Potential Socio-Economic Impact on the European Fragrance Value Chain of a Restriction on the Use of Encapsulation Technologies

Final Report by The Huggard Consulting Group

for IFRA Europe

The Huggard Consulting Group

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EXECUTIVE SUMMARY

This report sets out a qualitative and quantitative assessment of the potential risks to the socio-economic contribution to the EU of the fragrance value chain posed by an immediate ban on encapsulation technologies without the availability of a complete range of alternatives.

1. Fragrance Technologies

Fragrances make a difference. They are an essential part of life for almost every European. Through their presence our experiences are enriched. They enhance our well-being and our quality of life. They are the product of a deep partnership between the Fragrance industry and owners of consumer brands. Every fragrance is a unique combination of science and artistry. Through their complex properties they form "platform technologies", facilitating innovation and differentiation by brand owners throughout the Consumer Goods sector.

Satisfaction of these consumer needs generates enormous economic benefits for Europeans. In 2018, expenditure by end consumers on products that make use of fragrance was close to Euro 120 billion. This estimate provides an insight into the scale of the "economic footprint" of fragrance technologies in Europe.

Within this footprint, however, it is possible to identify the distinctive benefits that fragrance technologies create for end users and the economic value of those benefits. The valuation approach recognises that fragrance technologies create different types of benefit, some more valuable to end consumers than others. It is possible, therefore, to estimate the distinctive contribution of fragrance technologies to employment and Gross Value Added (GVA) in Europe.

In 2018, it is estimated that **the distinctive contribution of fragrance technologies supported GVA of more than Euro 63 billion**, after taking account of direct, indirect, and induced impacts. Moreover, **nearly 1.1 million jobs and an additional 340,000 small informal businesses** are supported by the economic output at all stages of the value chain that depends on the distinctive contribution of fragrance technologies.

2. The Fragrance Industry in Europe

Europe is the "home of fragrance". It has the largest concentration of fragrance activities in the world. The Fragrance industry has made major investments in Europe in production, innovation, creativity, and strategic management. In 2018, **overall sales of unique fragrances blends by the Fragrance industry in Europe were estimated to be EUR 2.2 billion, supporting more than 7,000 direct jobs (many highly skilled) and direct GVA of Euro 1 billion**. It is a world leader.

To develop large numbers of new, unique fragrance experiences, **fragrance companies make very large-scale investments, equal to approximately 16-18% of annual turnover, in product innovation**. This encompasses all forms of expenditure associated with the creation of new or improved products. Through this process of investment, the fragrance industry acts as a "motor of innovation" for the Personal Care, and Household Care sectors in Europe, supporting GVA of more than Euro 63 billion, throughout its value chain.

3. Importance of Encapsulation

The Fragrance industry invests in a range of dosing technologies designed to deliver an enhanced fragrance experience to end consumers, meeting emotional and perceived functional needs. Significant resources have been invested in the development of fragrance encapsulation over the last twenty years. It has become a strategic technology for the industry and for its customers.

Initial use of fragrance encapsulation focused on laundry care, specifically fabric conditioners and laundry detergents. Use of encapsulation is significant in these categories and its effective exploitation has established a new hierarchy of value propositions. Consumer spending on laundry

care products in Europe in 2018 was over Euro 13 billion.
In other product categories, the use of encapsulation technologies still has huge potential for growth. New segments, based on encapsulation, have emerged in “rinse off applications” (shampoo, hair conditioner, shower gel, and toilet soaps), skin care, antiperspirants, deodorants, and household surface cleaners.
In a lot of applications, it is considered to be the most sustainable and resource efficient way of dosing fragrances, as a result of its ability to control delivery at the point of use.
Overall consumer spending in Europe in product categories where fragrance encapsulation is being used in new applications to establish new segments was close to Euro 58 billion in 2018.

4. Potential Socio-Economic Impacts of a Restriction

4.1. Reduced Innovative Capability of the Fragrance Industry

In the event of a restriction on the continued use of fragrance encapsulation, the Fragrance industry will need to **reformulate at least 4,500 unique capsule-fragrance combinations**. Concurrently it will need to **invest in trying to develop new alternative, long-lasting dosing technologies**, in response to pressure from brand owners to restore the consumer benefits previously provided by encapsulation. This may, however, not be possible technologically in the short or medium-term. Together, these two phases of activity represent a form of ‘**Defensive R&D’**: a diversion of innovative resources in response to regulatory requirements that seeks to maintain existing technologies or customer benefits rather than to advance technological frontiers or consumer benefits.
Overall, the following negative impacts are likely to be triggered: closure of production and development activities; loss of turnover and gross margin; decreased operating efficiency; diminution of the palette of fragrance development technologies; and a major increase in Defensive R&D.
The cost of reformulating at least 4,500 unique capsule-fragrance combinations is estimated to be in the range Euro 135 - 225 million over a 2-3 year period. **At the same time the fragrance industry will seek to develop alternative, long-lasting dosing technologies capable of restoring existing consumer benefits. Investments equivalent to 30% of existing expenditure on science will need to be made over a 6-8 year period: an investment of between Euro 400 million and Euro 500 million.**
Taking these two stages of activity together, the level of Defensive R&D incurred by the Fragrance industry would be 35% of current innovative investment for the first three years and then 20% for the remainder of the programme horizon. In total, this would lead to investment of Euro 535 million to Euro 725 million over 6-8 years, significantly reducing the capability of the Fragrance industry to support innovation, and hence the scale of employment and GVA that depend on fragrance technologies, throughout the value chain.

