

Report prepared for:

ceev

Comité Européen
des Entreprises Vins

Economic, social and environmental importance of the wine sector in the EU

REPORT

March 2024



pwc

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Economic, social and environmental importance of the wine sector in the EU

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Executive Summary

The European Union (EU) has developed a complex value chain that involves different economic sectors and accounts for 62% of the world's total wine production

Wine value chain

Economic sectors | Market value¹ (B€)



**Viti-viniculture
(Agriculture)**

€29.4 B
Production value²



**Winemaking
(Industry)**

€50.3 B
Sold production³



**Commercialization
(Services)**

€100.3 B
Market size⁴

Main activities involved

- Vineyard care and management
- Grape harvesting
- Agricultural on-holding wine production using self-harvested grapes

- Wine production using not self-harvested grapes
- Crushing and fermentation
- Bottling, aging and maturation

- Distribution
- Retail sales
- On-trade consumption

The market value of each sector in the value chain incorporates the market value of the preceding sector. For example, the market value of commercialization encompasses the market value of winemaking.

62%

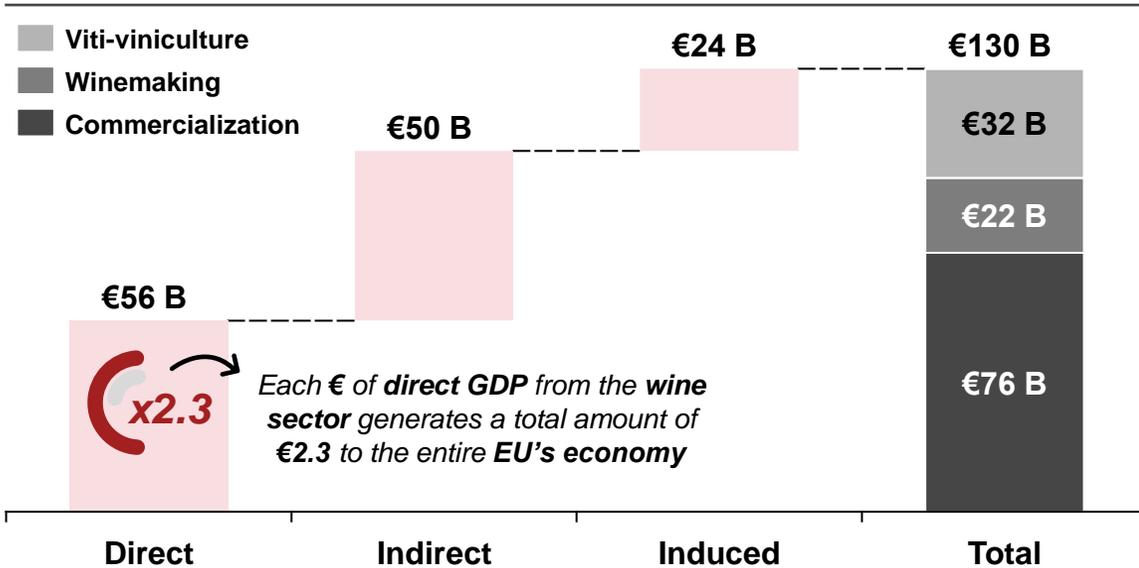
The **EU** is responsible for **62%** of global wine production volume⁵



(1) The market value represents the total revenue estimated or generated by each activity within the value chain. This can encompass the estimated value of production (in the case of viti-viniculture), the actual value of sold production (in winemaking), or the turnover generated through on-trade and off-trade sales channels (in commercialization). (2) Source: Eurostat – Economic Accounts of Agriculture, (3) Source: Eurostat Statistics on the production of manufactured goods, Value of sold production, (4) Source: Statista, (5) Source: OIV. World production accounted for 258 Mhl in 2022

In 2022, the wine sector in the EU contributed 130 billion euros to the Gross Domestic Product (GDP), equivalent to 0.8% of the EU's GDP

Wine sector contribution to EU's GDP in 2022 (€ Billion)



€130 billion
Wine total contribution to EU's GDP (2022)

Equivalent to

- **0.8%¹ of EU's GDP:** The economic activity generated by 125 Wine sectors would be equivalent to the whole economy of the EU
- **47.9%² of EU's Primary sector:** The economic activity generated by the EU Wine sector is equivalent to almost half of the total agriculture, forestry and fishing Gross Value Added inside the EU
- **9.7%³ of Spain's GDP:** The economic activity generated by 10 EU wine sectors would be comparable to the size of Spain's economy

Wine exports

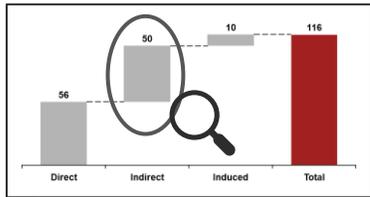
€15.9 billion
positive trade balance⁴

➤ The wine produced in the EU generates a strong demand from abroad... **3.7%** Without wine, trade deficit of the EU in 2022 would have been 3.7% higher

2nd Wine was the second most exported EU agri-food product by value during 2022⁵

Source: PwC estimates using Input-Output Methodology, Eurostat and Statista data
 (1) Source: Eurostat National Accounts GDP current prices for EU-27 in 2022. (2) Source: Eurostat Gross value added by industry current prices for EU-27 in 2022 (3) Source: Eurostat National Accounts GDP current prices for Spain in 2022 (4) Source: Eurostat International trade in goods with Extra-EU countries. (5) Source: European Commission *Monitoring EU AGRI.FOOD TRADE* March 2023

Around 38% of the total GDP contribution, 50 billion euros, is generated indirectly through the value chain, benefiting a wide range of economic activities outside of the wine sector



Top 3 indirectly benefited sectors by the wine sector



15.4%

of indirect contribution to EU'S GDP corresponds to the **trade & repair sector** (€ 7,682 Million)



14.5%

of indirect contribution to EU's GDP corresponds to the **manufacturing sector** (€ 7,235 Million)



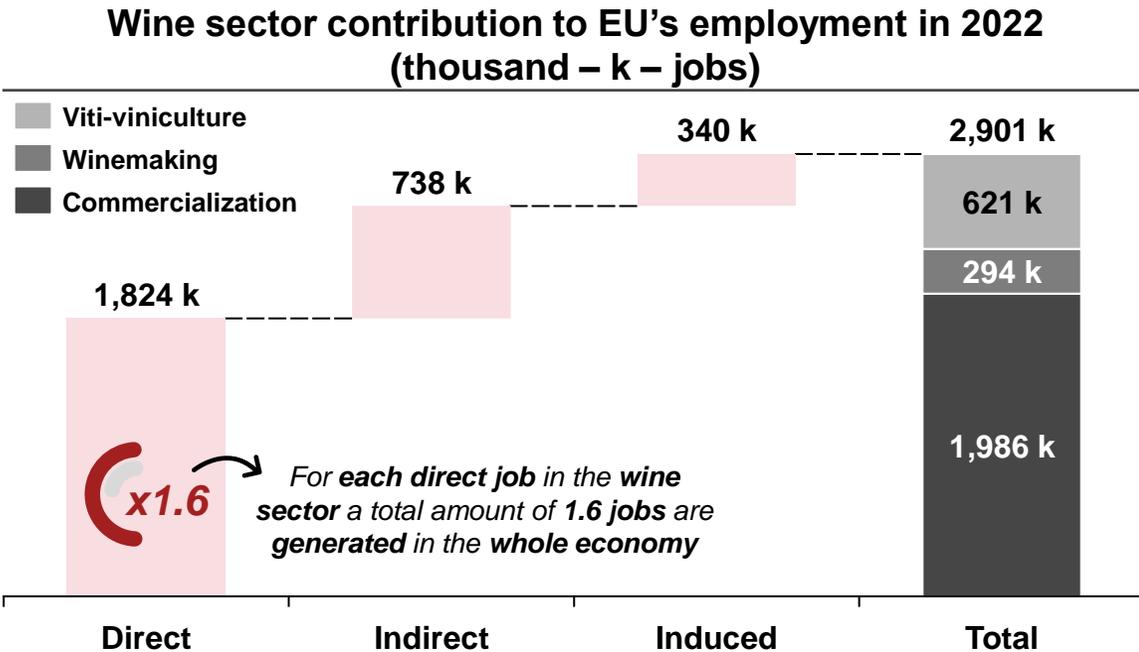
10.7%

of indirect contribution to EU's GDP corresponds to the **professional, scientific and technical activities** (€ 5,331 Million)

Main activities involved by sector

- **Wholesale and retail trade of:**
 - Wine glasses
 - Transportation vehicles
 - Wine fridges/coolers
- Wine **cork** manufacturing
- Wine **bottles** manufacturing
- **Agricultural machinery** manufacturing & repair
- **Engineering** auxiliary services (agricultural support, wine safety tests...)
- **Advertising campaigns**, marketing/branding

In terms of employment, the wine sector generated a total amount of 2.9 million jobs in 2022, which represents 1.4% of EU employment¹



2.9 million
Wine total contribution to EU's employment (2022)

Equivalent to

- **1.4%¹ of EU's employment:** The employees associated with 71 EU wine sectors are equivalent to the total jobs in the EU
- **20.3%² of EU's Construction employment:** The associated employment of 5 EU Wine sectors is comparable to the total number of construction employees within the EU
- **11.3%³ of Italy's employees:** The employment generated by 9 EU wine sectors would be on par with the total employment in Italy

Labor productivity⁴ of wine is higher than that of its counterparts at every stage of the value chain...

- Viti-viniculture +90%** vs crop and animal production
- Winemaking +16%** vs manufacturing
- Commercialization +5%** vs food and beverage activities

➡ Additionally, wine farms are **15% more profitable** than the average farm in the EU

Source: PwC estimates using Input-Output Methodology, Eurostat and Statista data
 (1) Source: Eurostat Employment for EU-27 in 2022. (2) Source: Eurostat employment by industry breakdowns for EU-27 in 2022. (3) Source: Eurostat Employment for Italy in 2022. (4) Labor productivity measured as GVA per employee. The values for counterparts were collected from Eurostat.



Rural areas in the EU, which have experienced a notable decrease in population, account for almost half of the territory. Vineyards, given its socioeconomic impacts, play a crucial role revitalizing them





Population in rural areas¹ in 2022

92.9 million people





Total surface covered by rural areas¹ in 2022

1.9 million km²

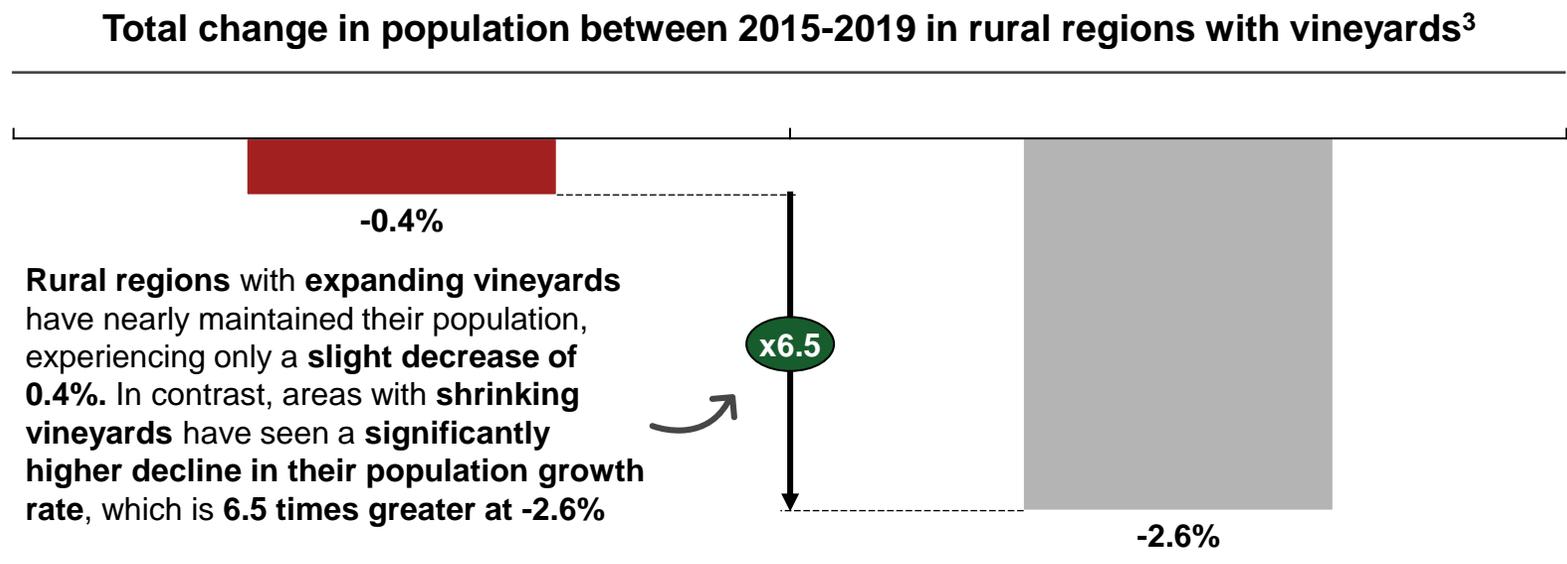




Total surface covered by vineyards² in 2020

31.8 thousand km²





Rural regions where area under vineyards **has increased** ↑
 Rural regions where area under vineyards **has decreased** ↓

-4%

Population in rural areas has been experiencing an annual **decrease** of around **0.7%** since 2014⁴, resulting in a total decrease of 4%

(1) Source: Eurostat classification of NUTS3 regions using population living in urban clusters or rural grid cells, (2) Source: Eurostat, (3) Source: PwC analysis using Eurostat data. (4) People from 0 to 64 years old. Source: Eurostat: Population by broad age group, sex and other typologies. Population for Predominantly rural regions, Estonia, Italy and Croatia don't report data until 2021,



Wine tourism promotes and develops rural areas in the EU, acting as an economic catalyst for generating economic value in related activities



Wine tourism is a key element for social and cultural promotion of rural areas because:



...increases the **status of those rural areas** converting them into premium destinations for potential tourists



... contributes to **develop the rural areas**, create jobs and an opportunity to stay for young adults



...promotes other regional cultural values, such as **gastronomy and local special products**

Key figures of the wine tourism sector



36 Million

Almost 36 Million people visited areas surrounding vineyards looking for experiences around wine during 2022¹

During their journey people **take pleasure in exploring the rural landscape** and its rich social and cultural traditions, generating revenues for the local businesses



€1.1 Billion

More than € 1 billion of estimated spending in wineries and wine museums visits in 2022 in the EU²



Visit of wineries and wine museums



Visit of vineyard's suitable areas

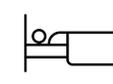


€15 Billion

Including also related activities, total revenue of wine tourism in the EU reached 15 Billion euros in 2022³



Tour guides



Rural accommodation



Local gastronomy discovery

(1) Estimates from different sources and sometimes with different definition of a wine tourist, for countries with no information PwC estimated the number of tourists using the number of vineyard's hectares in production and average visitors per hectare in other European countries Sources: Atout France, ACEVIN (Spain), Portuguese secretary of state for tourism, Geisenheim University and Wines of Germany, Città del Vino (Italy). (2) Estimates using information available for Spain (ACEVIN), then extrapolated to the rest of the EU. (3) Estimates using information available for Germany, Italy and France and then extrapolated to the rest of the EU given estimated wine tourists. Sources: Atout France, Geisenheim University and Wines of Germany and Città dl Vino.



The wine sector contributes over 1.1 billion euros to Research and Development (R&D) investment in the EU, equivalent to 0.3% of the total EU's R&D¹





€1.1 billion

Wine total contribution to EU's R&D (2022)

The **wine sector directly** contributes to **R&D** and innovation through **different areas** of study²:



Viniculture



Wine economy



Processes



Product

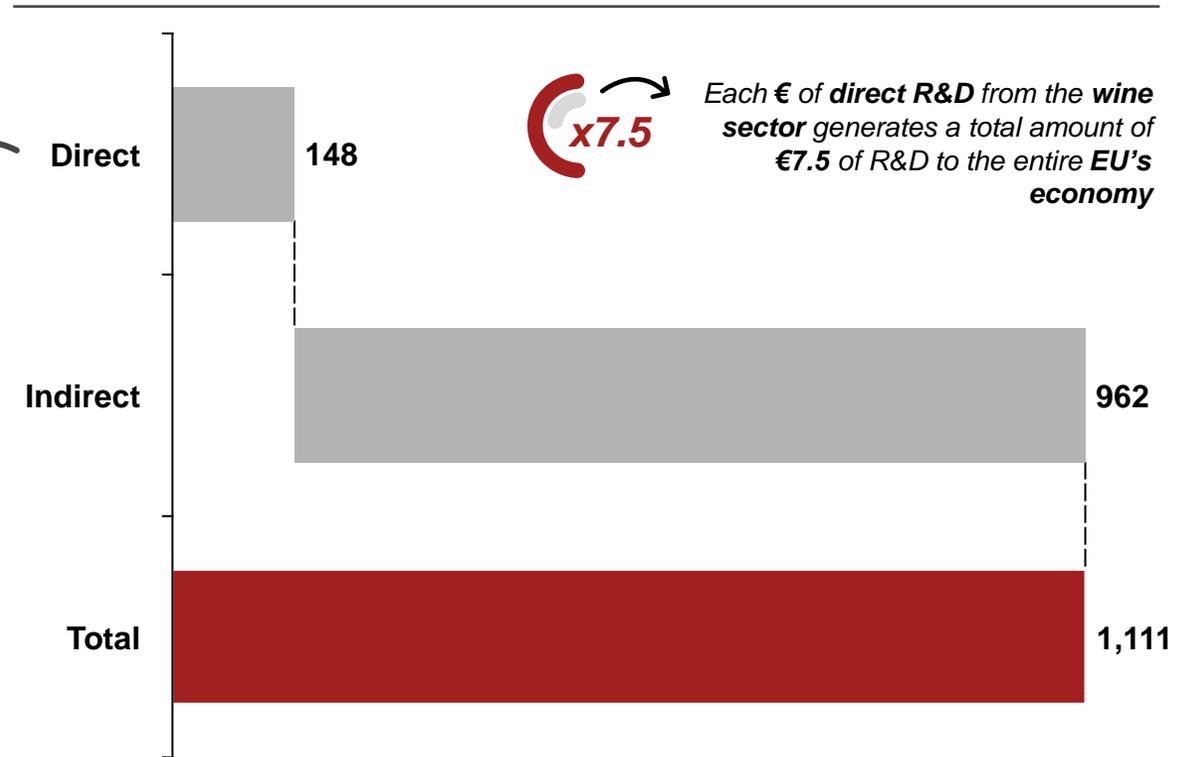


Sustainability



Health

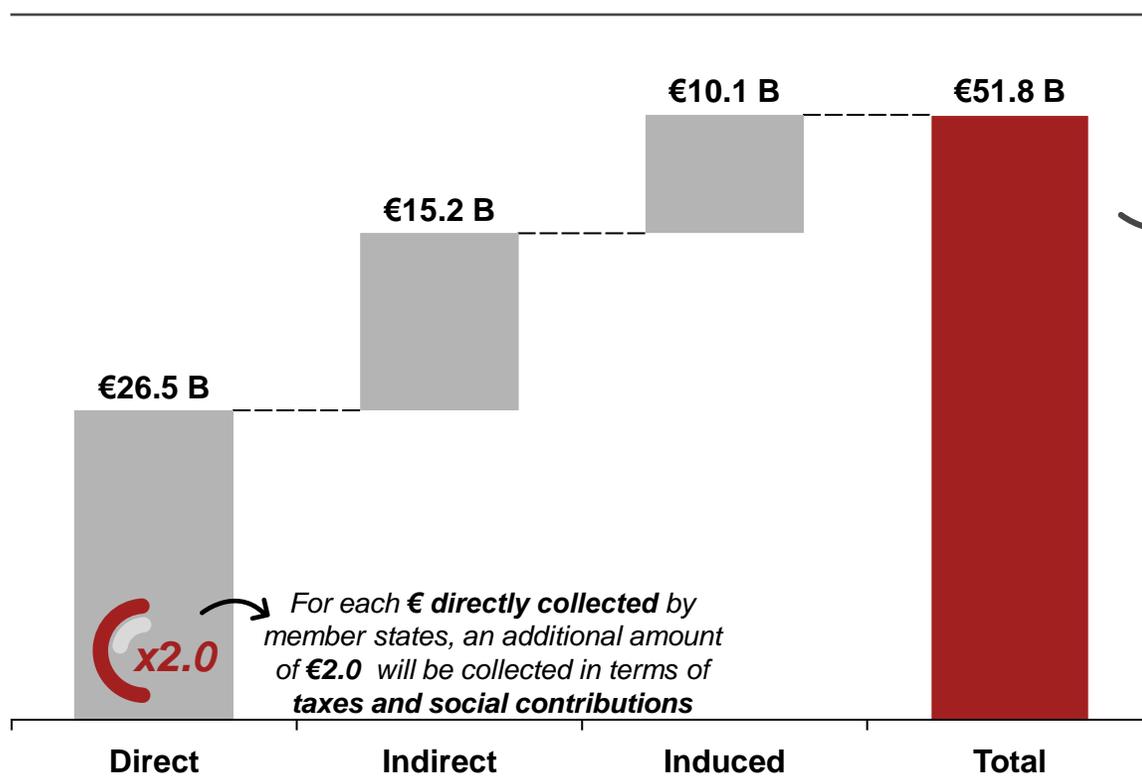
wine sector contribution to EU's R&D in 2022 (€M)



