be caused by some weather conditions or another accident. Prices depend on the distance to travel or chosen package.
Assuming transportation costs on a covered car trailer from Stuttgart to Venice, the route could be around €1,500 - €2,000.

Transport time depends on the performance of the transport company; the period may extend to ten days because of delays due to customs problems.

Once the Porsche 911 has been imported to Italy, it must be registered at the Department of Civil Motorization. Thanks to the CoC, during the homologation phase, there is no longer any need for further technical checks; hence, faster and less costly.

This is usually supposed to take between 15-30 days, following normal administrative procedures.

The administrative costs amount to about €500 and include all the following costs: registration under PRA as well as all the costs of a bureaucratic nature regarding Italian plates.

For each owner of a supercar in Italy, the stamp duty and "superbollo" are also quite big expenses. Taking the example of the Porsche 911 992 Carrera Turbo S, producing 478 kW—there are "superbollo" taxes too.

Standard stamp duty "*bollo*": Around €587,55 per year with minimal variations depending on different regions.

"Superbollo": Calculated as €20 for every kW more than 185 kW: (478-185) 20= €5.860

Consequently, summing the stamp and "*superbollo*," it comes to €6.447,55 per year. If the previous owner's stamp duty is to run out that year in which one buys this car, he may still have to pay for it.

The following is a cost breakdown that relates to the importation of the Porsche 911:

Item of expenditure	Amount (€)
Starting price in Germany	€207.811,00
Net price of the vehicle	€174.631,00
Italian VAT (22%) to be paid	€38.418,82
Transportation in enclosed trailer	€1500 - €2000
Registration and bureaucratic expenses	€500
"Bollo" and "*Superbollo"*	€6447,55
Total (excluding vehicle price)	€46.866,37 – 47.366,37
Final price for the car	**€221.497,37 - €221.997,37**

The value of the Porsche 911 imported from Stuttgart to Italy has been estimated at a value between €228,000 and €233,000, comparing very similar cars sold in Italy. This price difference, ranging from €7000 to €12000, makes the economic savings from imports considerable. It is, however, worth considering some pros and cons of buying abroad. On one side, importing a vehicle from Germany can give access to a larger market where you can find specific configurations, or vehicles with features that may not be available in Italy. On the other hand, you must consider import issues regarding the payment of Italian VAT, which adds 22% on top of the net price of the vehicle. In that case, the German VAT included in the purchase price would be refunded once the Italian VAT has been paid, a bureaucratic process that may take as long as 90 days and has an impact on the buyer's cash flow.

3.5.4 Case Study 2: Importation of Porsche Taycan GTS from Stuttgart, Germany to Venice, Italy.

Buying and selling electric supercars, such as the Porsche Taycan GTS, would rake in high profit margins, especially in Italy. This is because no European country has applied

environmental taxes on electric cars, while the price level varies within the European markets. This analysis has the goal of understanding how importing electric cars from Germany to Italy offers an economical benefit. It will cover tax application, running costs associated with the cars, and smart options that facilitate purchases and resales.

The taxation in Italy is very high at present for ICE cars over 185 kW of power. Even though the Porsche Taycan GTS has more than 185kW, it is excluded from such taxes because it is an electric car. First, the Taycan is fully exempt from "*superbollo*", and this automatically sets much lower maintenance costs compared to the 911.

The electric car, therefore, will cost less to acquire because of the absence of tax purposes and at the same time it will allow big savings in annual operation costs, so that the buyer can exploit this investment made over time. Arbitrations become highly profitable when it happens with Germany and Italy.

Importing a supercar such as the Porsche Taycan GTS from Germany requires the inclusion of some additional costs such as transportation, paperwork, and Italian VAT. We use as a case study the purchase of a Porsche Taycan GTS 2023 with 32,534 km at a price of €81,800, as indicated by the sale ad in Germany.