4.2. Negative Market Impacts for Brand Owners in EU Product Categories

Loss of fragrance encapsulation technologies is likely to have important negative impacts for brand owners in Household Care, and Personal Care markets in Europe. In laundry care, restrictions on the continued use of fragrance encapsulation are likely to lead to **a collapse of the current value hierarchy, triggering restructuring, and posing a risk of category commoditisation**.
Brand owners in other downstream product categories will face different challenges. In product categories where the use of fragrance encapsulation is growing and creating new end-user segments, there will be a **loss of new ways to differentiate, to develop new products, and to add value.** A restriction will lead to the loss of these emerging segments and the value added they sustain.

4.3. Reduced Consumer Welfare

A restriction on the continued use of fragrance technologies is likely to **reduce consumer choice and welfare** for very large numbers of Europeans. It may also trigger increases in overall household costs. There will be a loss of consumer satisfaction and choice, primarily in laundry care product categories. And, wash frequencies are likely to increase, because of the loss of the benefit of long-lasting freshness. Consumers will incur, as a result, higher energy and water costs. There will also be greater fabric damage and reduced garment longevity, further increasing household costs.

4.4. Challenges to the Competitiveness of EU Global Brands in non-EU Markets

Outside the EU, premium global brands have begun to make use of fragrance encapsulation in an increasing range of product categories, including laundry care and hair care. It strengthens their relative competitive advantage. Some of these gains may be placed at risk, in the event that the use of fragrance encapsulation technologies is restricted in Europe.

Decisions by the EU to ban the use of substances or technologies communicate social concern about safety and risk. These concerns are, increasingly, amplified, and shared globally, by activists, media, investors, and downstream users, stigmatising technologies and triggering mandatory and voluntary restrictions. Taking these factors into account, it is likely that global brand owners will reduce the use of fragrance encapsulation in non-EU markets, if it is restricted in the EU. If this occurs, then **the relative competitiveness of global brands in a wide range of product categories will be weakened**. Over time, this will have negative effects for the EU.

4.5 Risk-Risk Outcomes

A potential restriction on the continued use of fragrance encapsulation, before alternatives have been fully developed, raises the possibility of creating additional risks elsewhere. It is likely that there will be an **increase in rewashing** because of the loss of perceived long-lasting freshness. Industry experts believe that, after taking account of the use of fragrance encapsulation in laundry care products, approximately 2-3% of all washes would be redone. Based on the number of EU households this would equate to **around 1 billion additional washes per year: the environmental impacts of this change in household washing behaviour would be significant.** Consumption of water and electricity would increase, contributing to higher carbon emissions. There would be greater release of micro-fibres. And, it would trigger more regular replacement of clothing, increasing the carbon footprint of textile production.

4.6 Threats of Economic Damage to the Overall European Fragrance Value Chain

Based on the existing pattern of usage of fragrance encapsulation and its impact on different product categories, it is possible to identify the scale of jobs and GVA that these technologies currently support. Including direct, indirect, and induced impacts, it is estimated that in 2018, **fragrance encapsulation technologies supported more than 60,000 jobs and over Euro 4.5 billion GVA in Europe**. Of the jobs that currently are supported by fragrance encapsulation more than 40,000 are within retailers and manufacturers of products that make use of fragrance technologies, whilst the remainder are the result of indirect multiplier impacts from European-based suppliers of goods and services (more than 10,000 jobs), and induced multipliers due to increased household spending because of higher levels of direct and indirect employment (nearly 10,000 jobs).

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1. Background and Methodology

1.1. Background

ECHA, in response to public concern about persistent aquatic plastic waste, has proposed a mandatory restriction on the use of micro-plastics intentionally added to products. If implemented, this ban would severely restrict the continued use of encapsulation: a complex fragrance dosing technology used to create important benefits for consumers and brand owners in the Household Care, Personal Care, and Professional Cleaning and Hygiene markets.

In product categories where encapsulation is used, it helps brand owners define the functional benefits of their products, as well as meeting complex emotional and psychological user needs. By doing this, encapsulation technologies help satisfy consumers, differentiate brands, build brand equity, and, in consequence, create wealth and jobs throughout an extensive value chain.

These benefits, and the risks posed to them by a potential restriction on the continued use of encapsulation technologies, must be highlighted, so that relevant, proportionate, and effective regulatory decisions can be made. To support this, IFRA Europe asked The Huggard Consulting Group (HCG) to develop an independent report to examine the potential socio-economic impacts on the fragrance value chain of a restriction on the continued use of fragrance encapsulation.

1.2. Methodology

The review considers the entire fragrance value chain, encompassing developers and producers of fragrance blends, manufacturers of Household Care, Personal Care and Professional Cleaning and Hygiene products, and relevant retailers, as well as indirect effects as a result of supplier and consumption multipliers. Assessments assume that fragrance encapsulation is banned and that, based on the findings of the recent Risks & Policy Analysts Ltd (RPA) report produced for IFRA Europe, no viable alternative technology capable of matching the customer benefits of encapsulation is currently available.