Source: PwC estimates using Input-Output Methodology, Eurostat and Statista data
 (1) Data from the European Commission for 2021 (€331 billion). (2) Source: Wine Technology Platform areas of study in Wine research projects (PTV)

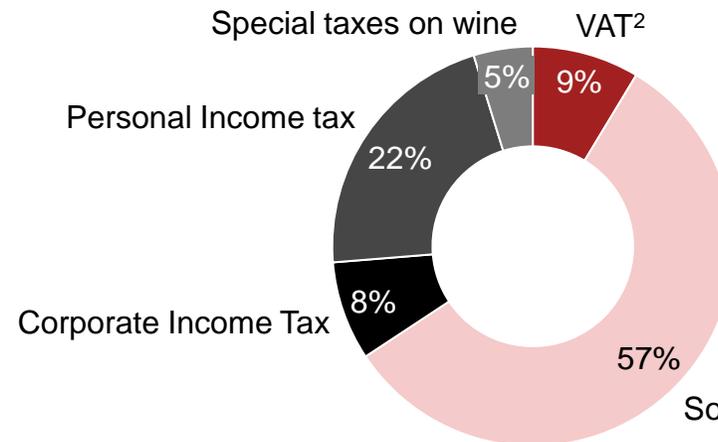
The wine sector's total fiscal contribution was nearly 52 billion euros in 2022, representing approximately 0.7% of the EU's general government expenditure¹

Wine sector fiscal contribution to the EU in 2022 (€ Billion)



€52 billion
Wine total fiscal contribution to the EU (2022)

Wine's fiscal contribution can be disaggregated into 5 different types of taxes:



For illustrative purposes and to facilitate comparability, the total fiscal contribution in 2022 is equivalent to 76% of the GDP of Croatia³, and represents 1.2 times the GDP of Malta and Cyprus combined³

Source: PwC estimates using Input-Output Methodology, Eurostat and Statista data (1) Data from Eurostat (€ 7,894 Billion). (2) VAT taxes refer only to VAT paid due to induced consumption of direct and indirect workers (3) Source: Eurostat; National Accounts



In addition, the wine sector contributes to the sustainability of the EU environment by boosting biodiversity, limiting soil erosion, improving water management and proving fire protection



Main areas of wine sector contribution to the EU environment

Boosting biodiversity¹
X3 plant species
+50% butterfly species *X4 bee species*

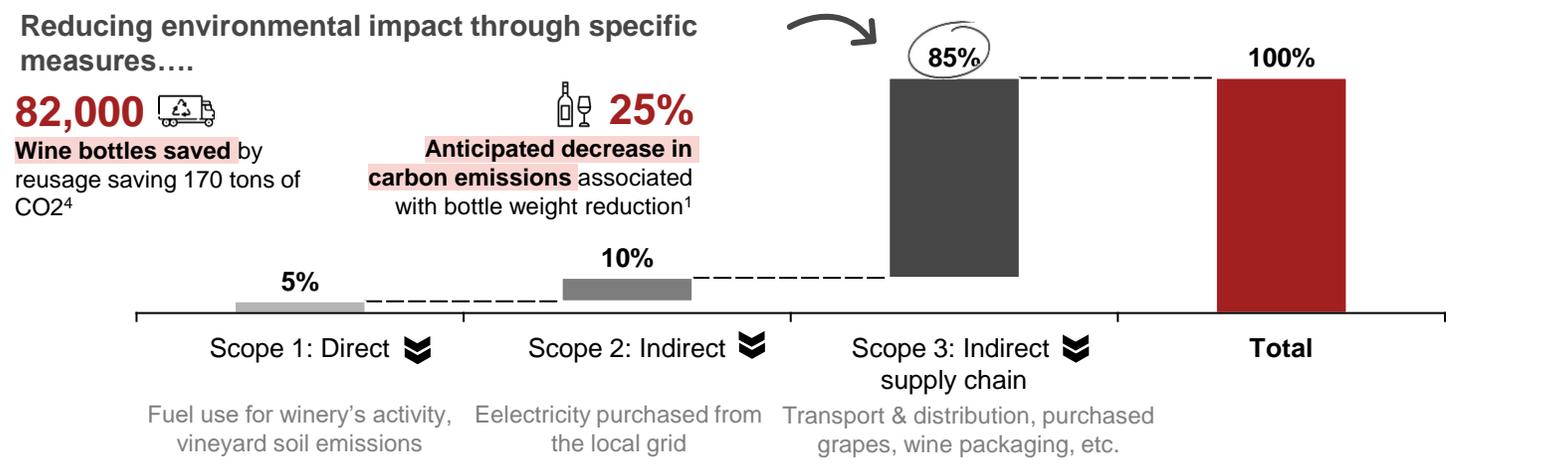
Limiting soil erosion²
 Covering crops in vineyards reduce soil erosion by up to **8 times** compared to traditional tilling

Improving water management¹
25% to 35% water savings

Providing fire protection³
 Vineyards have an average flammability **x5** lower than average cereal crops

In addition to its EU environmental contribution, the EU wine sector have already **taken action to mitigate their greenhouse gas emissions**, identifying the **sources of emissions** and defining **concrete actions** to reduce them

Distribution of GHG emissions in IWCA winery members by scope⁵ (%)



While the wine sector is taking **significant steps towards environmental sustainability**, it also requires support and funding to **adapt to a warming world and combat extreme weather events**

Projected impacts for EU's wine sector⁶ **10 – 40** Days of anticipated phenological phases of grapevine **8 tons** Up to 8 tons per hectare of yield loss projections for some wine regions in the EU

(1) Source: European Commission Cineac "How wineries are adapting to a warmer world" (2) NEIKER technology centre (Instituto Vasco de Investigación y Desarrollo Agrario). (3) Pagadala, T., Alam, M. A., Maxwell, T. M., & Curran, T. J. (2023). (4) Source: European Commission Cineac "How wineries are adapting to a warmer world" (5) Source: International Wineries for Climate Action GHG inventory (6) Source: Droulia, F.; Charalampopoulos, I. (2021),

1

The EU wine sector

1.1 Wine and its role over the European culture

1.2 The wine sector value chain

1.3 Objective and scope of the report

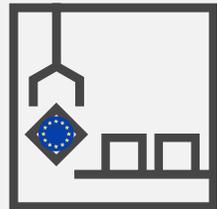
The European Union (EU) leads the world wine market with more than 165 million hectoliter (hl) produced, representing over 60% of the global share



EU wine production

165.7 Million hl¹

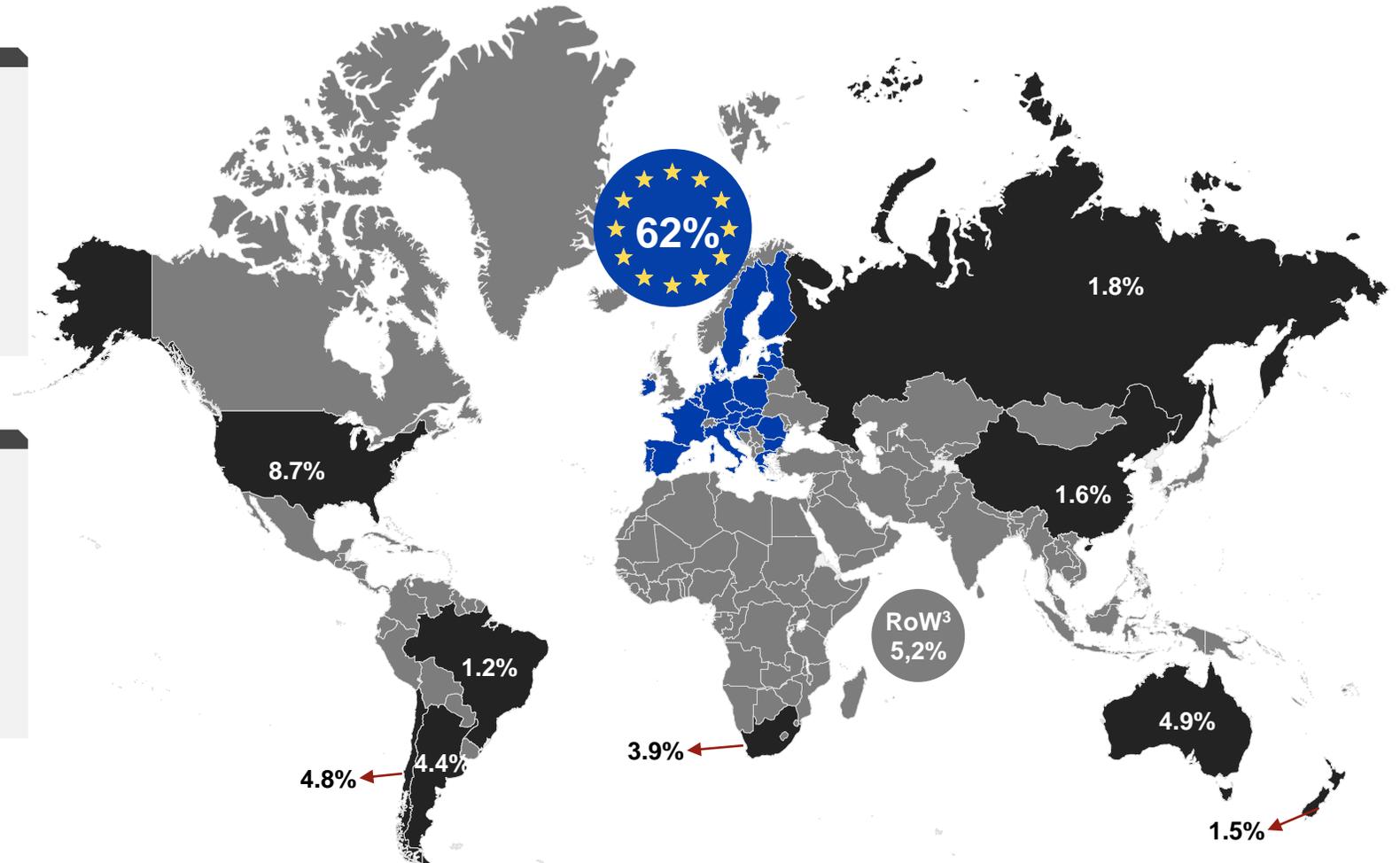
EU member states produced a total amount of 165.7 Million hl of wine products¹ in 2022



EU wine production global share

62%²

EU member states produced 62% of the total wine in the world in 2022



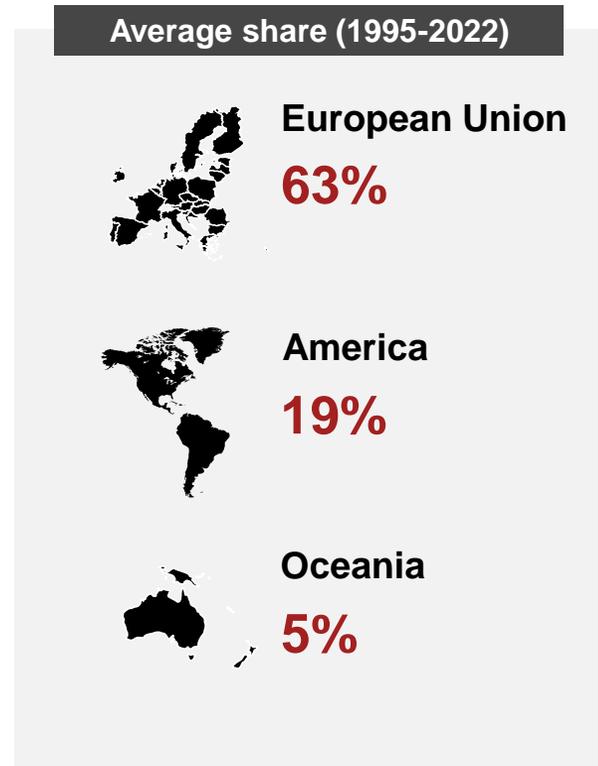
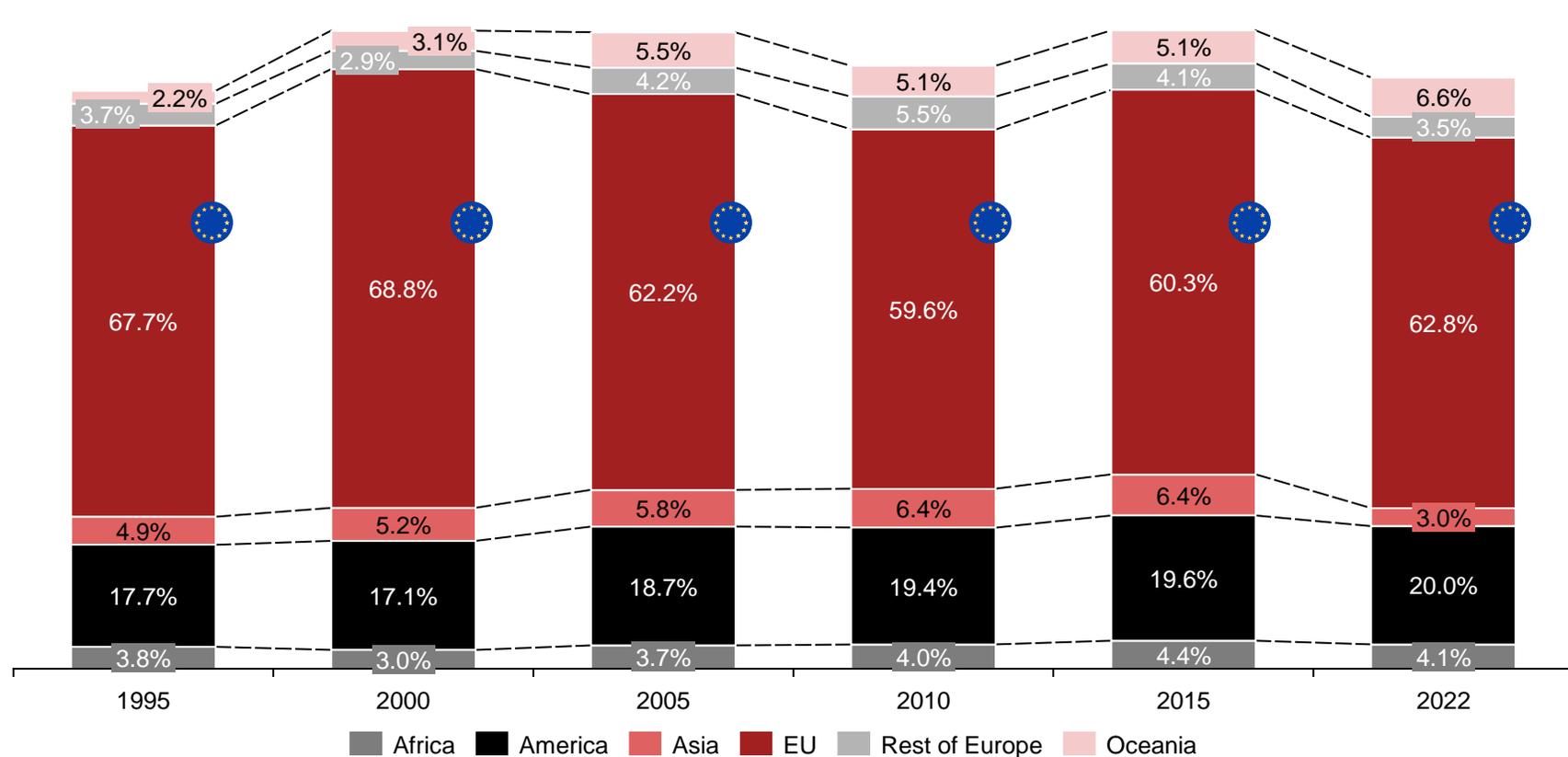
(1) Source: European Commission Wine Production and opening stocks wine products include P.D.O and P.G.I wines, other wines varietal and non vinified,

(2) Source: OIV State of the world Vine and wine sector in 2022

(3) RoW: Rest of the World

The EU has maintained its position as the major producer in the world with a relative constant global share in the last decades, while other regions such as Oceania and America have increased their stake

Global wine production by region¹ – 1995-2022



(1) Source : OIV Wine production in mhl by country/region

This leadership may result from the pivotal role that vineyards and wine have historically played in European culture

Vineyards & wine are...



... elements of cultural identity

In a time where **other industries delocalize** their productive processes, **the European wine sector will continue creating and maintaining economic, cultural and social value** for the EU's communities.



... part of the agrarian heritage

Vineyards are a **part of the agrarian heritage of the EU**, from the ancient Greeks and the Roman Empire to modern Europe, **vineyard landscapes and winemaking techniques have been a part of European's identity for centuries** shaping the local areas and adding tangible heritage to them, such as win cellars, traditions, folklore and festivals¹



... tradition keepers

Wine companies heavily depend on a certain territory and on the communities living there, establishing a **positive synergy** between the wine producers and the local communities.