Item of expenditure	Amount (€)
Starting price in Germany	€81.800
Net price of the vehicle	€68.739,50
Italian VAT (22%) to be paid	€15.122,69
Transportation in enclosed trailer	€1.500 - €2.000
Registration and bureaucratic expenses	€500
"Bollo" and "Superbollo"	€0
Total (excluding vehicle price)	€17.122,69 - €17.622,69
Final price for the car	€85.862,19 - €86.362,19

Comparing this with current minimum prices in the Italian market for similar vehicles, we can draw some interesting conclusions:

Vehicles in Italy	**Price (€)**
Porsche Taycan GTS 2023 in Milan	€89.500
Porsche Taycan GTS 2023 in Verona	€92.900
Difference from imported Taycan	3,6% - 7,6%

The percentage price differences range between 3.6 percent and 7.6 percent, which means that a buyer could save between €3.637,81 and €7.037,81 by buying and importing from Germany, even considering all ancillary expenses such as transportation and bureaucracy. This margin represents a significant opportunity for those who wish to take advantage of arbitrage between the two markets.

The arbitrage of electric supercars, such as the Porsche Taycan GTS, represents a unique and significant opportunity, especially for the Italian market, where taxation on internal combustion vehicles is particularly high: high-performance internal combustion engine cars

must pay "*bollo*" and "*superbollo*", which makes internal combustion engine cars much more expensive to keep on the road than electric ones.

It's important to consider, in addition, the fact that Germany has a diffuse and well-organized used car market, very often with very good quality at better prices than in Italy. The net price for the Taycan GTS model from Germany that we considered is € 68.739,50. Also in this case, like many others, the saving, compared to the Italian price, of importing the vehicle is remarkable.

This provides Italy with competitiveness not only through the acquisition price but also thanks to no environmental tax for electric vehicles. This really changes the economic view compared to internal combustion engine cars. For a Porsche 911 Turbo S with a conventional engine, this amounts to a total of €6,447.55 per year for stamp duty and supertax; in contrast, the Taycan GTS does not cost anything either for the CO2 emissions or for the power. From this point of view, too, savings are immediate and significant from the first year of ownership and so on for the others.

For example, cars powered by gasoline or diesel engines in Italy attract very high extra taxes. This makes electric cars a much more palatable buying prospect for Italian buyers. Importing a Taycan GTS from Germany gets one a much more high-performance car without heavy environmental taxes.

The great difference in the price of cars between Germany and Italy can also be related to the available supply. Italy can count on 32 official Porsche dealerships, whereas Germany counts on 86, more than double: this could be an explanation for why the prices in Germany for Porsches tend to be lower when compared. Any such imbalance in the supply and demand may push prices towards a higher level in Italy, making international arbitrage further beneficial.

There are also incentives policies for electric vehicles that could further lower the overall cost for buying a Taycan GTS imported. The same represents an added economic incentive for the buyer deciding to spend money on an electric vehicle other than on a car with an internal combustion engine and changes on a yearly basis.

In the end, electric vehicle arbitrage can be a strategic opportunity for the Italian market. Without taxation due to the lack of emissions, along with government incentives related to electric vehicles, the price discrepancy between markets will allow the buyer to achieve great savings with long term decreased costs of ownership. Already, a glimpse of the German and Italian markets tells where the final price of an imported Taycan GTS could possibly be competitive, amidst all the advantages of an electric vehicle in a country like Italy, with high environmental taxes.

3.6 Impact of arbitrage on dealers and policy implications

3.6.1 Impact of arbitrage on dealers

Car arbitrage occurs when there are price differences comparing very similar cars in different countries. This is, in fact, a very important issue for the dealers and at the same time, competition is increasing from all parts of the world. Buyers may import cars from countries with lower prices, such as Germany compared to France and Italy, and create a serious problem for official dealers, especially with the transparency introduced by online platforms such as AutoScout24 or Mobile.de.

The first impact of arbitrage on official and unofficial dealers is the pressure on the margins. In this kind of market, buyers could get price information all the time and the importing process is easier because of the fact of the same European rules, there came competitors who could buy at lower costs.