To undertake this review, The Huggard Consulting Group up-dated estimates of the quantified distinctive socio-economic contribution of fragrance technologies to the EU, using the methodologies developed for IFRA in 2012. These are summarised in Appendix A of this report, and set out in more detail in the 2012 report.[1]. This work was complemented by a reappraisal of the contribution of fragrances to value added in specific categories carried out using insights from leading consumer goods companies and the support of IFRA Europe. Taken together, these analyses enabled The

[1] The detailed methodology is set out in Section 2 and Appendix A of 'The Socio-Economic Impact of Fragrance Technologies in Europe' IFRA (2012). A link can be found at: www.ifraorg.org/view_document.aspx?docid=23341

Huggard Consulting Group to establish a new 'baseline' for the scale of the fragrance value chain in the EU.

A programme of confidential in-depth interviews with experts in major Fragrance companies and IFRA Europe was then undertaken. This, along with a programme of desk research, enabled the project team to identify the scale of current penetration of encapsulation technologies, their benefits for consumers and brand owners, and their potential future growth; the historic development of the use of these technologies; and the contribution of encapsulation to the growth of global brands in non-EU markets. Finally, the interview programme was used to highlight other potential socio-economic impacts, including the scale of 'Defensive R&D' costs of reformulating existing blends that use encapsulation and of seeking alternatives to replace existing consumer benefits; and potential risk-risk impacts resulting from likely changes in household washing behaviour.

In addition, IFRA Europe developed a questionnaire and carried out a small-scale survey of leading producers of fragrance blends known to make use of encapsulation technologies. Where appropriate, responses to the survey have been used by the project team to provide additional, indicative insights.

1.3. Report Coverage

This report from The Huggard Consulting Group sets out a qualitative and quantitative assessment of the potential risks to the socio-economic contribution to the EU of the fragrance value chain posed by an immediate ban on encapsulation technologies without the availability of a complete range of viable alternatives.

In Section 2, this report explains and highlights the socio-economic contribution of fragrance technologies to the EU. It shows how the Fragrance industry, through major investments in science, consumer understanding, creativity, and safety, acts as a "motor of innovation" for brand owners in the Personal Care, Household Care, and Professional Cleaning and Hygiene sectors. It explains the process of value added, showing how the unique capacity of fragrance technologies to meet complex functional and emotional needs of consumers creates work and wealth within retailers and manufacturers and, through a process of indirect and induced effects, elsewhere in the economy.

In the next section (Section 3), the importance of encapsulation technologies is identified and highlighted. Its use, as a delivery technology, providing unique consumer benefits in a growing number of product categories, is described.

Section 4 then sets out the potential socio-economic impacts of a restriction of the continued use of fragrance encapsulation. They cover the potential impacts on the Fragrance industry, including 'Defensive R&D' expenditure; consequences for EU brand owners in domestic markets; losses of benefits for consumers; possible "spill over" impacts on EU brand owners in non-EU markets; potential pathways to negative risk-risk outcomes, leading to an increase in net risk rather than a reduction; and, quantified estimates of the current importance of encapsulation technologies to the

fragrance value chain, and hence the scale of potential damage that could occur as the result of an immediate restriction.

Our conclusions are set out in the final section (Section 5).

2. Socio-Economic Contribution to the EU of Fragrance Technologies

2.1. The Fragrance Value Chain

In modern economies, wealth and employment, along with other public benefits, are often created because ideas and technologies are embedded in other more complex products and services, adding value through progressive stages of the production process. This often culminates in the final purchase of a product or service (which contains the embedded ideas or technologies) by consumers who satisfy multiple, complex functional and emotional needs. This process of 'up-grading' generates successive increases in value added and employment, and is described as a "value chain".

The creation, supply, and consumption of fragrance technologies generate wealth, jobs, and other public benefits in Europe through three distinct and sequential phases of economic activity:

- **"The Fragrance Industry"** – this is made up of global specialist fragrance companies, mid-sized specialist fragrance companies, and specialist suppliers of ingredients. This stage of the value chain makes major investments in science, creativity, and market knowledge, and then exploits these assets to create and supply proprietary fragrance blends, based on a wide range of ingredients, to manufacturers of personal care and household care products for consumer and business-to-business markets.

- **"Manufacturers"** – companies in a range of consumer and luxury goods sectors use investments in creativity, science, and market knowledge by the Fragrance industry to create new sectors, build brands, and differentiate themselves in competitive markets. Economic benefits created here are of a significant scale, and of considerable importance in Europe. Direct economic benefits are created through production, sales, marketing, product development, R&D, administration, and logistics activities.

- **"Retailers"** - In the final stage of the fragrance value chain, end consumers purchase the consumer products and luxury goods that contain fragrance technologies. They do this through expenditure in a wide range of retail outlets. Spending by consumers in these stores creates jobs and wealth. In Europe, the main types of store and non-store retail outlets distributing products that contain fragrances are: grocery retailers, mass merchandisers, department stores, pharmacies, beauty and well-being specialists, hair and beauty salons, and, direct and electronic sales.