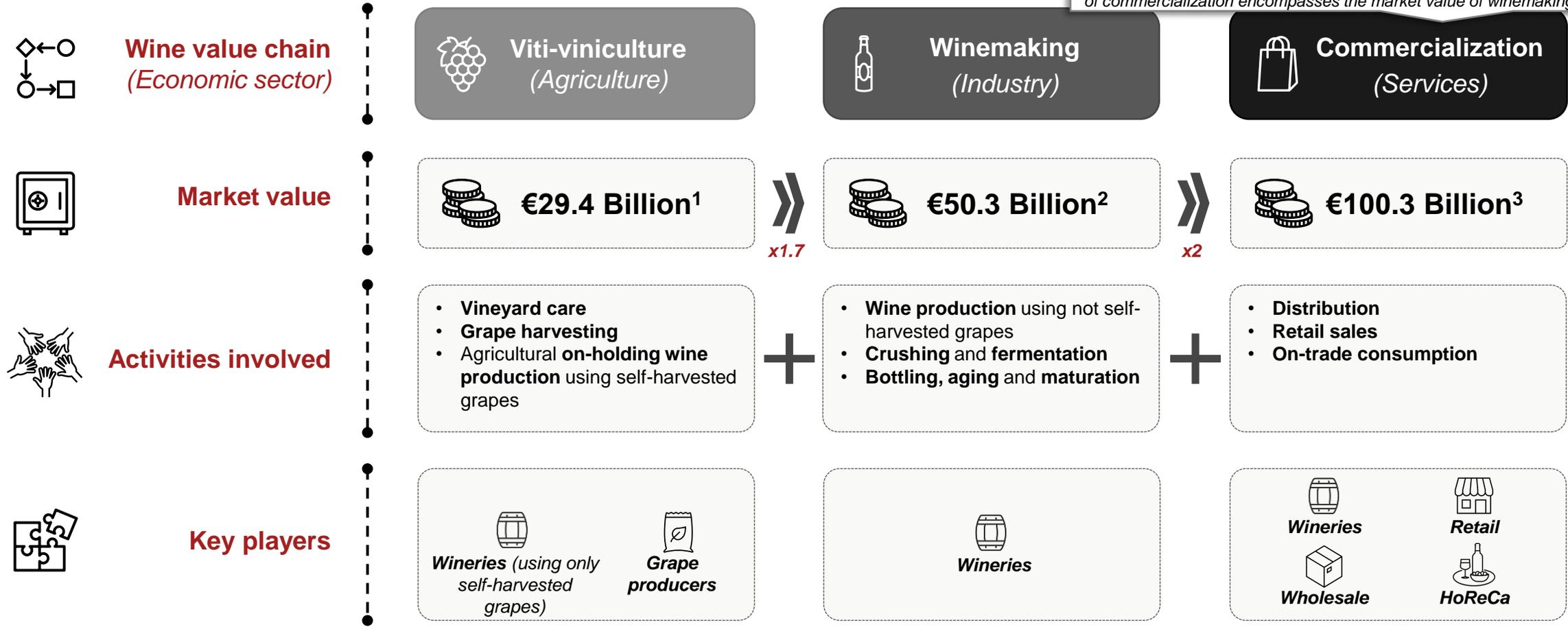
... linked to the EU territory

European Wines uniqueness depends on the diverse European terroirs where the grapes are cultivated and harvested and, as a consequence of this, **wine is a product absolutely linked with Europe's territories.**

(1) A.Pulpon et.al Potential of Vineyard Landscaps for Sustainable Tourism in Geosciences 2019
Source: CEEV <https://www.ceev.eu/about-the-eu-wine-sector/>

Wine sector's long history has conformed a complex value chain that can be divided in three main activities: viti-viniculture, winemaking and commercialization. The three stages combined to form a market value of 100.3 billion € in 2022

The market value of each sector in the value chain incorporates the market value of the preceding sector. For example, the market value of commercialization encompasses the market value of winemaking.



(1) Source: Eurostat – Economic Accounts of Agriculture production value 2022, (2) Source: Eurostat Statistics on the production of manufactured goods Value of sold production 2022, (3) Source: Statista 2022



Viti-viniculture is the first pillar of the wine sector, with a market value of almost 30 billion euros through the production of premium grapes



€29.4 billion
Viti-viniculture production value (2022)¹

- **10.2%** of total **crop output** production value in the **EU**
- **5.6%** of **agricultural output** production value in the **EU**



3.2 M ha
Area under vines in the EU²

- **2%** of the **utilized agricultural area** in the **EU**
- **45%** of all **vine-growing areas** in the **world** (2.2M holdings)



Area under vines by type of production²



A vast majority of vines in the EU are destined to the production of quality wines

| | |
|--------------|----------------------|
| PGO 65.3% | PGI 17.1% |
| | Table 13.2% |
| | Dual purpose 4.4% |

(1) Source: Eurostat – Economic Accounts of Agriculture production value for 2022 (25.6 Billion €). Values for transformation of agricultural products wine and other grapes are for 2021 (3.8 Billion €)

(2) Source: European Parliamentary Research Archive *The EU wine sector* -July 2023. Values for 2020



Winemaking, the second pillar, involves more than 12,000 enterprises that contribute to the industrial sector, with a sold production value exceeding 50.3 billion euros

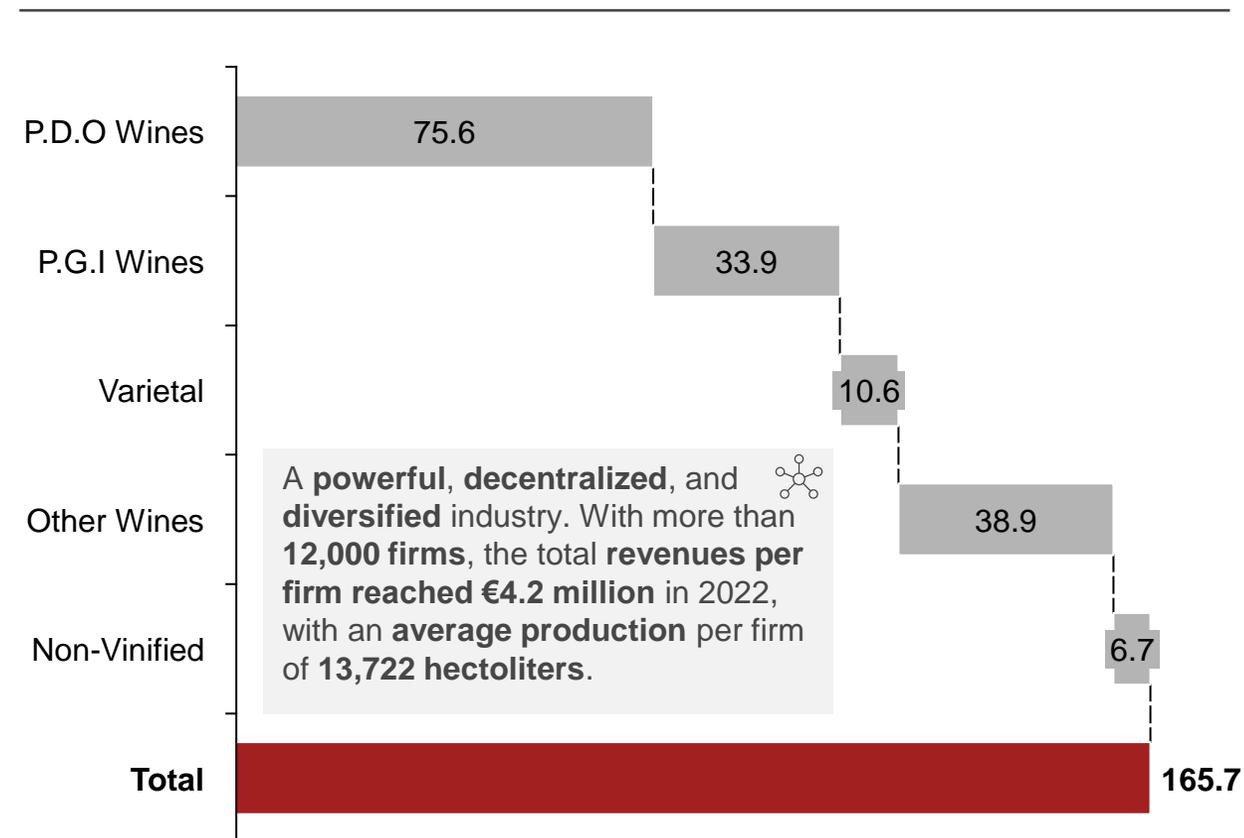
 **€50.3 billion**
Wine industry value of sold production¹

 **12,031 enterprises²**

 **66%** of total hl produced were P.D.O & P.G.I wines



Wine products produced in the EU in 2022³ - Million of hl



(1) Value of sold production of all wine products. Source: Statistics on the production of manufactured goods 2022 Eurostat
 (2) Number of firms within category manufacture of wine from grape. Source: Structural Business statistics Eurostat 2021
 (3) Wine production and opening stocks. Source: Directorate-General for Agriculture and Rural Development: European Commission



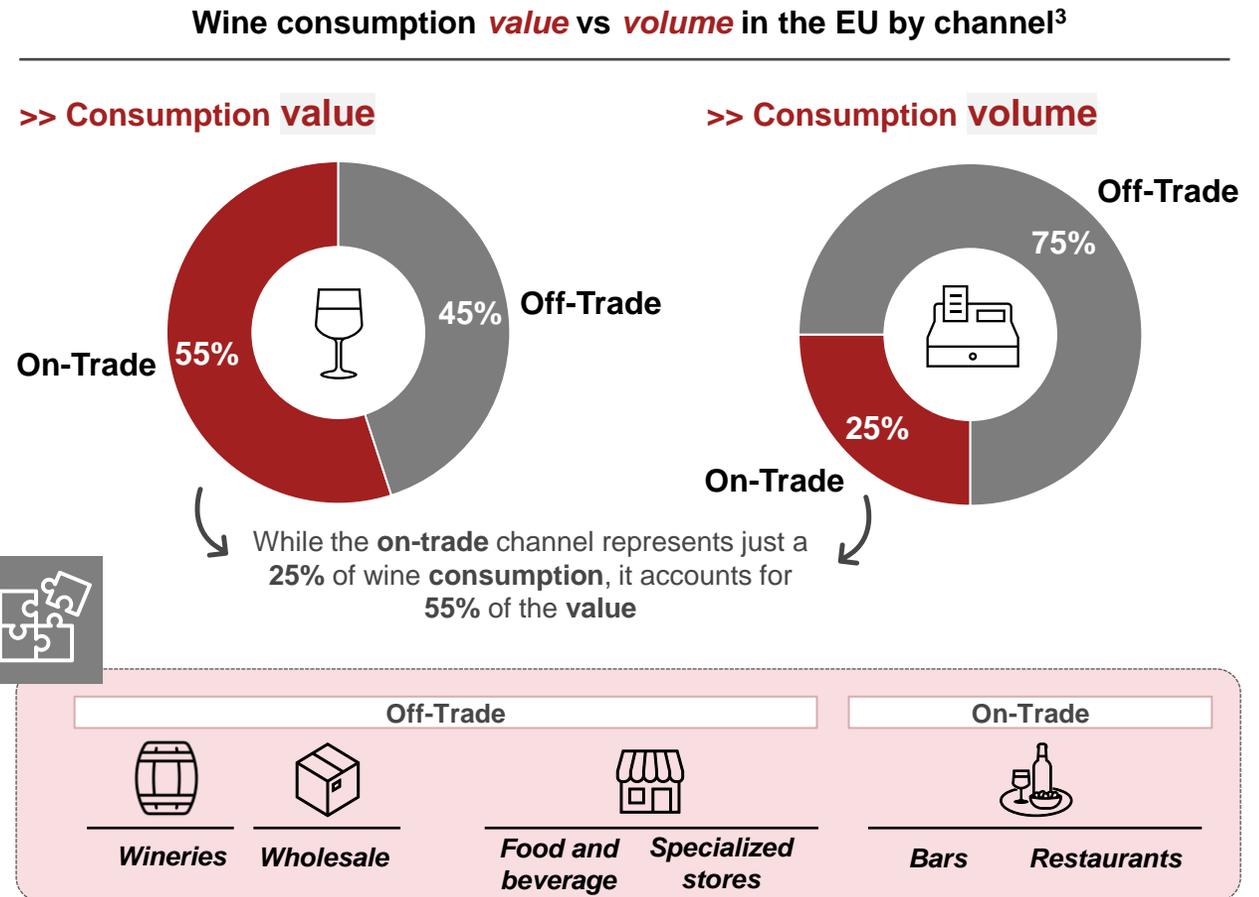
Distribution and commercialization of wine represent the third pillar, the critical step in delivering the final product to customers through diverse channels, with a total market size of more than 100 billion euros



€100.3 billion

Value of wine sold in the EU¹

- **35%**
 of total world sales value¹
- **111 million hl**
 Consumption of wine in the EU² (48% of world total)



(1) Wine market size EU and world 2022 source Statista
 (2) 2022 EU consumption source OIV
 (3) Distribution of wine sales by volume and value in EU countries, source Statista

The aim of this report is to quantify the economic contribution of the wine sector to the EU, considering every stage in its value chain, and acknowledging its impact on R&D, society, culture and the environment

Objective

The purpose of this report is to estimate the socioeconomic contribution of the wine sector to the European Union by computing different impacts



Scope



Sectoral scope

The **entire wine sector will be analyzed, from the grape cultivation up to the final sell of wine to customers in bars, restaurants and stores.**



Geographical scope

The **region considered for this study is the entire EU.** Thus, we will compute the contribution of the entire wine sector for the whole European Union.



Temporal scope

The impacts are computed for the year **2022.** For this matter we will use **production and sales data for 2022.**

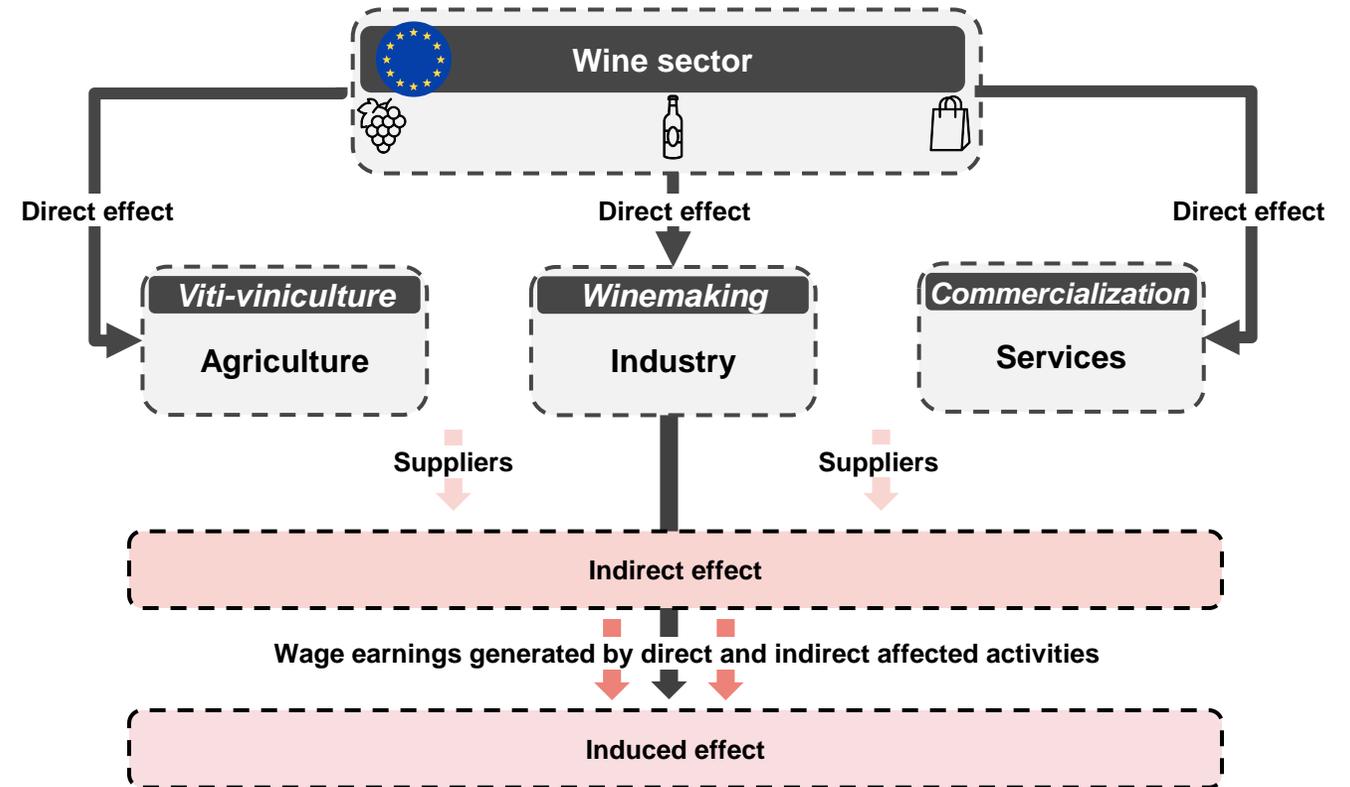
The quantification will encompass not only the direct impact but also the spillover effect on the broader productive network through indirect impacts (supply chain) and induced impacts (household consumption)

Input-Output methodology

In order to estimate the socioeconomic contribution of the wine sector to the EU's economy we applied **Input-Output methodology**, a standard and widely accepted and utilized technical tool that **allows to calculate three different effects**:

- **Direct effect.** The effect generated by the activity of each stage of the wine sector (viticultors).
- **Indirect effect.** The effect generated by the investment and expenses made by the direct activities (suppliers of agricultural machinery, suppliers of cork stoppers).
- **Induced effect.** The effect generated by the household's consumption of goods and services associated with the direct and indirect wages generated

This input-output methodology is applied to analyse the following key variables...



Source: PwC Analysis.

Note: A more detailed version of this methodology is contained in Annex A.

2

Unveiling the economic significance of the wine sector

2.1 GDP contribution of the wine sector

2.2 Wine exports



Wine sector's total economic contribution to EU's GDP was €130 billion in 2022, equivalent to 0.8% of the EU's GDP

Total GDP contribution (2022)

€130 Billion

GDP total contribution of the wine sector



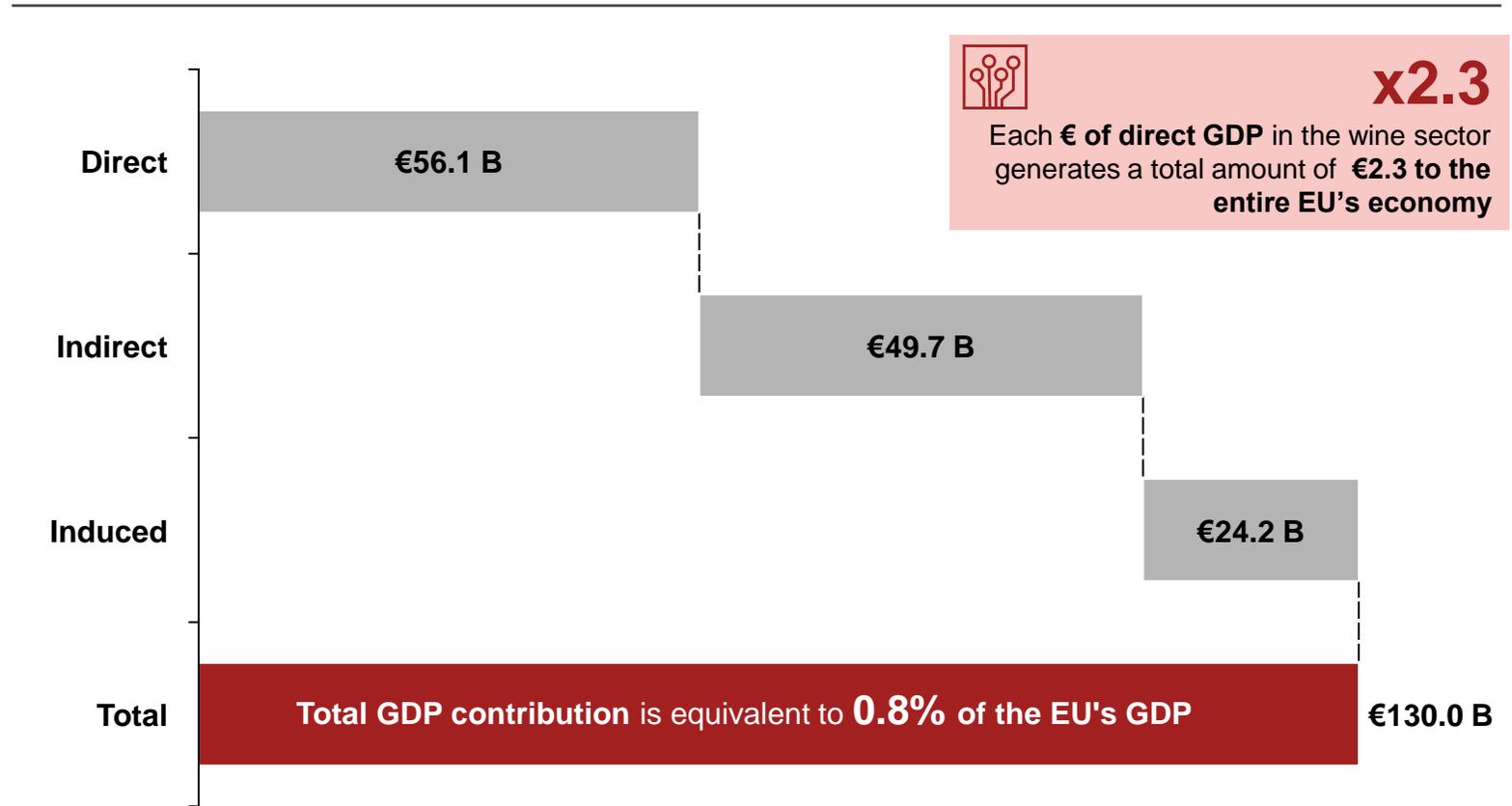
€ 56.1 Billion

The wine sector generates a direct GDP of €56.1 billion through the **payment of employees** (salaries), **payment of taxes on production** (payroll tax, taxes on land and buildings, etc.) and the **realization of benefits** (EBITDA).