For official dealers, arbitrage poses a problem of profit margin erosion and perceived devaluation of the product offered. Dealers operating within the brands' official network are constrained by the pricing policies imposed by the manufacturers, making it difficult to compete with traders who can buy at lower prices in markets such as Germany and resell in Italy or France with reduced but sustainable margins due to the net price difference. An example might be given by the Porsche 911 Carrera GTS, in Germany sold from 10% to 15% less than in Italy: this opens for arbitrage possibilities, considering the direct competition of the official with the parallel importers.

In contrast to the parallel importers, the official dealers are authorized and, therefore, have better warranties and after-sale services, but this means that, at the same time, they need to have higher operational costs to survive. While adding such services makes extra value for the customer, the customer may not justify it. This is particularly true when pricing is immediately available online. The price-sensitive buyers will look at imported cars from neighboring countries rather than patronizing the official sales network.

For unofficial dealers - that do not take advantage of arbitrage opportunities - the impact of arbitrage can be even more destabilizing. Operating on smaller profit margins and relying on a less loyal customer base, these dealers' risk being cut off from the market if they are unable to compete on price. Being able to sell lower applies by the fact that unofficial dealers do not have similar post-sale services or warranties compared to official ones.

One good example is the resale of second-hand luxury cars in Italy. If an unofficial dealer advertises for sale at a very low price, say a Porsche 911, it would be easy for a parallel importer to find the same car at a cheaper price in Germany, take it to Italy, and sell the same at a price lower than what the unofficial dealer can offer. Therefore, unofficial dealers may have to rely on other forms of differentiation or otherwise experience a sharp decline in sales.

3.6.2 Policy implications and improvement proposals

Arbitrage in the supercar industry not only affects dealers, but also highlights gaps and misalignments in national regulations and policies, such as different tax rates and environmental regulation. Sometimes these differences in price between markets create opportunities for the arbitrageurs. Most important amongst these issues is the variation in VAT and in various countries' environmental taxation rates that directly hits the end price of the automobile in different national markets.

With a 22% VAT rate, Italy loads things more expensively for the final buyer than does Germany with 19% or France at 20%. Even more, it concerns supercars whose net price is very high. Italy has a tax for all cars over 185 kW, called the "*superbollo*". That would most likely make owning a supercar relatively higher than in Germany.

Closer and more uniform taxes could eliminate much of the price gap and result in more homogenous national markets, which would allow far more effective and fair competition between domestic sellers and parallel importers. Harmonization of environmental policy may also be performed mainly in CO_2 emission taxes. For instance, the same level of the environmental taxes in all the EU markets would neutralize the mentioned differences caused by, for instance, France as it applies high emission taxes, making owning an ice combustion engine supercar more expensive compared to Germany and Italy.

The question is if more parallel importation will cause harm or benefit to the consumers and the local market. Generally, arbitrage benefits the consumers in finding the lowest prices, but it also makes the local dealers fight for lower margins; thus, this could pose a threat to jobs and investment in the car industry.

One proposal for improvement could be the creation of a parallel import tracking system, which would better monitor and regulate the flow of vehicles imported from other EU countries. Such a system would avoid risks of double taxation and ensure that all imported vehicles meet national environmental and safety standards, thereby reducing the competitive advantage of arbitrageurs and better protecting local dealers.

Smoothening of the taxation and environmental regulations in the EU nations, besides proposing incentives for local traders, will ultimately make the owners have more control over the parallel imports, reducing price discrepancies that lure arbitrage and making the market real and competitive for all participants.

3.6.3 Managerial implications for dealers

Arbitrage in supercar transactions impacts the competition among dealers and it may need some different management strategies. Official and unofficial dealers both face their problems, mainly because easy access to market data together with price differences in other countries can make buyers able to import cars rather than buy through regular channels. Because the needs for official and unofficial dealers are so different, they need to have detailed plans separately to maintain competitiveness.