Economic activity of this type also sustains jobs and wealth indirectly through the operation of "multipliers". Purchases of goods and services by retailers and manufacturers throughout the value chain, to support the sale and production of goods that make use of fragrance technologies, creates additional jobs and wealth in suppliers, many of which are located in Europe. This process is often described as an "indirect multiplier" mechanism.

Further indirect impacts are likely to occur through the operation of "induced multipliers". Household spending, by people whose jobs are dependent on the sale or manufacture of products that make use of fragrance technologies is also affected by the scale of activity of the fragrance value chain. Such expenditures create additional economic benefits.

2.2. Fragrance Technologies – Social Benefits

Fragrances make a difference. They are an essential part of life for almost every European[2]. Through their presence our experiences are enriched. They enhance our well-being and our quality of life. They are the product of a deep partnership between the Fragrance industry and owners of consumer brands. Every fragrance is a unique combination of science and artistry. Through their complex properties, they form "platform technologies", facilitating innovation by brand owners throughout the Consumer Goods sector. In Personal Care and Household Care markets most products rely upon fragrances to deliver valued emotional or functional benefits, to communicate product performance, to differentiate brands, or to create added value.

For ordinary Europeans, fragrances solve important functional problems and they satisfy valued emotional needs. On a functional level, the complex properties of fragrances allow individuals to control or remove malodour: the bad smells that afflict the everyday lives of millions. Control of these smells, using fragrances embedded in household and personal care products, improves the physical quality of people's lives.

The absence of smell can also be a concern for consumers, who often need signals to reassure themselves or to give themselves confidence that they, their clothes, or their homes are clean.

Yet the enjoyment of fragrances by Europeans goes beyond the satisfaction of functional needs. Through their appeal to our fifth sense and its complex links in our minds, memories, and psychologies, fragrances help meet an extensive range of emotional needs for countless people. They help us become more alluring and attractive to others. For many, they help create a sense of self, supporting personal identity, distinctiveness, and uniqueness. In some cases, fragrances may even help people achieve aspirational and lifestyle goals, communicating distinctive personalities and contributing to a heightened sense of self-worth.

[2] Throughout this report, the terms 'Europe' or 'Europeans' refers to EU-28 plus Switzerland and Norway.

Fragrances play a valued emotional role in the household as well. They create a sense of place and of belonging, defining our homes to ourselves and to others. They demonstrate to families, friends, and peers that we care about home, hygiene, and family, building self-respect and pride.

And fragrances help us with our feelings and sense of well-being too. They create different moods, triggering emotional relief or stimulating new ideas, sensations and pleasures. They relax us, stimulating a sense of calm and relieving stress.

2.3. Fragrance Technologies – Economic Benefits

Satisfaction of these consumer needs generates enormous economic benefits for Europeans:

- Sales to Europeans (through retail and non-store channels) of consumer products that make use of fragrance technologies sustain jobs and contribute to economic wealth. Brand owners in the Personal Care and Household Care sectors manufacture most of these products. Indeed, Europe is the world's largest net exporter of consumer products that rely upon fragrance technologies, most notably in fine fragrances, skin care, cosmetics and toiletries. It is also a major exporter of household care products and fragrance technologies. This process of manufacturing supports employment throughout Europe and produces additional wealth.

- Brand owners in a wide range of consumer and luxury good sectors use investments in creativity, science, consumer understanding and safety by the Fragrance industry to create new sectors, build brands, and differentiate themselves in competitive markets. Fragrance technologies help brand owners remove obstacles to consumption by masking the smell of raw materials; deliver core functional benefits such as control of malodours; create major markets by delivering primary emotional benefits; articulate the complex functional benefits of major consumer markets; and, satisfy complementary emotional needs.

- Jobs and wealth are also produced by the economic activities of the Fragrance industry, creating new fragrances to help consumer goods companies meet the needs of Europeans ever more successfully.

- Economic activity, triggered by the exploitation of fragrance technologies in retail and manufacturing, also sustains jobs and wealth indirectly through the operation of "multipliers". Purchases of goods and services by retailers and manufacturers from European-based businesses, to support the sale and production of goods that make use of fragrance technologies, creates additional jobs and wealth in suppliers. This process is often described as an "indirect multiplier" mechanism.

- Further indirect impacts are likely to occur through the operation of "induced multipliers". The scale of activity of the fragrance value chain stimulates household spending by people whose jobs are dependent on the sale or manufacture of products that make use of fragrance

technologies either directly or indirectly throughout the supply chain. Such expenditures create additional economic benefits.

In 2018, purchases by end consumers of products that make use of fragrance, including net exports, retail sales, and business-to-business transactions with Professional Cleaning and Hygiene customers, was close to Euro 120 billion (Exhibit 1)[3]. This estimate provides an insight into the scale of the "economic footprint" of fragrance technologies in Europe.