57%

Indirect effects (added value generated by suppliers of the wine industry) and **induced effects** (higher household consumption) together generate **57% of the total impact**

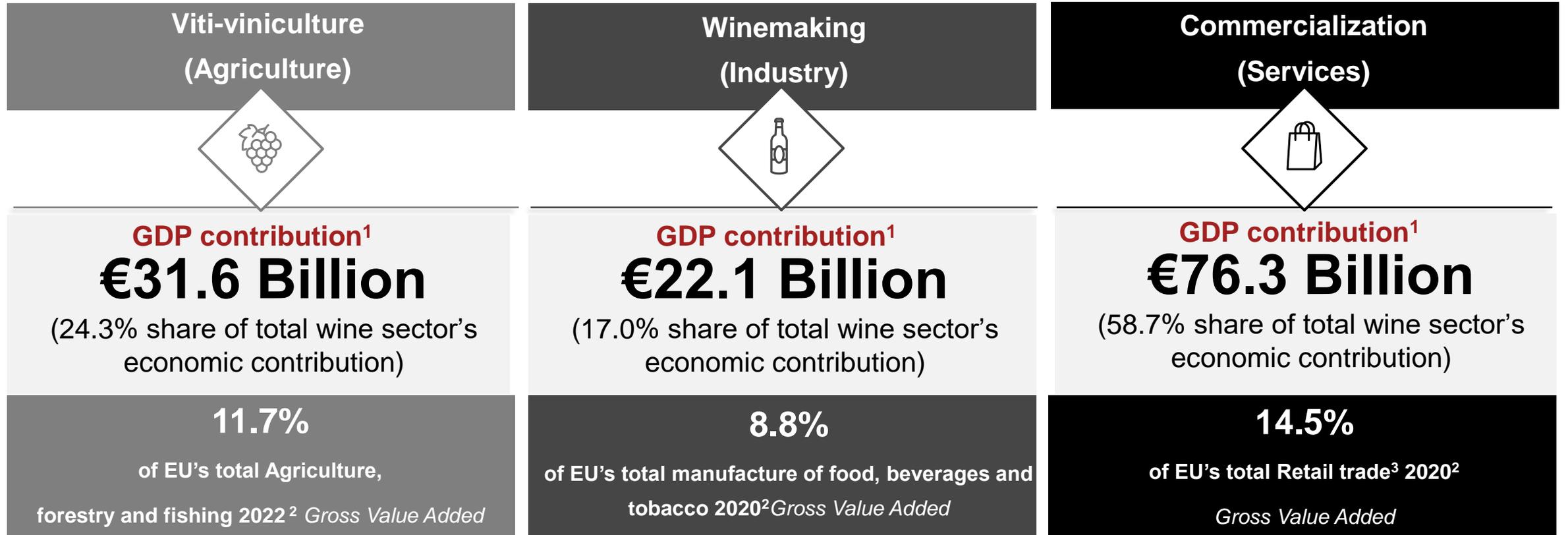
Wine sector contribution to EU's GDP in 2022 (Billion €) ¹



(1) Source: PwC estimates using Input-Output Methodology, Eurostat and Statista data



The total GDP impact (€130 billion) can be categorized based on the primary actors in the wine sector that generate this impact: viti-viniculture, winemaking, and commercialization



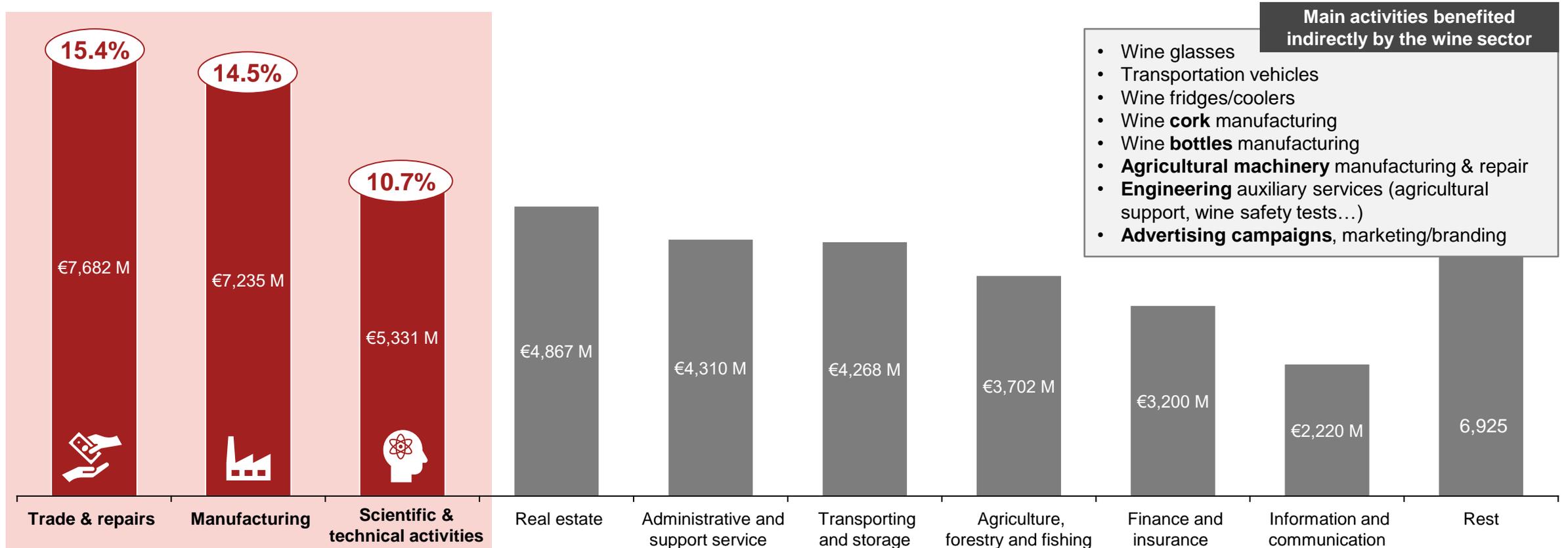
Total EU wine sector GDP impact equivalent to... >> 47.9%⁴ of EU's Primary sector GVA 9.7%⁵ of Spain's GDP

(1) Source: PwC estimates using Input-Output Methodology Eurostat and Statista data (2) Most recent data available for EU 27 Source Eurostat National Accounts. For agriculture we are comparing the vitiviniculture value with the whole agricultural sector (using a 10 industry breakdown), therefore, most recent available date is 2022 instead of 64 sector breakdown for which most recent data is only available for 2020 (3) Total retail trade except of motor vehicles and motorcycles (4) Source: Eurostat Gross value added by industry current prices for EU-27 in 2022 (5) Source: Eurostat National Accounts GDP current prices for Spain in 2022



Companies in the wine sector value chain (indirect effect) contribute €49.7 billion to the GDP, with trade, manufacturing, and scientific activities being the macroeconomic sectors most benefited with 41% of this impact

Indirect GDP contribution of the wine sector in the EU in 2022¹ (€, Million)



(1) Source: PwC estimates using Input-Output Methodology, Eurostat and Statista data



Due to the salaries generated directly and indirectly by the wine sector, household consumption has an induced impact on GDP of €24.2 billion, with this impact flowing mainly to sectors such as real estate, trade, and manufacturing

Salaries generated directly and indirectly

€44.4 Billion

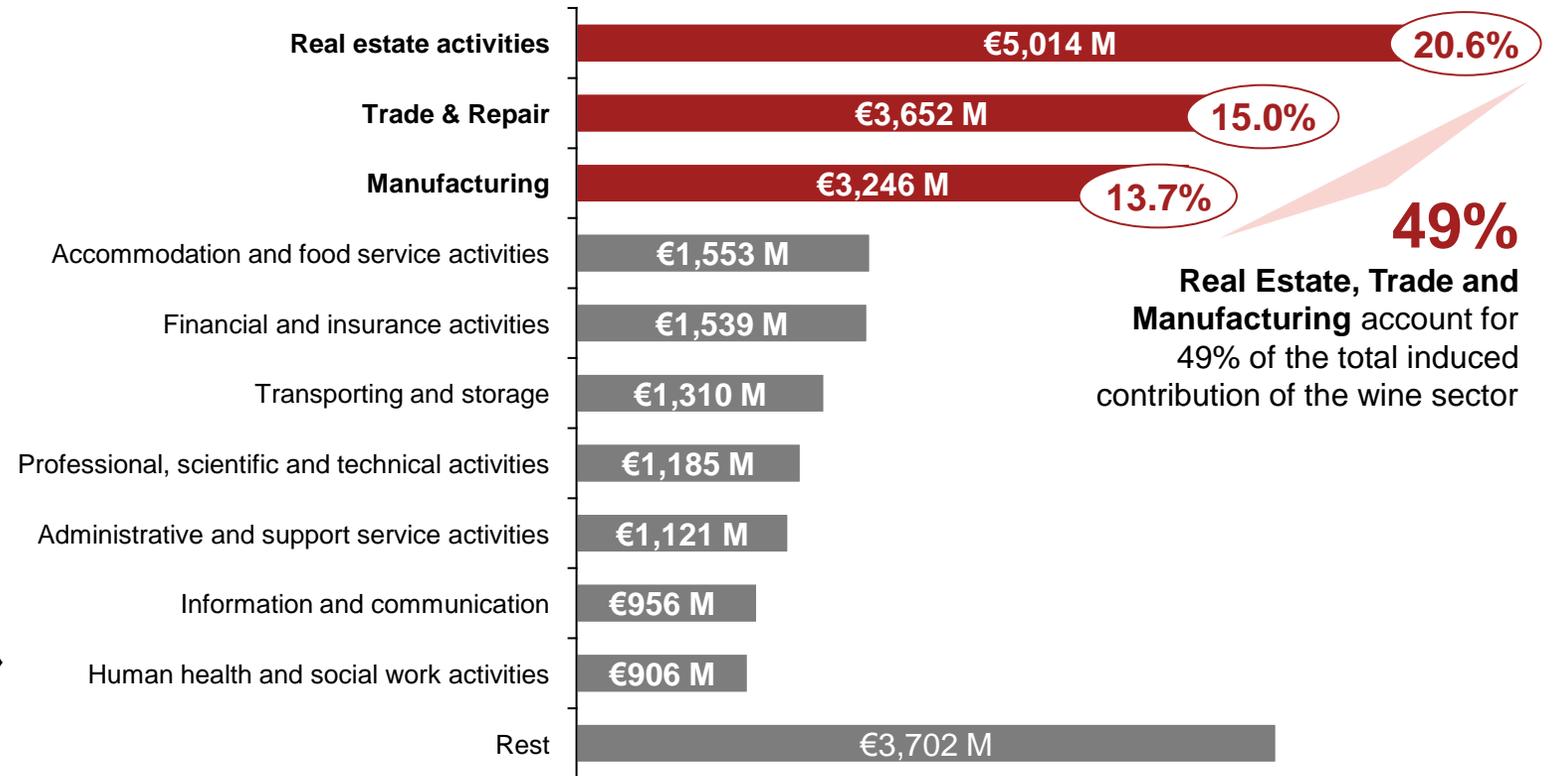
Consumption by households

€26.2 Billion

Induced GDP contribution

€24.2 Billion

Induced GDP contribution of the wine sector in the EU in 2022¹ (€, Million)



(1) Source: PwC estimates using Input-Output Methodology, Eurostat and Statista data



In this context of GDP creation, the European wine got exported to 194 countries in 2022, with a total export value of €17.9 billion, which represents around 32% of the direct GDP contribution

Key export figures



€ 17.9 Billion

Value of wine exports to non-EU countries in 2022. With **€16 billion** in PDO & PGI Wines (90%)



31.8 Million hl

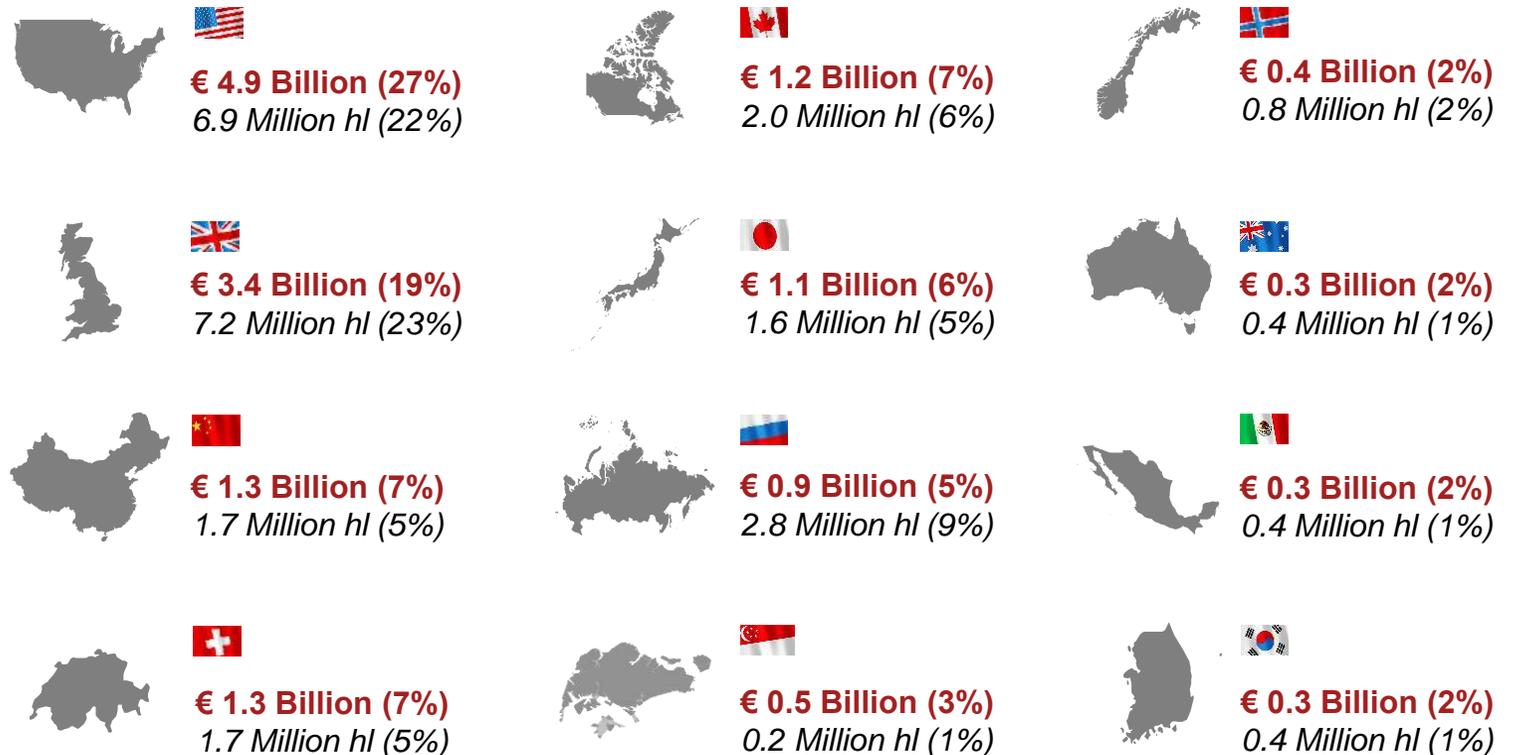
Volume of wine exports to non-EU countries in 2022. With **23.1 Million of hectoliters of PDO & PGI Wines** (72%)



67%

Exports to the *US, UK, Switzerland, Canada and China* accounted for **€ 11.9 Billion**, representing **67% of total wine Extra-EU exports** value in 2022

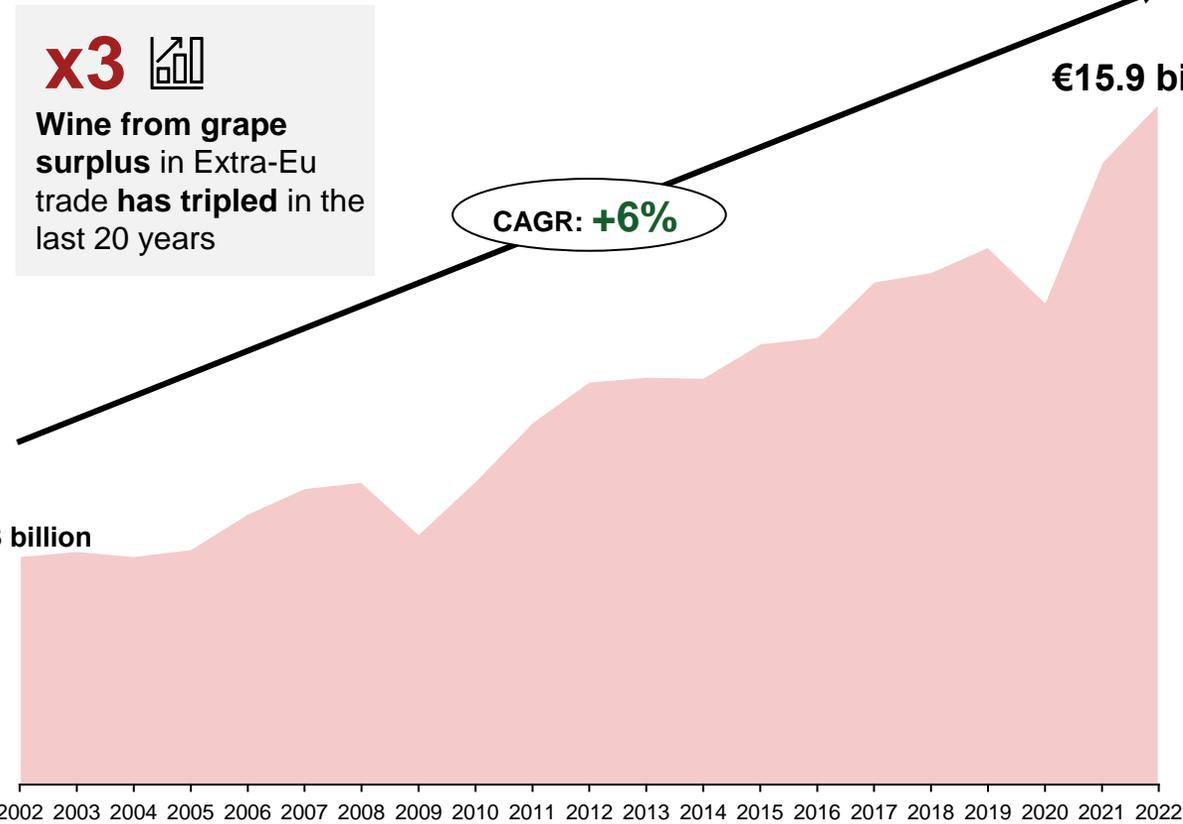
Distribution of EU external wine exports value by main partners in 2022





The strong export-oriented nature of wine played a crucial role in reducing EU's balance of trade deficit by a 3.7% in 2022

EU's trade balance in wine from grape annual evolution 2002-2022 (€, Billion)¹



The importance of Wine in extra EU trade



EU's trade balance in goods in 2022 (Billion €)²

| All products | Food&Beverage | Wine from grape |
|------------------|-----------------|-----------------|
| - €432.6 billion | + €71.5 billion | + €15.9 billion |

3.7%
Without wine trade, the deficit of the EU in 2022 would have been 3.7% higher

22%
of the total EU trade surplus in food & beverages corresponds to wine

(1) International trade in goods with extra-EU 27 countries in 2022, Source: Eurostat.
 (2) International trade in goods with extra-EU 27 countries in 2022, Source: Eurostat.