Dealers, in close collaboration with the manufacturers, must focus on making their value more enhanced over the parallel importers. One of the best strategies is improving customer loyalty through exclusive offers, longer warranty programs or after-sales service that only an authorized dealer can offer. For instance, "Porsche Experience" programs are offered by official dealers that can be a strong incentive for buyers.

Moreover, under the manufacturer's closer collaboration policy, official dealers will have an exclusive and customized model, not available through unofficial channels. Therefore, they might offer unique products that are networked to be more attractive. An additional and very significant element toward a successful official dealer is the use of advanced market information for tracking pricing in foreign markets, thus preventing the risk of being subjected to competition from parallel importers.

Arbitrage activities are sensitive to unofficial dealers who are fighting one another on prices. Their skills depend on being quicker in the purchase and sale of vehicles and the winning strategy to respond is in finding different sources of supply. Unofficial dealers can work on getting vehicles from countries that have cars with lower prices or focus on models which are not as available within local markets, taking advantage of price differences.

Other strategies can include investments in the form of specialization, for example selling only a particular kind of supercars or vehicles, or services that improve customer care. This will make a difference not only in prices in this non-official dealer, but also possibly for personal buying experiences that are simply impossible for official dealers.

Both kinds of dealers face problems in creating relations with customers and the market. Being an official dealership can in fact outshine competition by presenting an image of trust and advertisement of official certification and rigid control over cars that are being sold. Open communication regarding the benefits of buying through official channels - for example and extended warranties and certified maintenance - will keep the customer base loyal.

The managers must make some crucial changes through arbitrage. Official dealers need to add what they are offering with a row of special services and guarantees. Unofficial dealers must react by flexibility and custom tailoring to the fast alteration of world prices through alternative sources of supply.

Conclusion

The supercar market represents a complex and articulated reality, since special demand and economic, social, and legal factors change in every country. This thesis looks at arbitrage in Europe, in particular Italy, Germany, and France, to understand how the different structures of these markets can create opportunities for profit-making.

The analysis also showed how economic, tax, and cultural factors significantly affect supercar prices in various countries that are supposedly so similar. Particularly, many tax rules about CO_2 emissions and luxury taxes have considerable effects on the final prices of vehicles, allowing profit opportunities to take place.

Another major finding of the research concerns the importance of economic conditions and purchasing power, which vary greatly among the different regions of the three countries analyzed.

However, demand is great in affluent areas, such as Lombardia in Italy or Bavaria in Germany, due to their high disposable income and strong luxury culture.

While conceptually related to financial markets, arbitrage in the supercar market requires a careful technical and operational approach, where the ability to identify price discrepancies between markets is only the first step. The transportation costs, import fees, possible risks of price depreciation and the opportunity cost of the money that could have been spent elsewhere have to be weighed up very carefully to establish the profitability of the transaction. Also, details about vehicle conditions, like how many kilometers it has and its maintenance history, make the supercar market less active than regular markets.

From a theoretical standpoint, this paper has demonstrated how classical economic theories, including the efficient markets hypothesis and the intrinsic value theory, can be applied to analyze the supercar market.

All the same, this market has inefficiencies and information asymmetries that move its operation away from that of a perfectly efficient market. The subjective elements related to

brand perception, vehicle history, and perceived scarcity help maintain these inefficiencies at levels conducive to arbitrage opportunities. This research gave a clear and complete view on how the supercar market in Europe works. It has shown that rules, economic factors, and cultural differences play an important role in determining prices. There are many practical insights for people in this line of business, from finding opportunities to make profits to keeping an eye on the risks associated with these deals to understanding complex issues about supply and demand in different countries. In conclusion, buying and selling supercars for profit is a smart strategy that requires good knowledge of market function, cautious evaluation of risks, and attention to rules and cultural differences. This paper has demonstrated how, even a supposedly homogenous European Union still offers opportunities to exploit market differences and thereby make arbitrage a significant and potentially profitable activity for those able to manage the complications in this industry.

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