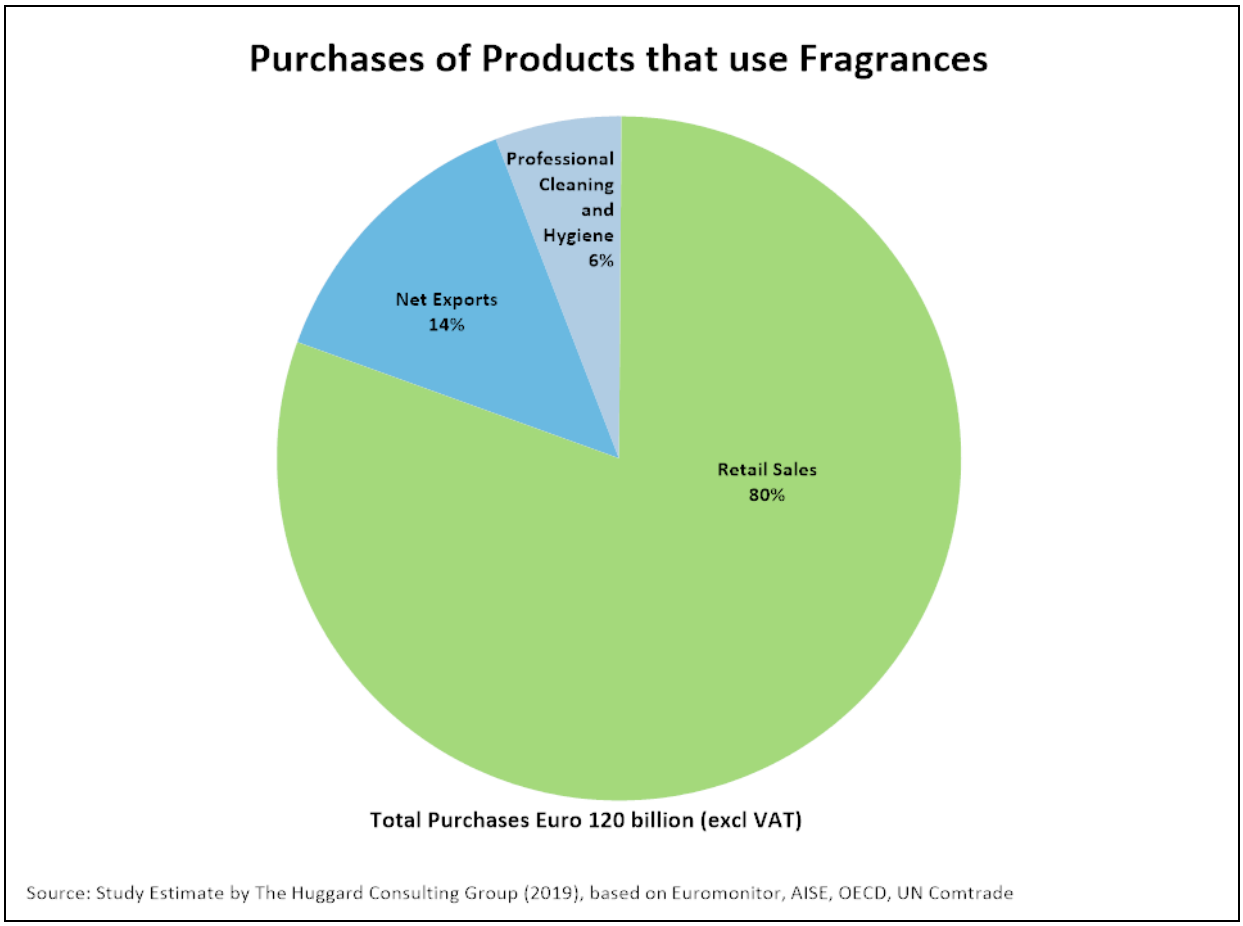

Exhibit 1: Purchases of Products that Use Fragrances

Within this footprint, however, it is possible to identify the distinctive benefits that fragrance technologies create for end users and the economic value of those benefits. Based on a series of expert assessments of each product category, up-dated in 2019 with insights from leading consumer goods companies, the valuation approach recognises that fragrance technologies create different types of benefit: some more valuable to end consumers than others. It also takes into account the role that fragrances play in driving levels of initial purchase and repurchase for many applications: the most important determinants of category value for consumer products. (Most consumer goods that make use of fragrances are purchased on a weekly or monthly basis). Finally, the valuation approach recognises the role that fragrances play in mature markets, such as Europe, in providing brand owners with ways to differentiate their brands, and hence create higher product category values, by meeting emotional needs and confirming functional performance. The valuation approach is explained in more detail in Appendix A.

[3] This estimate is based on the methodology set out in 'The Socio-Economic Impact of Fragrance Technologies in Europe' IFRA (2012) and up-dated using 2017/18 data from Euromonitor, AISE, and OECD. It excludes VAT and sales of services that depend upon fragrance technologies.

Using this approach, it is possible to estimate the distinctive contribution of fragrance technologies to employment and Gross Value Added (GVA)[4] in Europe.

In 2018, after taking account of direct, indirect, and induced impacts, it is estimated that the distinctive contribution of fragrance technologies supported GVA of more than Euro 63 billion (Exhibit 2). Direct economic impacts within the value chain account for over Euro 37 billion. The remainder are the result of indirect multiplier impacts from European-based suppliers (Euro 16 billion), and induced multipliers due to increased consumption spending (Euro 10 billion).