3

Cultivating secure and sustained jobs: the wine sector's impact on employment

3.1 Employment contribution of the wine sector

3.2 Labor productivity of the wine sector



The wine sector contributed to create and maintain around 2.9 million of jobs in the EU in 2022, which represents 1.4% of EU employment

Total employment contribution (2022)

2.9 Million



Employment total contribution of the wine sector in the EU

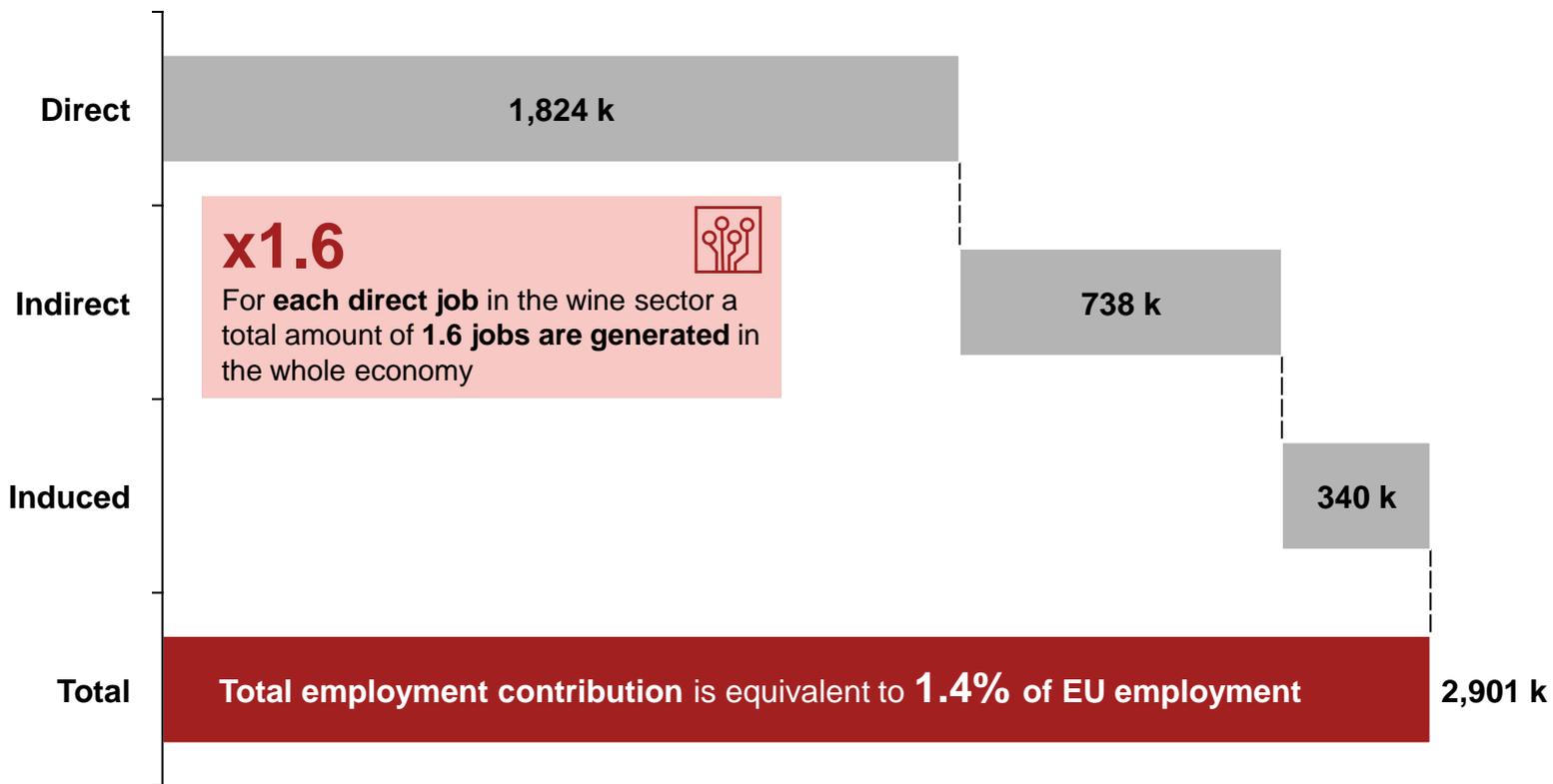
1.8 Million jobs

The wine sector directly contributes to 1.8 Million jobs to the EU's labor force during 2022 through **viti-viniculture** (18%), **winemaking** (7%) and **commercialization** (75%)

4 out of 10

4 out of 10 jobs are generated by the **supply chain** (indirect effect) and **household's consumption** (induced effect)

Wine sector contribution to EU's employment in 2022 (Thousand jobs, k)¹



(1) Source: PwC estimates using Input-Output Methodology, Eurostat and Statista data



Total job creation can be classified by examining the primary actors within the wine sector that generated the impact: viti-viniculture, winemaking, and commercialization



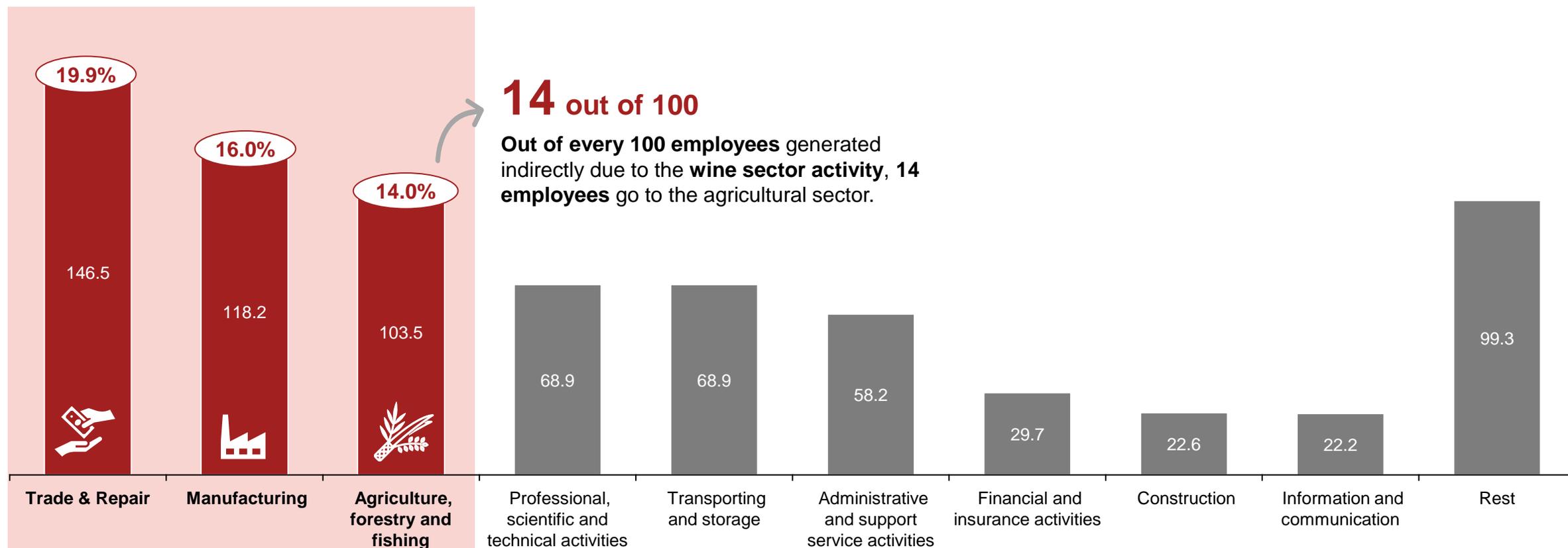
Total EU wine sector employment contribution equivalent to... >> 20.3%⁴ of EU's construction employees 11.3%⁵ of Italy's employment

(1) Source: PwC estimates using Input-Output Methodology Eurostat and Statista data (2) Most recent data available for EU 27 Source Eurostat National Accounts. For vitiviniculture we are comparing values with the whole agricultural sector (using a 10 industry breakdown). For Winemaking and Commercialization we are comparing with more detailed sectors, using a 64 sector breakdown for which most recent data is only available for 2020 (3) Total retail trade except of motor vehicles and motorcycles (4) Source: Eurostat employment by industry breakdowns for EU-27 in 2022. (5) Source: Eurostat Employment for Italy in 2022



The wine sector's activity generated and sustained nearly 740,000 indirect jobs, with 50% of them distributed across trade, manufacturing, and agriculture sectors

Indirect employment contribution of the wine sector in the EU in 2022¹ (Thousand jobs, k)

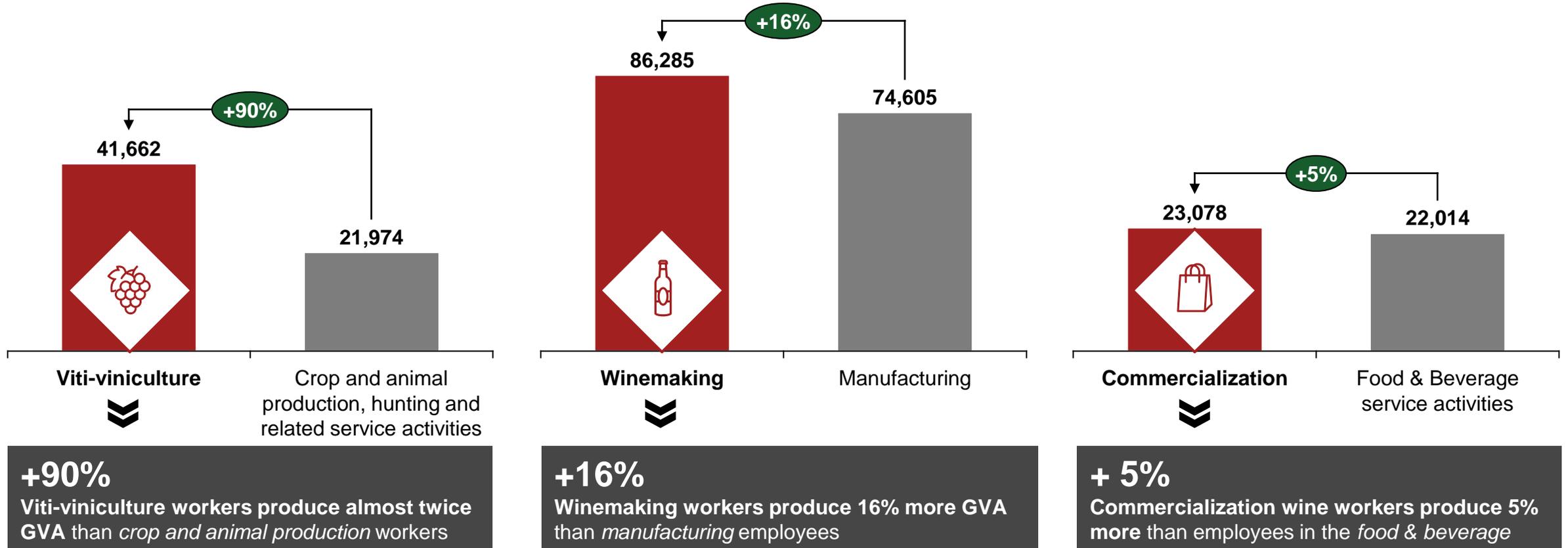


(1) Source: PwC estimates using Input-Output Methodology, Eurostat and Statista data



The wine sector exhibits exceptional productivity, yielding higher added value per employee compared to similar activities at every stage of the value chain

Labor productivity of wine sector vs labor productivity of EU related activities (GVA per employee) ¹



(1) Source: wine sector labor productivity is computed by PwC using Input-Output Methodology, For manufacturing and Food & Beverage service activities, we used the Structural Business Statistics in 2021 from Eurostat where data for Ireland is not available. For Crop and animal production, hunting and related service activities we used the national accounts for GVA and employment from Eurostat in 2020 (latest available data for EU-27)

4

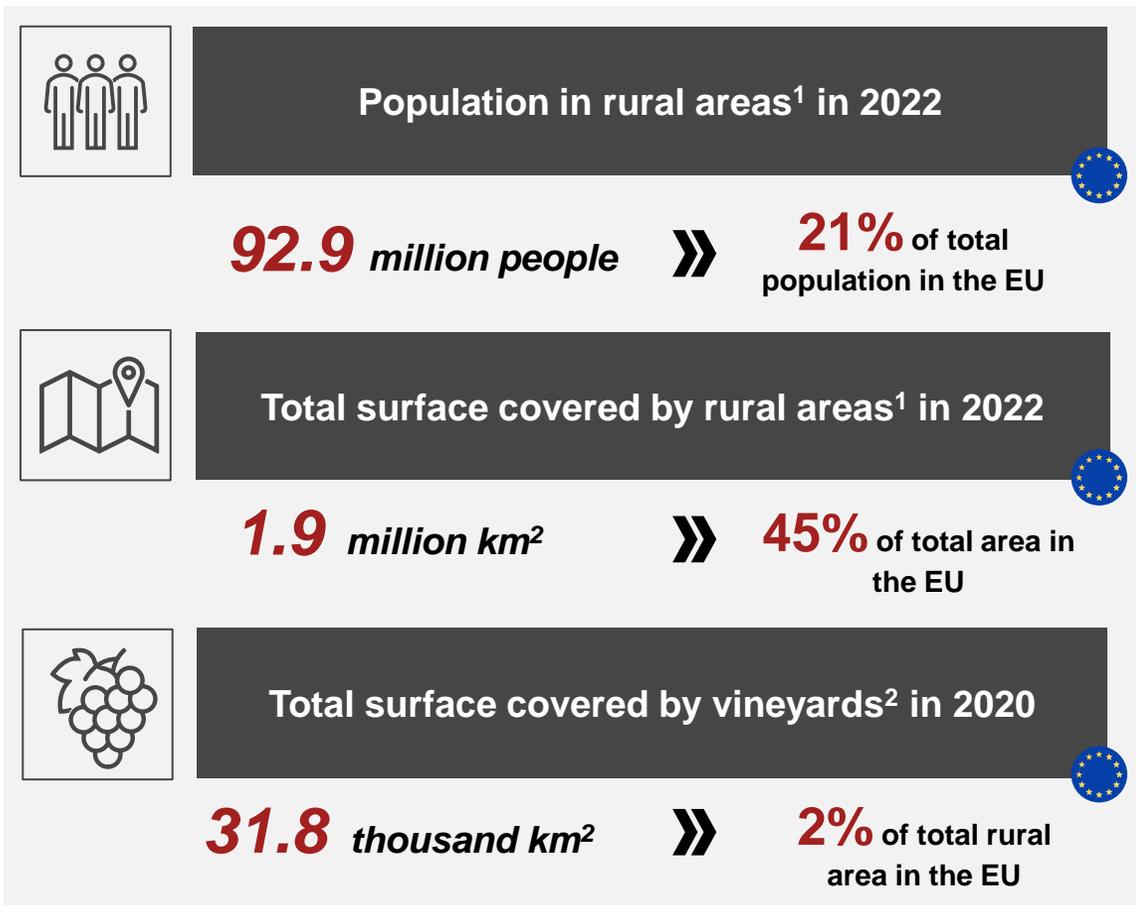
The heart and soul of wine: socio-cultural and rural impact

4.1 Wine & Vineyards contribution to rural areas

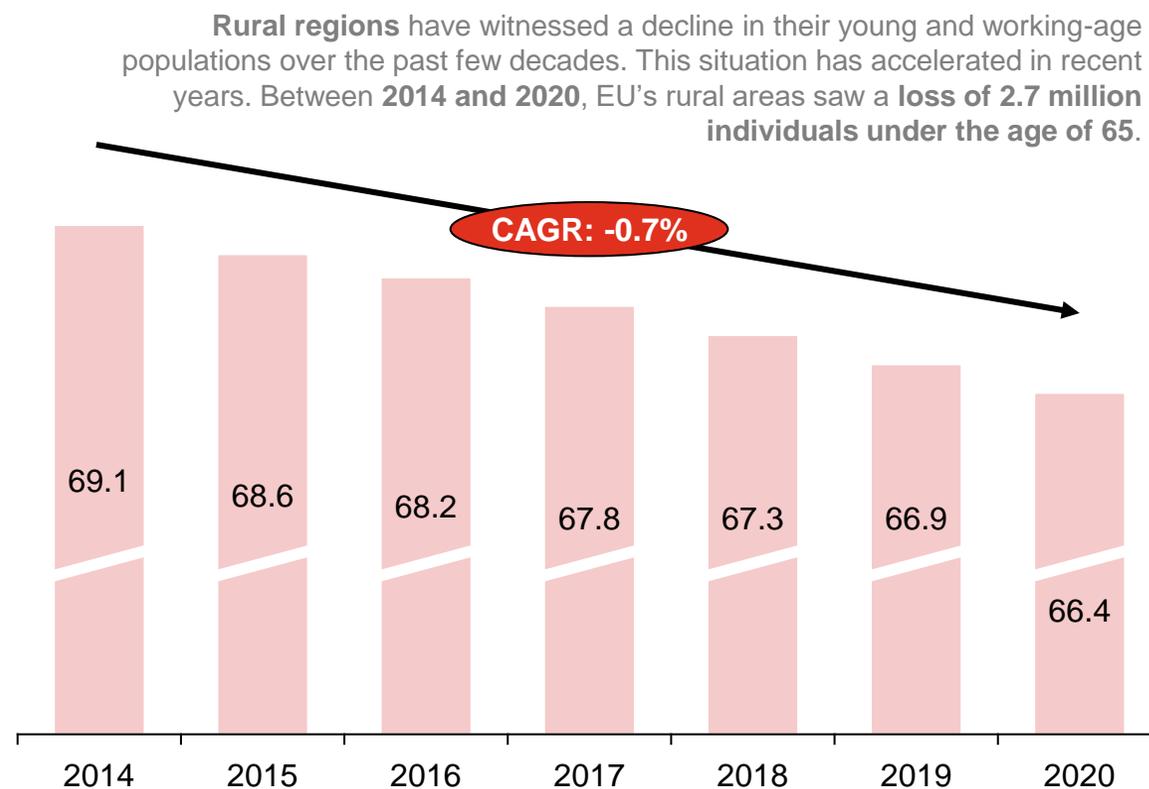
4.2 Social and cultural contribution of wine



Across the EU, predominantly rural areas occupy nearly half of the territory and are home to almost 93 million inhabitants. Over the past decade, these regions have seen an average population decline of 0.7%



Annual population change in rural areas of the EU (Million people from 0 to 64 years old) ⁽³⁾



(1) Source: Eurostat classification of NUTS3 regions using population living in urban clusters or rural grid cells

(2) Source: Eurostat

(3) Source: Population by broad age group, sex and other typologies Eurostat . Population for Predominantly rural regions, Estonia, Italy and Croatia don't report data until 2021.