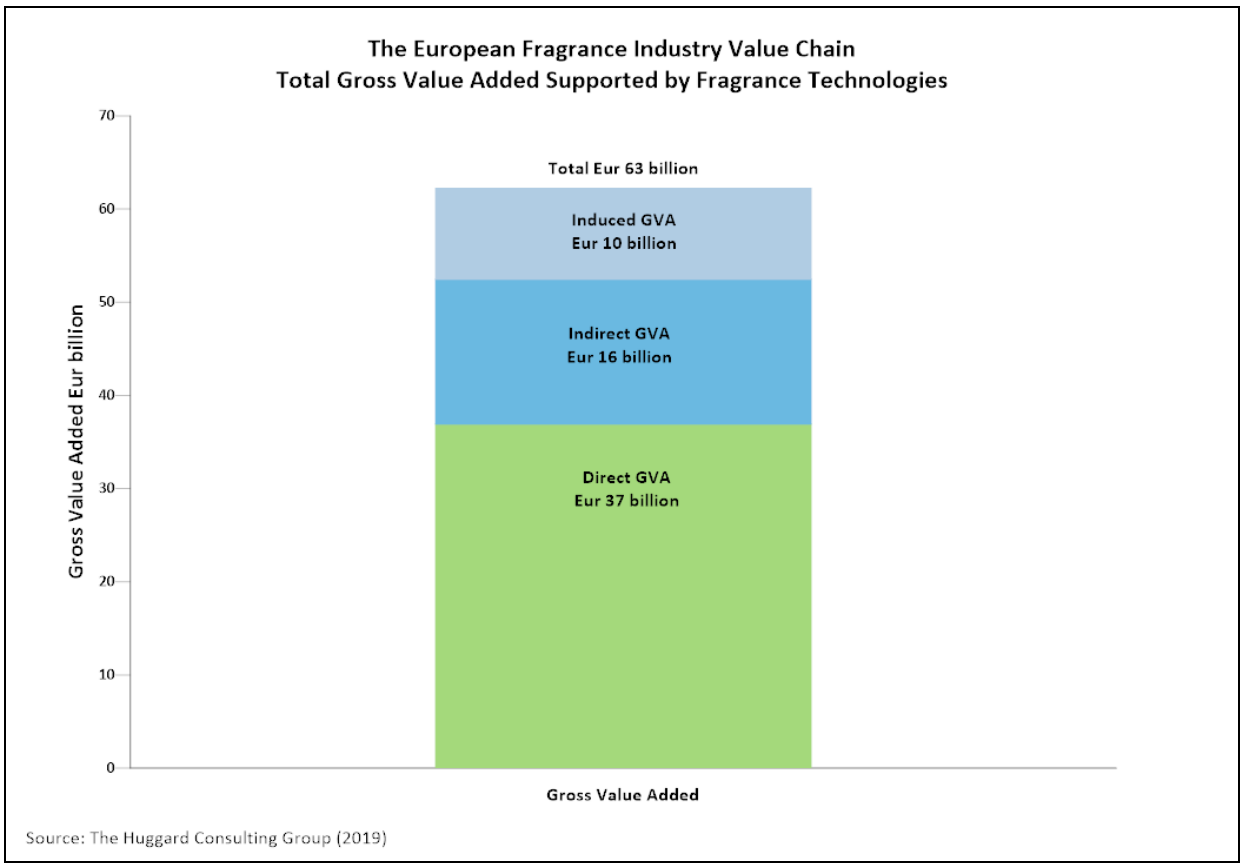

Exhibit 2: The European Fragrance Industry Value Chain: Total Gross Value-Added Supported by Fragrance Technologies

Moreover, on a conservative basis, nearly 1.1 million jobs (full time equivalents) and an additional 340,000 small informal businesses are sustained by the economic output at all stages of the value chain that depends on the distinctive contribution of fragrance technologies (Exhibit 3)[5]. Of these, 70% are direct jobs in the Fragrance industry, manufacturing, and retail; indirect jobs within suppliers account for 13%; and induced jobs, elsewhere in the economy, account for around 17%. The greatest proportion of direct jobs (nearly 80%) is in retail store and non-store outlets, including grocery, mass merchandisers, department stores, pharmacies, specialist beauty stores, hair salons, direct selling and electronic selling.

[4] The activities of the fragrance industry, and all other parts of the fragrance value chain, contribute to the wealth of Europe as a result of their impact on Gross Domestic Product (GDP). GDP is an indicator of a nation's economic situation. Within individual companies, industries or sectors, this is broadly equivalent to operating profit plus gross expenditure on salaries and wages, and is described by economists as 'Gross Value Added' (GVA).

[5] In general, jobs within the Fragrance industry and manufacturers of Household Care and Personal Care products are highly skilled and highly paid. They are important to Europe.