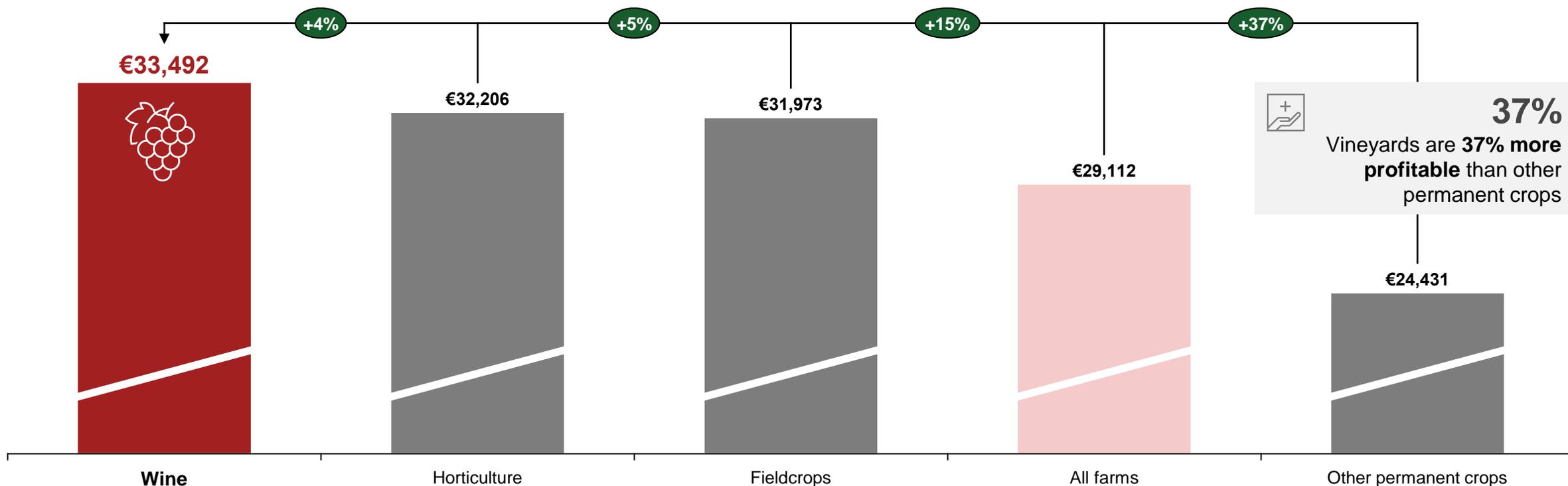


Vineyards in the EU are more productive than the average farm, enhancing economic profitability in the rural environment

Farm Net Value Added per Average Working Unit in the EU in 2021 by farm type¹



More productive than other uses of agricultural area...

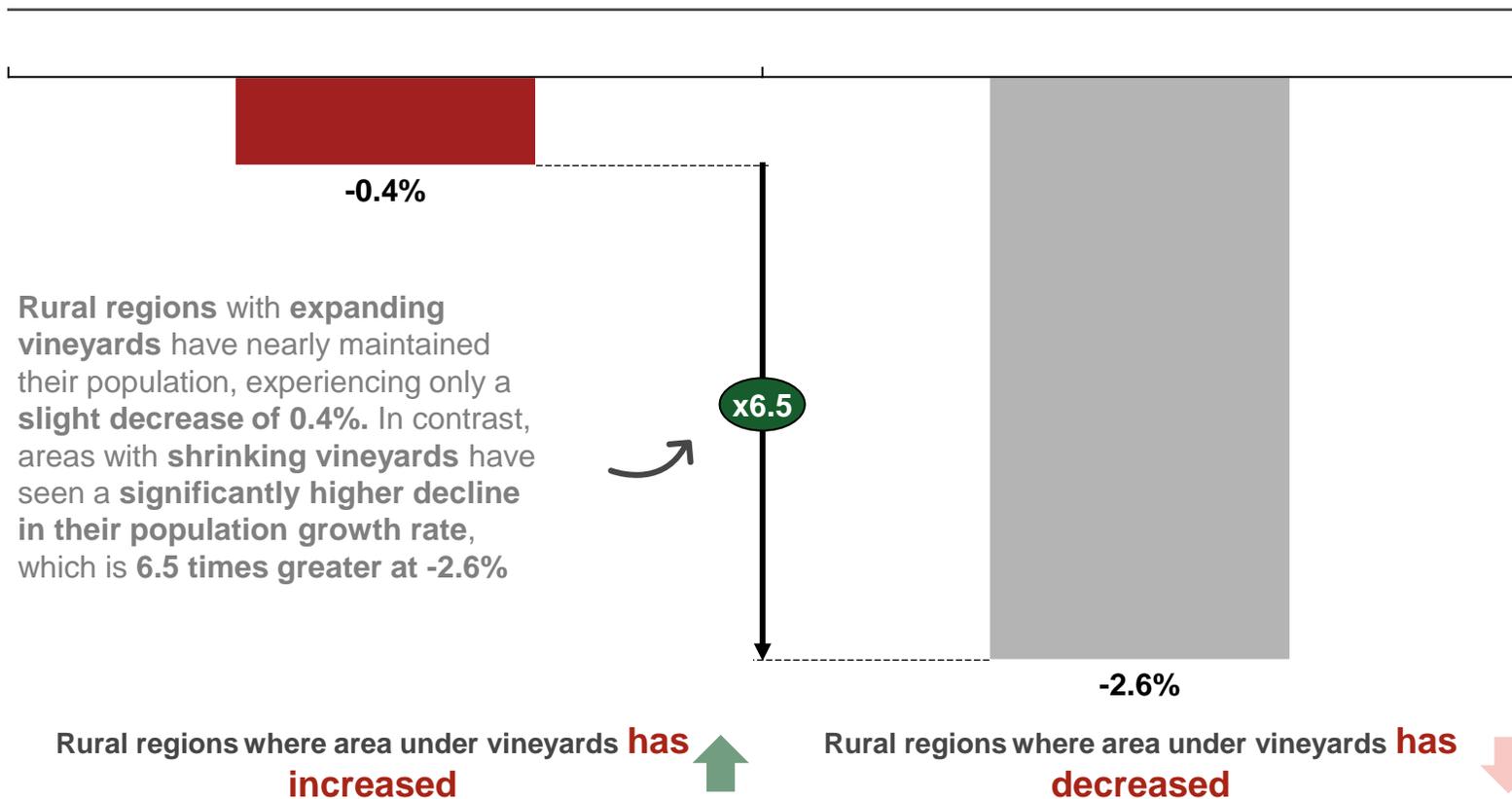


(1) Source: Farm Economy Focus Farm accountancy data network (FADN) last consulted on October 23rd



This results in rural regions in which the area under vines has increased tending to experience a smaller population decline

Total change in population between 2015-2019 in rural regions with vineyards¹



Rural regions with **expanding vineyards** have nearly maintained their population, experiencing only a **slight decrease of 0.4%**. In contrast, areas with **shrinking vineyards** have seen a **significantly higher decline in their population growth rate**, which is **6.5 times greater** at **-2.6%**

Rural regions in which the **area under vines has increased** tend to experience a **smaller population decline...**

5.6%

Viti-viniculture's share of total agricultural output **occupying only 2%** of the agricultural area



90%

Viti-viniculture workers are **90% more productive** than crop and animal production workers

(1) Source: PwC analysis using Eurostat data. Since Vineyard surface area is only presented by NUTS2 regions, we classified all NUTS2 regions with area under vines in 2015 and 2020 as rural regions if agricultural land area in the region is 25% greater than average share of agricultural area over total land area in all NUTS2 regions in the EU (39%) and population density is 25% lower than average population density in all NUTS2 regions in the EU (379 people per sq km).



On top of this rural contribution, the EU wine regions are a part of our cultural heritage, promoting a deep sense of tradition and a connection to the land

10 EU Wine growing regions have UNESCO WORLD HERITAGE status ⁽¹⁾



- Jurisdiction of Saint-Emilion
- The Loire Valley between Sully-sur-Loire and Chalonnes
- Champagne Hillsides, Houses and Cellars
- The Climats, terroirs of Burgundy
- Alto Douro Wine Region
- Landscape of the Pico Island Vineyard Culture
- Wachau Cultural Landscape
- Upper Middle Rhine Valley
- Tokaj Wine Region Historic Cultural Landscape
- Vineyard Landscape of Piedmont: Langhe-Roero and Monferrato

Wine tourism is a key element for **social and cultural promotion of rural areas** because:



...increases the **status of those rural areas** converting them into premium destinations for potential tourists



... contributes to **develop the rural areas**, create jobs and an opportunity to stay for young adults



...promotes other regional cultural values, such as **gastronomy and local special products**

(1) Source: UNESCO World Heritage List



Thus, wine has emerged as a tourist draw and, consequently, a key economic catalyst in many rural regions, with significant additional positive spillover effects on related activities

A whole industry of wine tourism has been established



Travel agencies



Rural accommodation



Visit of wineries and wine museums



Visit of vineyard's suitable areas



Thematic leisure activities



Transport



Tour guides



Local gastronomy discovery



Wine therapy

Key figures of the wine tourism sector



36 Million

Almost 36 Million wine tourists in the EU ⁽¹⁾

It is estimated that almost **36 million people** visited the areas surrounding vineyards in 2022 **in search of experiences related to wine.** During their journey they **take pleasure in exploring the rural landscape** and its **rich social and cultural traditions**



€1.1 Billion

More than € 1 billion spending in wineries and wine museums visits ⁽²⁾

Direct revenues from visits to wineries and wine museums estimates exceeded **€1 billion** in the entire EU in 2022.



€15 Billion

Almost 15 Billion revenue generated by wine tourism in the EU ⁽³⁾

Total revenues from wine tourists (hospitality, transport, wineries and other expenses) are estimated to be close to **€15 billion** in the EU in 2022.

(1) Estimates from different sources and sometimes with different definition of a wine tourist, for countries with no information PwC estimated the number of tourists using the number of vineyard's hectares in production and average visitors per hectare in other European countries Sources: Atout France, ACEVIN (Spain), Portuguese secretary of state for tourism, Geisenheim University and Wines of Germany , Città del Vino (Italy)

(2) Estimates using information available for Spain (ACEVIN) , then extrapolated to the rest of the EU.

(3) Estimates using information available for Germany, Italy and France and then extrapolated to the rest of the EU given estimated wine tourists. Sources: Atout France, Geisenheim University and Wines of Germany and Città dl Vino

5

Innovating with taste: R&D contributions of the wine sector

The wine sector actively contributes to R&D and innovation with projects that can be categorized in 6 big areas of study: viniculture, wine economy, processes, product, sustainability and health

Wine R&D projects by area of study¹



Viniculture

Projects related to **agriculture improvement**. Some of them to be enjoyed by other agricultural practices also.



Wine economy

Projects related to improve **efficiency in different stages** of the wine sector's value chain.



Processes

Projects related to address **technical and technological challenges** in the winemaking processes.



Product

Projects related to improve the **final quality of wine**.



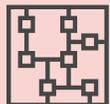
Sustainability

Projects related to improve the whole wine sector **resilience to climate change**.



Health

Projects related to increase the **healthiness of wine products** and to investigate about the wine and **grape health** contribution for individuals.



>> Key Wine Technology Platform (WTP) projects approved for the period 2021-2024²

Digital Twins to optimize energy efficiency and product quality in Wineries

The use of **seaweed extracts** for reducing chemicals and improving grapevine resistance.

New **microbiological strategies** to reduce the effects of climate change on the quality of tempranillo wines

Demonstration **project based on UV flashes** as stimulator for plant defense and substitute for fungicides

(1) Wine Technology Platform (WTP): <https://www.ptvino.com/en/projects/>
 (2) Wine Technology Platform (WTP): R&D&I projects 2021

The wine sector's direct activity, and especially its influence on its value chain (indirect activity), contributed to maintaining over 1.1 billion euros of investment in R&D and innovation in the EU in 2022

Total R&D contribution (2022)

€1,111 Million

R&D total contribution of the wine sector



Main sectors benefiting indirectly

37% of indirect R&D and innovation contribution is generated in the **scientific and technical services**



31% of indirect R&D and innovation contribution generated in **manufacturing**

10% of indirect R&D and innovation contribution is generated in **telecommunications**



Wine sector R&D contribution in 2022 (€, Million)¹

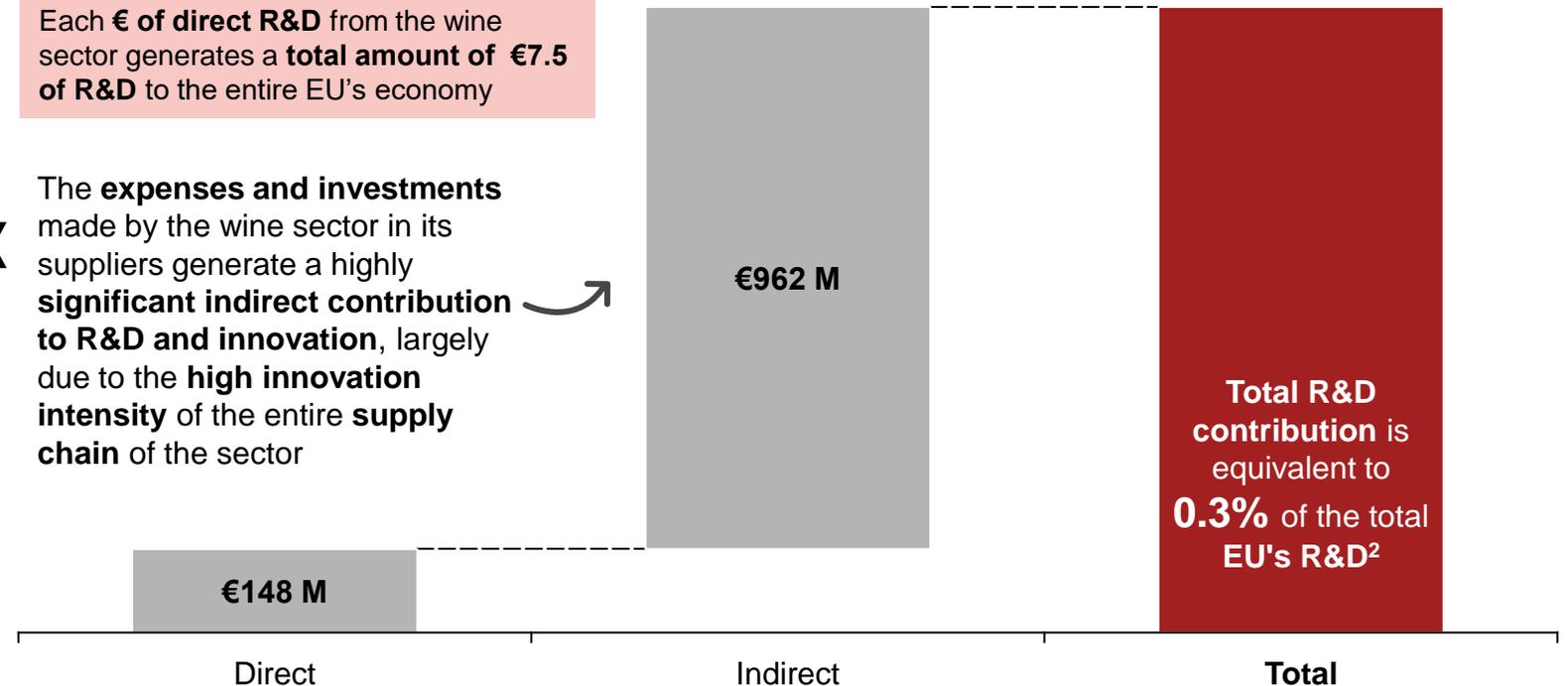
x7.5



Each € of direct R&D from the wine sector generates a total amount of €7.5 of R&D to the entire EU's economy



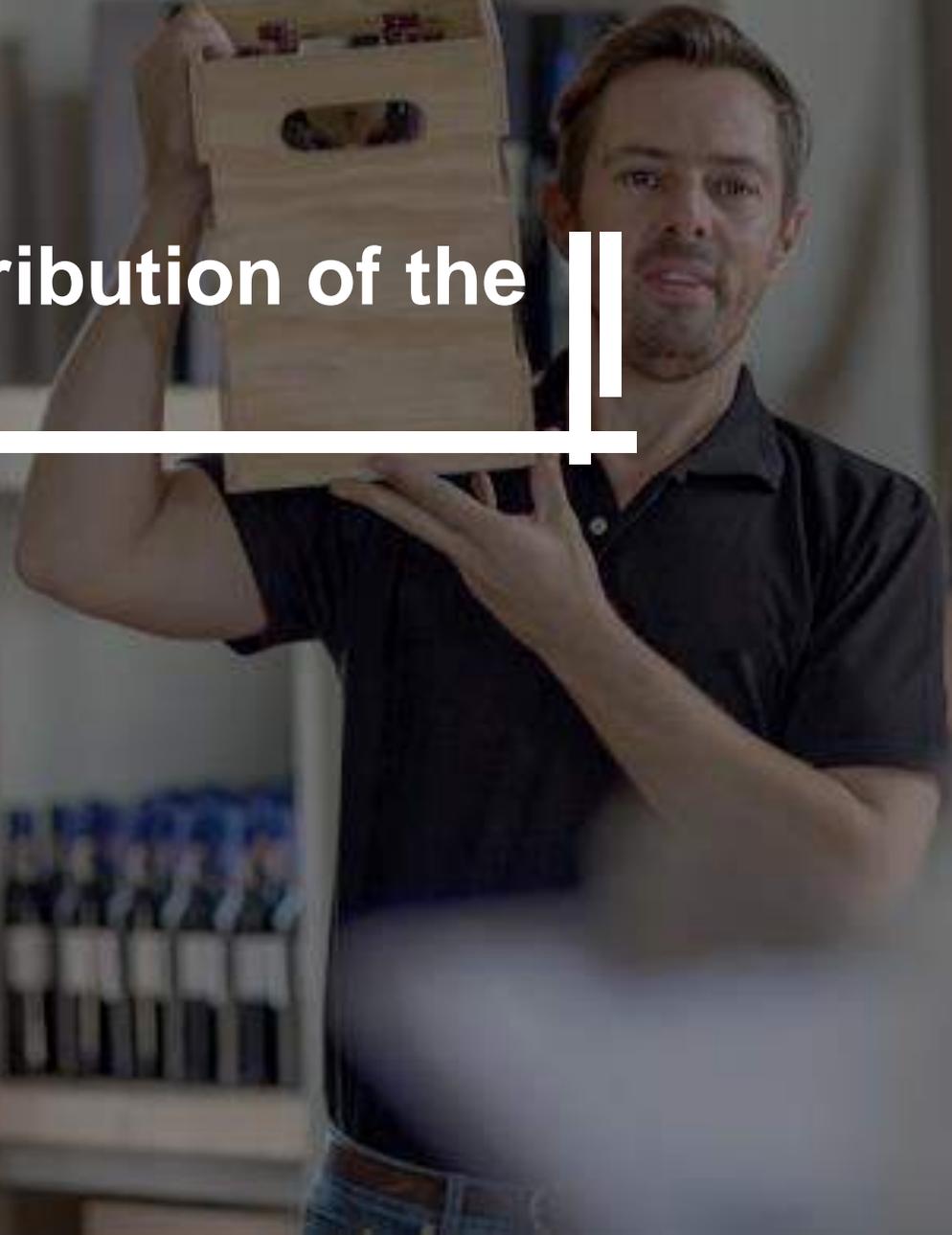
The expenses and investments made by the wine sector in its suppliers generate a highly significant indirect contribution to R&D and innovation, largely due to the high innovation intensity of the entire supply chain of the sector



(1) Source: PwC estimates using Input-Output Methodology and Eurostat and Statista data
 (2) Data from the European Commission for 2021 (€331 Billion).

6

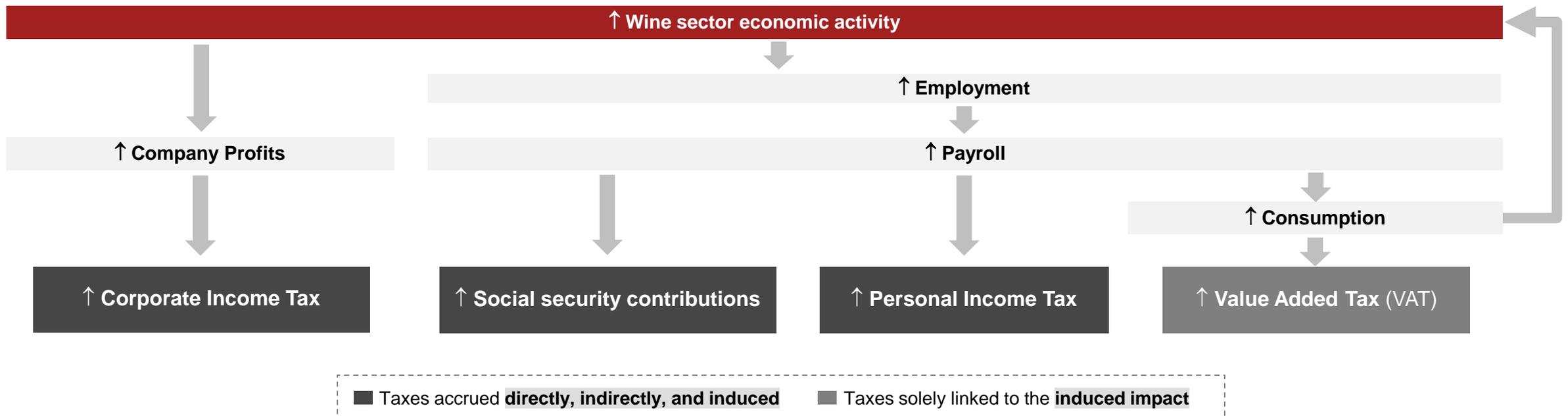
The tax contribution of the wine sector



In addition to its contribution to economic activity and employment, the wine sector contributes to tax revenue through its own operations and the activity it generates in its supply chain (indirect effect) and in households (induced effect)

Scheme of the fiscal impact generated by the wine sector¹

The **contribution of the wine sector** to fiscal revenue comes from both **taxes incurred** (Corporate Income Tax) and **collected** (Personal Income Tax from workers, Social Security Contributions from employees, etc.) **directly by the sector**, as well as from the **related economic activity** (indirect and induced impacts).



(1) Source: PwC analysis

Thus, the total fiscal impact generated by the wine sector amounted to nearly €52 billion in 2022, which is equivalent to 0.7% of the EU's general government expenditure

Total fiscal contribution (2022)

€52 Billion

Total fiscal contribution of the wine sector



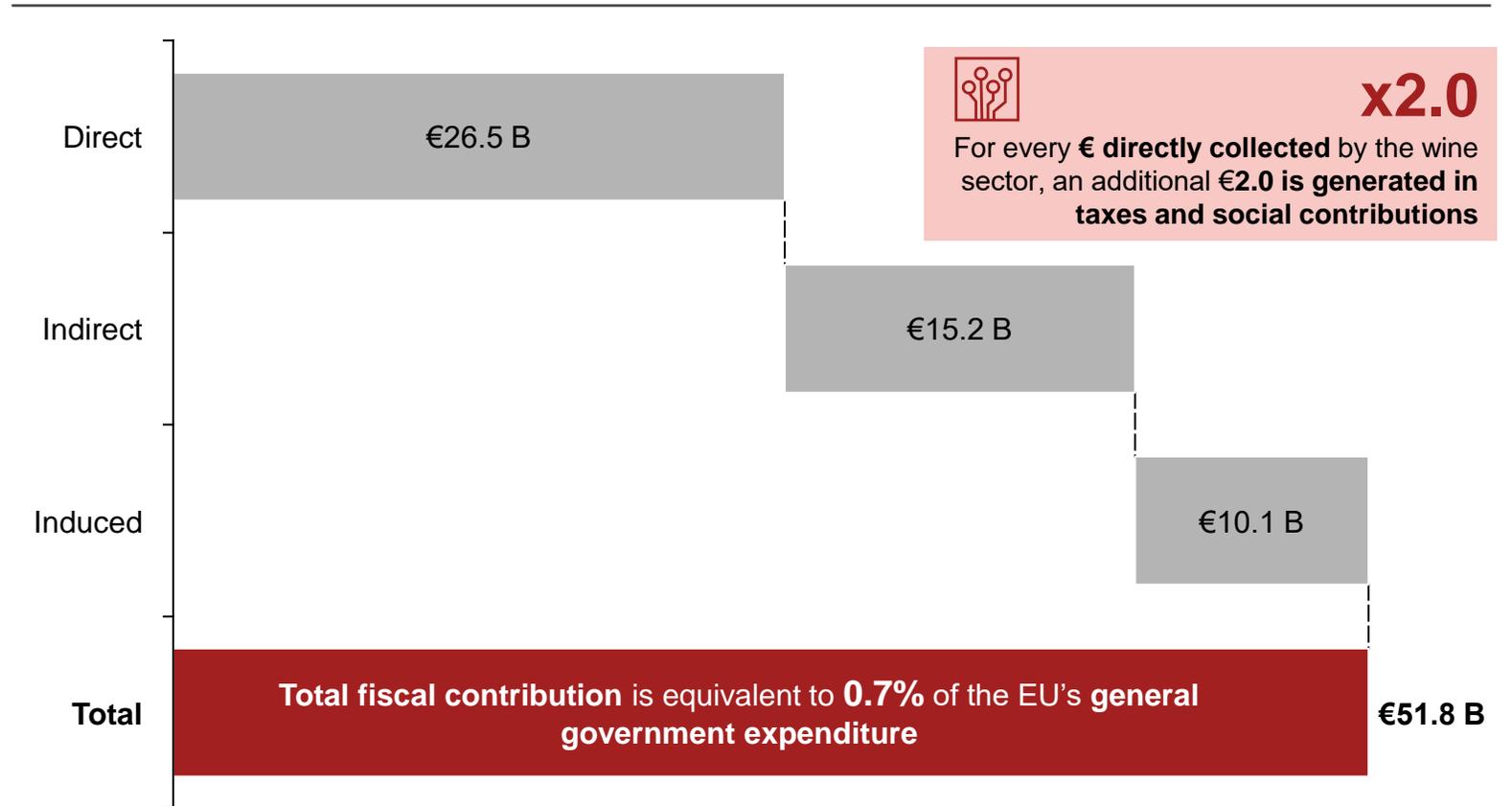
5 out of 10

Indirect effects (added value generated by suppliers of the wine industry) and **induced effects** (higher household consumption) together generate **almost 50% of the total fiscal contribution**

73%

The **total fiscal contribution** in 2022 is equivalent to **73%** of EU-27 total general government expenses in cultural services²

Total fiscal contribution of the wine sector in 2022¹ (€, Million €)

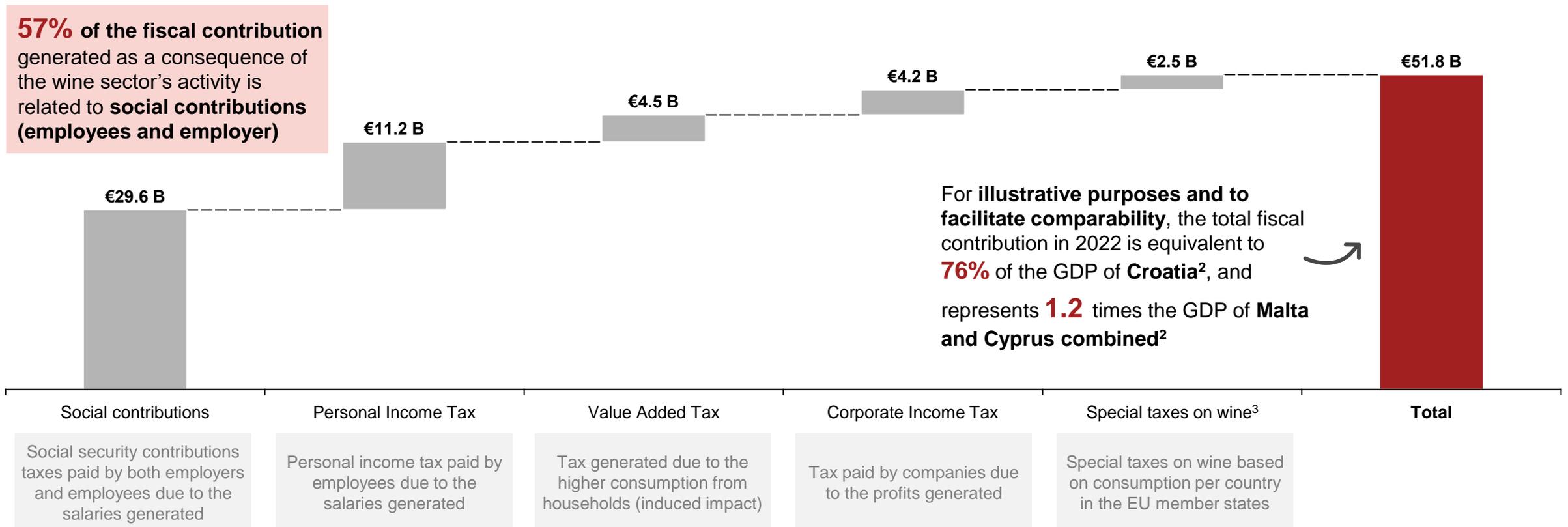


(1) Source: PwC estimates using Input-Output Methodology, Eurostat and Statista data

(2) Source: Eurostat; data for latest year available (2021)

The majority of this overall fiscal impact stems from social contributions, comprising 57% of the total impact (€29.6 billion), along with personal income tax at 22.3%

Total fiscal contribution of the wine sector by type of tax generated in 2022¹ (€, Million)



(1) Source: PwC estimates using Input-Output Methodology, Eurostat and Statista data

(2) Source: Eurostat; National Accounts

(3) Special taxes on wine computed using consumption per country and special taxes on alcohol in EU member states https://ec.europa.eu/taxation_customs/tedb/advSearchForm.html?taxType=EDU_ALCOHOL



The environmental contribution of the wine sector



The wine sector contributes to the sustainability of the EU environment in many ways such as boosting biodiversity, limiting soil erosion, improving water management and providing fire protection



Boosting biodiversity

Vineyards often host a variety of **plants and animals**, creating diverse ecosystems. Some vineyards incorporate **sustainable farming practices** that can include planting **cover crops**, leaving natural vegetation around the vineyards, and avoiding the use of chemical substances. These measures can help support local wildlife and **promote biodiversity** around vineyard areas.



A project¹ conducted in the **vineyards** of the German state **Saxony-Ahnalt** incorporated diverse seed mixtures to **enhance biodiversity** on steep slopes

+50%

Butterfly species

x3

Number of plant species

x4

Bee species



Improving water management

The wine sector can contribute to this by implementing **water-saving irrigation techniques**, using **advanced technology** to monitor and manage water use, and collecting rainwater for vineyard irrigation. Sustainable water management not only benefits the vineyards but also helps conserve water resources, especially in regions facing water scarcity.



In the Spanish wine region of **Priorat**², This project's team offered irrigation advice to **16 wineries** and winegrowers **covering 200 hectares**.

25% - 35%

of water savings



Limiting soil erosion

Soil erosion can be a significant issue in agricultural areas, but vineyards can help limit soil erosion through practices like planting cover crops, using erosion control techniques, and implementing sustainable vineyard layouts. These measures help to **stabilize the soil, reduce runoff, and prevent erosion**, which in turn protects the **quality of the soil for future grape cultivation**.



Covering crops in vineyards reduce soil erosion by up to **8 times** compared to traditional tilling³



Providing fire protection

In some wine-producing regions, vineyards can serve as **firebreaks or barriers**, helping to **protect against wildfires**. The bare ground between vine rows can create a firebreak, preventing the rapid spread of wildfires. Some vineyard managers may also engage in **controlled burning or other fire prevention practices** to reduce the risk of fires spreading in the area.



Vineyards have an average flammability **x5** lower than average cereal crops⁴

(1) Source: European Commission Cineac "How wineries are adapting to a warmer world"

(2) International Wineries for Climate Action Regenerative Farming & Carbon Sequestration (IWCA). Data from IWCA in February 2021.

(3) NEIKER technology centre (Instituto Vasco de Investigación y Desarrollo Agrario).

(4) Pagadala, T., Alam, M. A., Maxwell, T. M., & Curran, T. J. (2023).

These areas of contribution are key to the future goals of the European Union, which has recently adopted ambitious environmental objectives in which the primary sector is a key player

Main milestones in agriculture and sustainability in the past few years



Why take action? ⚡



The global average **temperature increases** at a rate of **0.18°C** per decade



Each degree increase in temperature **decreases the yield of rice, corn and wheat** by **3% to 10%**



1 million species are at risk of extinction



More than **75%** of global **food crop** types rely on animal pollination

Central to the European Green Deal is the need to shift to a more sustainable agriculture that minimizes the environmental footprint and does more to protect and sustain nature

Initiatives under the European Green Deal

➤ **Clean energy +**

Prioritize energy efficiency, renewable resources, affordable energy supply and an integrated energy market in the EU

➤ **Sustainable industry +**

➤ Push industry to explore and create “climate neutral” circular economy-friendly goods markets

➤ **Building and renovation**

Increase the use of renewable resources and the renovation rate of buildings

➤ **Farm to Fork ++**

Ensure a more sustainable food chain

➤ **Eliminating pollution +**

Aims to achieve cleaner air, water, and soil

➤ **Sustainable mobility**

Encourage more sustainable, efficient and smart means of transport

➤ **Biodiversity ++**

Restore ecosystems and their biological levels

➤ **Climate action +**

Reduce EU greenhouse gas emissions

(++) Initiatives **directly related to agriculture**

(+) Initiatives **closely related to agriculture**



6/8



among the **8 main initiatives**, **6 are directly or indirectly related to agriculture**

-55%



Cut **greenhouse gas emissions** by at least **55% by 2030** and become **climate neutral by 2050**

Further initiatives to support the environment: **The International “4 per 1000” initiative¹**

The International “4 per 1000” initiative seeks to achieve **0.4% growth rate per year in soil carbon stocks**. If the level of carbon stored by soils in the top 30 to 40 centimetres of soil increased this amount, the annual increase of carbon dioxide (CO₂) in the atmosphere would be significantly reduced.

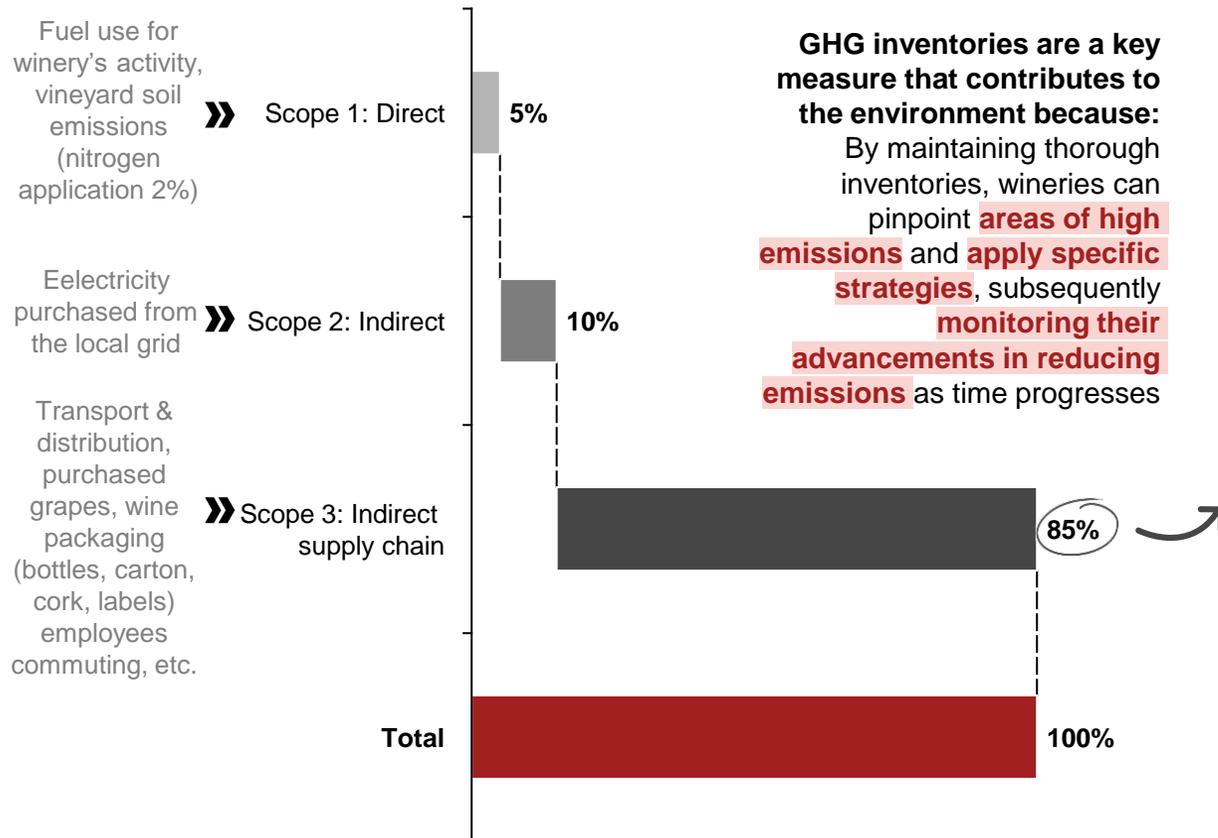


Source: European Commission (2019,2020 and 2021) and European Parliament.

(1) The international "4 per 1000" Initiative: Soils for Food Security and Climate and Lal et al., 2015.

In this context, the EU wine sector have already taken action to mitigate their greenhouse gas emissions, identifying the sources of emissions and defining concrete actions to reduce them

Distribution of GHG emissions in IWCA winery members by scope¹ (%)



GHG inventories are a key measure that contributes to the environment because:
 By maintaining thorough inventories, wineries can pinpoint **areas of high emissions** and **apply specific strategies**, subsequently **monitoring their advancements in reducing emissions** as time progresses

Reducing environmental impact through specific measures....

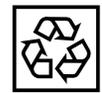


Reduction of wine glass bottles weight²

A commitment by leading wine retailers including EU companies to reduce the average weight of still wine bottles from an average of 550 gr to less than 420 gr by 2026¹. This reduction in weight will lead to lower emissions in the wine value chain.

25%

Anticipated decrease in carbon emissions associated with bottle weight reduction



Recycling³

To showcase the feasibility of an eco-friendly system for collecting, cleaning, and reusing glass bottles within the wine sector in Catalonia (Spain). The initiative engaged consumers, producers, bars, restaurants, wholesalers, and retailers in a pilot study that encompassed the entire process of reusing wine bottles, spanning from washing, labeling, bottling, and market distribution to their eventual collection.