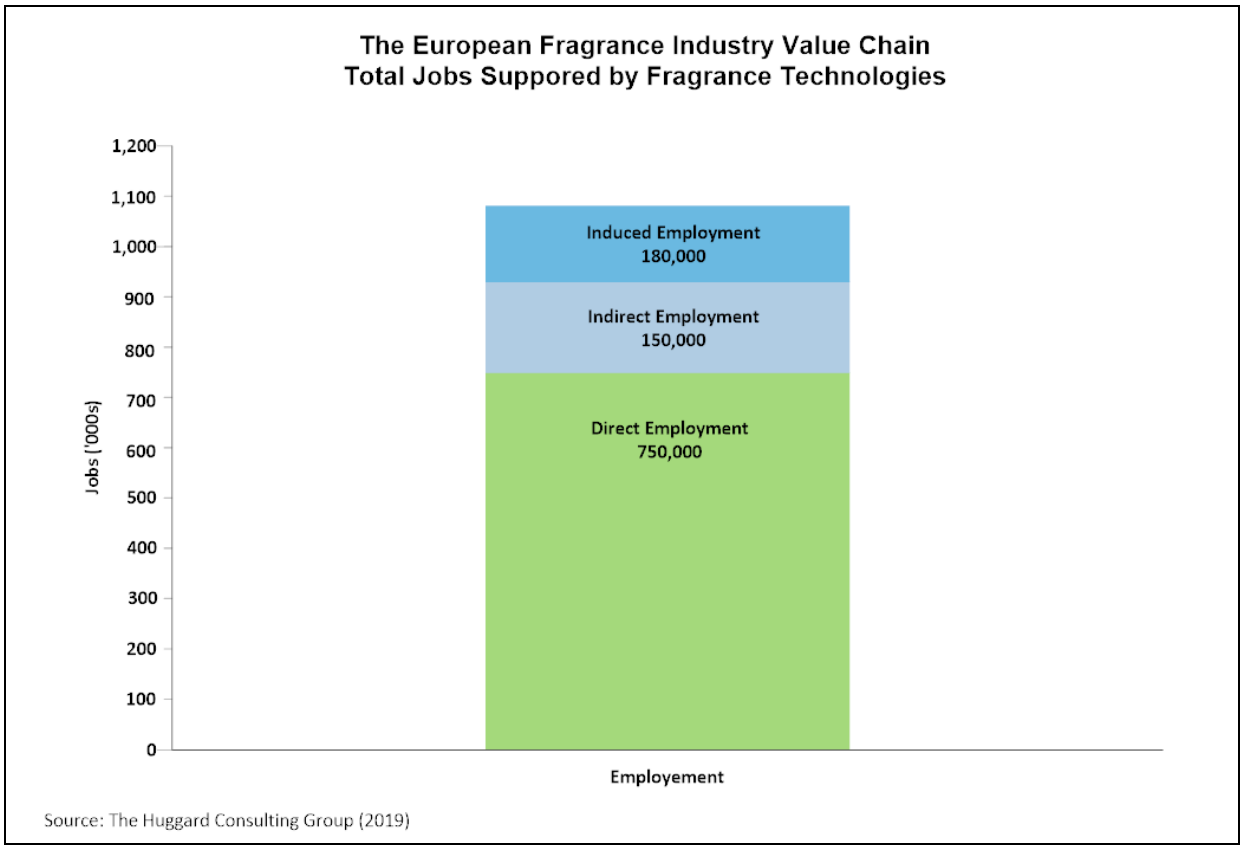

Exhibit 3: The European Fragrance Industry Value Chain: Total Jobs Supported by Fragrance Technologies

Noticeably, the scale of the distinctive contribution of fragrance technologies has grown since 2012. This reflects four factors: first, the growth in sales in the product categories where fragrances are used; second, the use of fragrances to either achieve or support functional claims; third, the increasing use by brand owners of 'soft' forms of differentiation, as functional performance differences become more difficult to achieve; and, fourth, continued investments by the Fragrance industry in innovation, including fragrance encapsulation as a delivery technology. Indeed, the Fragrance industry continues to act as a "motor of innovation" for a significant part of Europe's economy.

2.4. The Fragrance Industry in Europe

Europe has the largest concentration of Fragrance activities in the world. The Fragrance industry has made major investments in Europe in production, innovation, creativity, and strategic management. Whilst a substantial proportion of these investments support production and innovation activities needed to meet the needs of European customers, additional investments in strategic management, innovation and creativity have been made in Europe by major fragrance companies to support global activities.

For all of the world's major Fragrance companies, Europe represents one of the most important markets in the world. Its scale, complexity, and demanding nature (sophisticated customers seek high levels of creativity and innovative new products) makes it an economically attractive market, as well as exposing fragrance companies to emerging new trends, new brands, and new segments.

Europe's strategic importance to the Fragrance industry encompasses, however, additional factors. It is "the home of the fragrance industry". Most major companies originated in Europe and still seek creative inspiration from local perfumers, scientists, and customers. Indeed, Europe continues to be the world's leading centre for perfumery education and for the scientific developments surrounding successful development of new fragrance ideas and novel fragrance raw materials. These assets, rooted in tradition, creativity, education, and science, make Europe one of the world's most attractive locations for investments in fragrance innovation and creativity.

At the same time, Europe is "the home" of some of the world's leading Fine Fragrance and Beauty, Personal Care, and Household Care companies. Most of these companies, as well as their non-EU controlled competitors, have global product and innovation centres in Europe, providing opportunities for close linkages with Fragrance companies and the opportunity to form global partnerships.