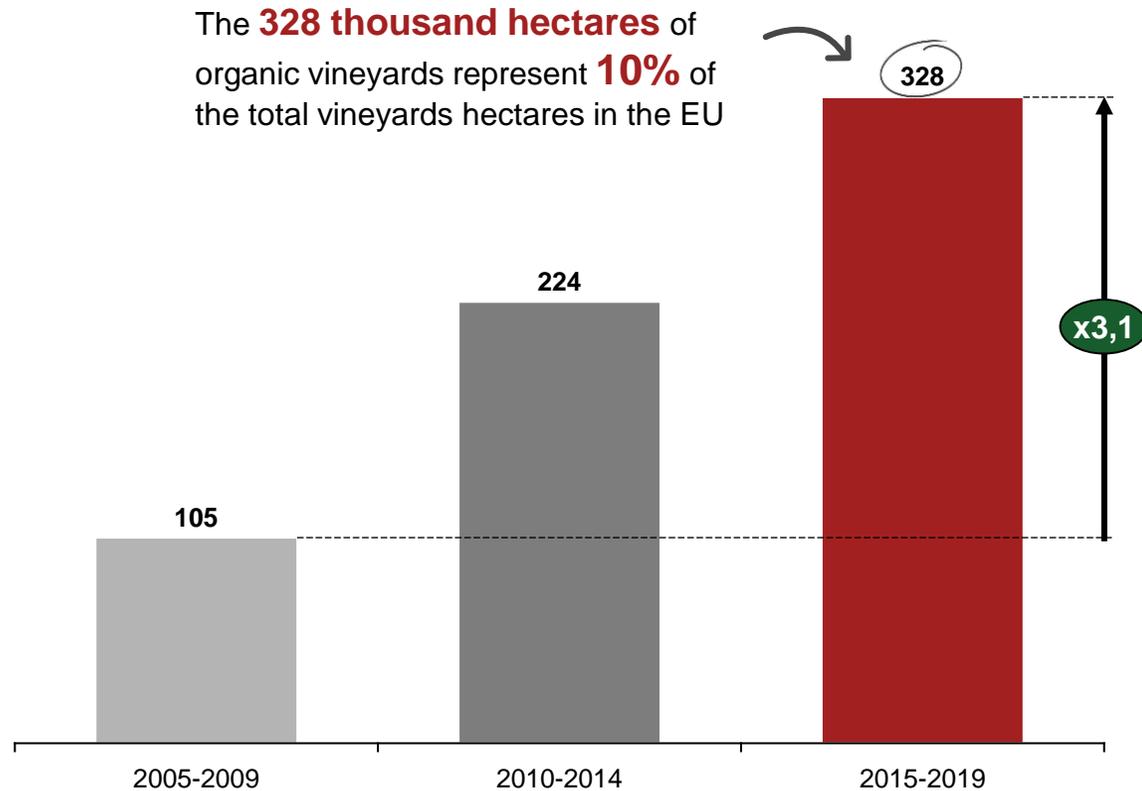
82,000

Wine bottles saved by reusage saving 170 tons of CO2

(1) Source: International Wineries for Climate Action GHG inventory
 (2) Source: Sustainable Wine Round Table Press Release October 10th 2023
 (3) Source: European Commission Cineac "How wineries are adapting to a warmer world"

Alongside supply chain improvements, the wine sector is adopting techniques like organic vineyard farming to reduce direct emissions

Organic vineyards surface in EU countries (thousand of hectares)²



80%

of the global organic vineyard surface¹

Organic viticulture is a production system that seeks to³ ≡

- 1 Sustain ecosystems and preserve **soil fertility**
- 2 Enhance **biodiversity and safeguard natural resources**
- 3 Advocate for the utilization of **ecological processes** and cycles
- 4 Reduce or eliminate external interventions and the **use of chemically synthesized products**
- 5 Utilizes organic products and procedures in the transformation and production processes, **avoiding all methods that have a substantial adverse** impact on the environment
- 6 Avoid the utilization of **genetically modified organisms** and any inputs derived from them

(1) Source: OIV Focus OIV The Organic Vineyard

(2) Source OIV Focus OIV The Organic Vineyard, countries considered Spain, France, Italy, Germany, Austria, Greece, Portugal, Bulgaria, Romania, Hungary, Croatia, Czech Republic and Slovenia

(3) Source OIV The Organic Vineyard according to Resolution OIV-ECO 460-2012.

While the wine sector is taking significant steps towards environmental sustainability, it also requires support and funding to adapt to a warming world and combat extreme weather events

Climate change can impact European viticulture...



Further alterations in the **timing of grapevine phenology**



Upsetting the equilibrium in grape and wine composition, leading to the **modification of traditional wine styles**



High **risk** for established **typical varieties**



Substantial **shifts** in the geographic **locations of traditional cultivation regions**

Adverse **effects on grapevine productivity resulting from extreme weather** occurrences like heatwaves, frost events, unpredictable storms, and destructive hailstorms



Projected impacts for EU's wine sector

10 – 40

Days of **anticipated phenological phases** of grapevine



8 ton

Up to **8 tons per hectare** of yield loss projections for some wine regions in the EU



Annex

An aerial photograph of a large wind farm situated in rolling green hills. The landscape is characterized by undulating terrain with numerous wind turbines scattered across the hillsides. The turbines are white with three blades, and their shadows are cast long and dark on the grass. A network of dirt roads winds through the hills, connecting the turbine sites. The sky is clear and blue, and the overall scene conveys a sense of vast, open space dedicated to renewable energy.

A. Sources of information

B. Input-Output methodology

Annex A | Sources of information

For this study, we calculated the direct, indirect, and induced effects of the wine sector on the European economy, considering the specifics of each stage in the value chain. We initiated our analysis with the primary stage of the value chain, which is viti-viniculture, encompassing agricultural activities. We then proceeded with winemaking, which falls within the industrial sector, concluding with commercialization, a part of the service sector. To prevent any double counting, we subtracted the production value of each stage from the next one. In order to obtain the share of GVA and employment from production values we used National Accounts and Structural Business Statistics from Eurostat. Below is a list containing the primary statistical sources from which we obtained the necessary information for each stage of the value chain

Viti-viniculture (Agriculture)

- Economic Accounts for Agriculture (*Eurostat*)
- National Accounts employment data by industry (*Eurostat*)
- National Accounts aggregates by industry (*Eurostat*)

Winemaking (Industry)

- Structural Business statistics (*Eurostat*)
- Statistics on the production of manufactured goods (*Eurostat*)

Commercialization (Services)

- Structural Business Statistics (*Eurostat*)
- Market size (*Statista*)
- Wine consumption (*OIV*)
- Wine special taxes (*European Commission*)

Other data & sources used for the study

- International trade in goods with Extra-EU countries (*Eurostat*)
- General Government Statistics (*Eurostat*)
- National Accounts aggregates by industry (*Eurostat*)
- State of the world Vine and wine sector in 2022 (*OIV*)
- Wine production in Mhl by country/region (*OIV*)
- Ruiz Pulpón, Á.R.; Cañizares Ruiz, M.d.C. Potential of Vineyard Landscapes for Sustainable Tourism. *Geosciences* **2019**, *9*, 472
- The EU wine sector July 2023 (*European Parliamentary Research Archive*)
- Wine Production and opening stocks (*Directorate-General for Agriculture and Rural Development European Commission*)
- Wine trade (*Directorate-General for Agriculture and Rural Development European Commission*)
- Population by broad age group, sex and other typologies– *Regional statistics by other typologies (Eurostat)*
- Farm Economy Focus Farm accountancy data network (*FADN*)
- UNESCO World Heritage List
- Informe visitas a bodegas y museos del vino 2022, 2020 (*ACEVIN*)
- L'Oenotourisme en France en 2016 (*Atout France*)
- Szolnoki, Gergely; Tafel, Maximilian; The Impact of Wine Tourism on Germany 2020
- Wine Technology Platform (PTV): R&D&I projects 2021
- Interenational Wineries for Climate Action Regenerative Farming & Carbon Sequestration feb 2021
- Droulia, F.; Charalampopoulos, I. Future Climate Change Impacts on European Viticulture: A Review on Recent Scientific Advances. *Atmosphere* **2021**, *12*, 495
- Neiker technology centre (Instituto Vasco de Investigación y
- Pagadala, T., Alam, M. A., Maxwell, T. M., & Curran, T. J. (2023). Measuring flammability of crops, pastures, fruit trees, and weeds: a novel tool to fight wildfires in agricultural landscapes. *Science of the total environment*, *906*, 167489.

Annex B | Input-Output methodology

Output, GDP and GVA

The **economic contribution of the wine sector** has been estimated using **Gross Value Added (GVA)** as **Gross Domestic Product (GDP)** is essentially the sum of the Gross Value Added (GVA) at basic prices across all sectors of the economy plus net taxes on products (VAT, excise taxes, etc., net of subsidies on products).

The **Gross Value Added (GVA)** at basic prices is calculated as the **difference between production value (output)** and the amount spent on the purchase of goods and services - **intermediate consumption** - (supplies, external services, and other current operating expenses), without deducting amortization or depreciation. It can be broken down into the following three elements:

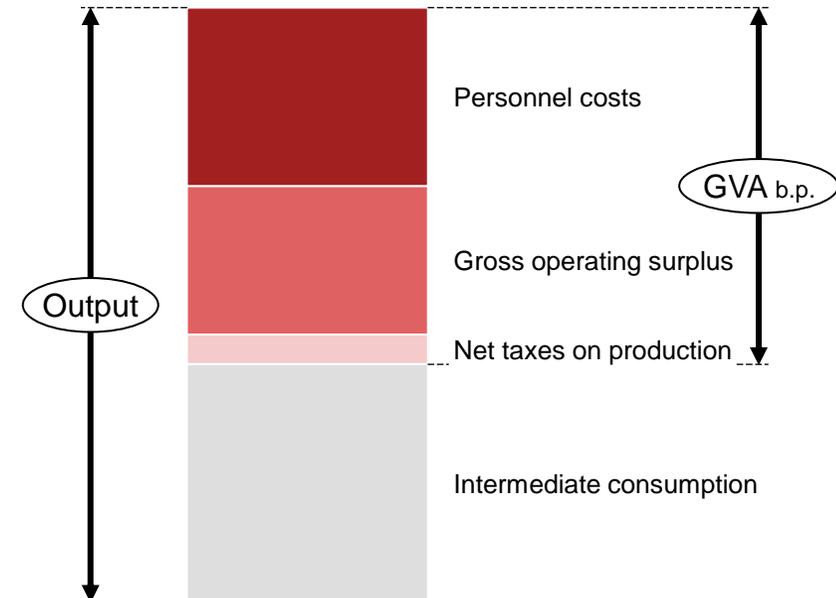
$$GVA_{bp.} = PC + GOS + NTP$$

Personnel costs (PC): Compensation for labor. It corresponds to all payments made to the company's own personnel for the remuneration of work (monetary or in kind), including social contributions and severance pay. It can be broken down into wages and salaries (gross) and social security contributions.

Gross Operating Surplus (GOS): Compensation for capital. It corresponds to the surplus generated by operating activities after remunerating labor and paying production taxes. It represents the available balance that allows for rewarding providers of equity and debt funds, paying profit taxes, and financing investments.

Net taxes on production (NTP): These are taxes that impose a burden on production, the use of labor, property, or the use of land, buildings, and other assets, regardless of the quantity or value of the products sold, minus subsidies for operation.

The figure below illustrates the decomposition of output (production value) between GVA at basic prices and intermediate consumption.



Annex B | Input-Output methodology

In order to obtain the share of direct GVA of each wine sector value chain component and intermediate consumption we used GVA to production or turnover ratios per activity provided by official statistics from Eurostat.

In order to avoid double counting of indirect effects, for Winemaking (stage 2 of the value chain) we obtained the net intermediate consumption by deducting the production value of viti-viniculture, also for commercialization (stage 3 of the value chain) we eliminated from intermediate consumption all the winemaking production that will be commercialized in the EU (Winemaking production value – wine exports outside the EU).

| Variable | Viti-viniculture | Source | Winemaking | Source | Commercialization | Source |
|------------------------------|------------------|--|----------------|---|-----------------------------------|--|
| Market value | € 29.4 Billion | Economic accounts of agriculture- <i>Eurostat</i> | € 50.3 Billion | Statistics on the production of manufactured goods- <i>Eurostat</i> | € 100.3 Billion € 97.8 Billion | Market size- <i>Statista</i> Market size without special taxes on wine – <i>European Commission</i> |
| Gross Value Added | € 13.5 Billion | National accounts- <i>Eurostat</i> | €10.9 Billion | Structural business statistics- <i>Eurostat</i> | € 31.7 Billion | Structural business statistics- <i>Eurostat</i> |
| Intermediate consumption | € 15.9 Billion | National accounts- <i>Eurostat</i> | € 39.4 Billion | Structural business statistics- <i>Eurostat</i> | € 66.1 Billion | Structural business statistics- <i>Eurostat</i> |
| Net-Intermediate consumption | € 15.9 Billion | National accounts - <i>Eurostat</i> | € 10 Billion | = (Winemaking Intermediate consumption) – (Viti-viniculture production value) | € 33.6 Billion | = (Commercialization Intermediate consumption) – (winemaking production value) + (winemaking exports outside the EU ¹) |

(1) 17.9 Billion euros source: Eurostat

Annex B | Input-Output methodology

Economic impacts are calculated on the basis of the input-output (I-O) model based on data from Eurostat

Input-output models are a standard and widely used technique for quantifying the economic impact of economic sectors, business activities and infrastructure investments. They are based on Leontief's production model, which states that the production requirements of an economy are equivalent to the intermediate demand for goods and services by the production sectors, plus final demand, as expressed in the following equation:

$$X = AX + y$$

where X is the column vector that represents the production needs of each sector in the economy (using a 20 sector breakdown from FIGARO and 27 countries we have 540 individual sectors), y is a column vector that represents the final demand of each sector, and A is the so-called matrix of technical coefficients (in this case- 540 rows x 540 columns), which by row indicates the percentage of production destined for each one of the other sectors in the economy for each specific sector, and by column indicates the weight that demand by each one of the other sectors in the economy has over its total production of goods and services for each sector. The above formula can also be represented in the following way:

$$\begin{bmatrix} X_1 \\ X_2 \\ X_3 \\ \dots \\ X_{63} \end{bmatrix} = \begin{bmatrix} a_{11} & a_{12} & a_{13} & \dots & a_{163} \\ a_{21} & a_{22} & a_{23} & \dots & a_{263} \\ a_{31} & a_{32} & a_{33} & \dots & a_{363} \\ \dots & \dots & \dots & \dots & \dots \\ a_{631} & a_{632} & a_{633} & \dots & a_{6363} \end{bmatrix} \times \begin{bmatrix} X_1 \\ X_2 \\ X_3 \\ \dots \\ X_{63} \end{bmatrix} + \begin{bmatrix} y_1 \\ y_2 \\ y_3 \\ \dots \\ y_{63} \end{bmatrix}$$

where, for instance, X_1 are the production needs of sector 1, y_1 is the final demand of that sector, and a_{11} , a_{12} , a_{13} , ..., a_{163} are the production percentages of sector 1 which are destined, respectively, for sectors 1, 2, 3, ..., 63, while a_{11} , a_{21} , a_{31} , ..., a_{631} are the weights on sector 1 production of goods and services demanded, respectively, from 1, 2, 3, ..., 63.

If we rearrange the above formula, we can calculate the production needs of an economy (X) based on the final demand (y) that it has to meet as follows:

$$X = (I-A)^{-1} y$$

Where $(I-A)^{-1}$ is the inverse Leontief matrix or the production multiplier matrix, which is used to calculate the impacts.

The GVA and employment multipliers that we have used in our analysis has been taken from the RIMS II framework developed by BEA.

Annex B | Input-Output methodology

Selected Input-Output Table

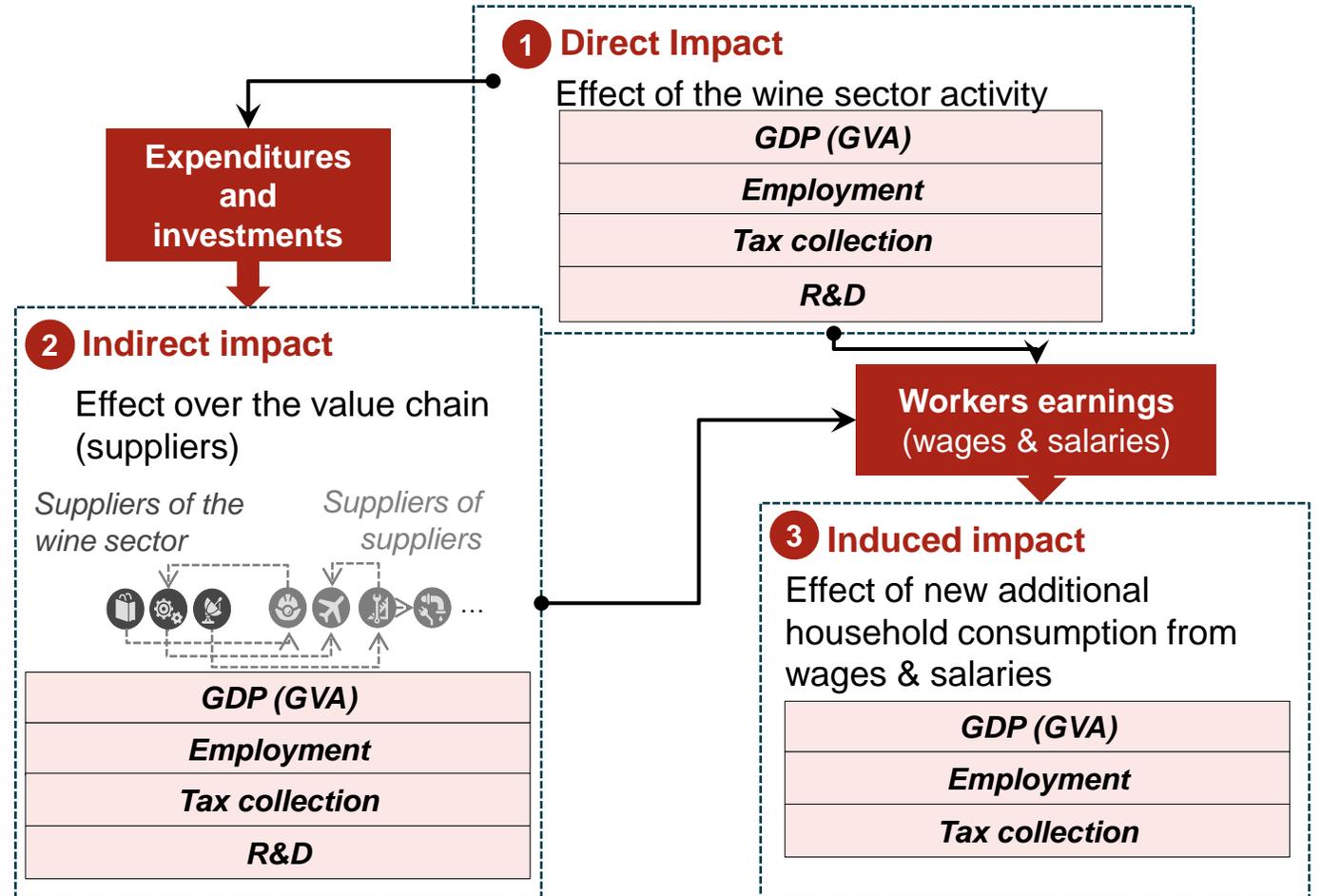
Annual **EU inter-country input-output tables industry by industry (FIGARO)** provided by Eurostat have been used to estimate the model.

FIGARO Input-Output tables allowed us to compute the economic, employment, R&D and Tax contributions taking into account not only the national economic sectors relationships but **also the international flows of jobs, income and trade inside the EU.**

The latest publication of this Input-Output tables corresponds to 2020 but, **in order to avoid the economic noise produced by the pandemic Covid-19 the 2019 FIGARO Input-Output table has been used** for this study.



The estimated impact covers the entire EU





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