In 2018, overall sales of unique fragrances blends by the Fragrance industry in Europe were estimated to be EUR 2.2 billion, supporting more than 7,000 direct jobs and direct GVA of Euro 1 billion.

2.5. "Motor of Innovation"

Development of new fragrances begins with major investments by Fragrance companies in science, consumer understanding, creativity and, safety. These investments are then used to create unique proprietary ideas to meet the defined requirements of consumer goods businesses. In turn, brand owners combine the insights and creativity of these new fragrance ideas with their understanding of product performance, the values of their brands, and their deep insights into consumer needs, wants, and behaviours, triggering waves of innovation across major consumer goods markets.

To develop large numbers of new, unique fragrance experiences, fragrance companies make very large-scale investments, equal to approximately 16-18% of annual turnover, in product innovation[6]. This encompasses all forms of expenditure, short and long-term, associated with the creation of new or improved products. Measurement of this expenditure focuses on the overall innovation activity: for this industry the scale of activity is substantially greater than traditional measures of "research and development", as defined by accounting standards such as GAAP and IFRS.

[6] This level of investment in product innovation compares favourably with many other industries. Measured on the same basis, FMCG companies spend 6-8% of turnover on innovation; human pharmaceutical companies spend 15-18%; and veterinary medicine companies spend about 8%.

Product innovation by the Fragrance industry encompasses two types of expenditure:

- **Strategic investment, in four distinct types of intangible asset – science, creativity, market understanding, and safety**:

  Science – significant resources are invested in long-term development of scientific knowledge, including the creation of new molecules; the understanding of malodour and the development of technologies to control it; the undertaking of fundamental research into smells; and the improvement of delivery systems for fragrances, enabling them to survive and function well under different and increasingly demanding use conditions;

  Creativity – major expenditures are made every year in building up the knowledge and skills needed to research and develop unique fragrances, using an understanding of different natural and synthetic ingredients, an awareness of market trends and the needs of brand owners, creative flair, and artistry;

  Market understanding – significant investments are made, on a long-term basis and during the development of fragrances for specific briefs, in understanding the values, attitudes, and behaviours of end consumers groups; and,

  Safety – companies have, over the past twenty years, made substantial investments in product safety. In part this has been a response to new data and to social concerns relating to the potential hazards posed by some of the materials used by the Fragrance industry.

- **Operational expenditures to develop new unique products for customers, exploiting and (through the process of "learning-by-doing") creating strategic assets.** This includes all product development activity, as well as most sales, customer support, and marketing expenses.

Fragrance companies use these assets, and operational resources, to generate a continuous flow of unique proprietary fragrance blends. Whilst exact figures for the scale of this activity are not available, industry participants estimate that brand owners issue more than 5,000 to 6,000 new briefs annually[7]. (New briefs include requirements to re-formulate for cost reasons or to meet new safety information, as well as requests to up-grade existing fragrances and create new ones). This is equivalent to between 8% and 10% of the number of unique blends supplied to brand owners each year.

Through this process of investment, the fragrance industry acts as a motor of innovation for the Fine Fragrance and Beauty, Personal Care, and Household Care sectors in Europe. An upstream industry with European output of around Euro 2.2 billion, investing 16-18% of turnover in innovation, sustains GVA of more than Euro 63 billion, throughout its value chain.

[7] This includes encapsulated as well as non-encapsulated fragrances.

3. Importance of Encapsulation[8]

3.1. Rationale

In response to the needs of its customers, the Fragrance industry invests in a range of dosing technologies designed to deliver an enhanced fragrance experience to end consumers. As part of this dimension of innovation activity, significant resources have been invested in the development of fragrance encapsulation over the last twenty years. Arguably, its introduction and development represents one of the most important developments made by the Fragrance industry in delivery technologies. It has become a strategic technology for the industry and for its customers.

Prior to the introduction of fragrance encapsulation, dosing technologies released fragrances quickly, leaving limited levels of fragrance oil on skin or fabric for end users. Fragrance experiences were limited in olfactive character, time and place. Encapsulation, in contrast, provides end consumers with extended fragrance experiences and brand owners with new opportunities to create added value. In most applications, it is considered to be the most sustainable and resource efficient way of dosing fragrances, as a result of its ability to control delivery at the point of use.

Specifically, fragrance encapsulation:

- Protects fragrances from the aggressiveness (such as pH, presence of surfactants) of some of the components used within products and from the severe usage conditions of the process they experience (particularly for laundry washing);

- Offers long-lasting fragrance delivery with greater control of the consumer experience;

- Creates an additional perceived functional benefit of long-lasting freshness, including eliminating residual smells from otherwise clean fabric, and increasing the longevity of the perception of bodily cleanliness;

- Articulates functional benefits of freshness to end consumers;

- Creates additional intense olfactory experiences, extending consumer satisfaction through a series of fragrance ‘moments’, and lengthening relationships with brands. For example, a consumer using a laundry detergent containing encapsulation will experience fragrance ‘moments’ when they first open the detergent container, when they pour the detergent into the washing machine, when they remove the wet laundry from the machine, when they dry the

[8] These insights have been developed with the support of group of experts from the world’s leading Fragrance companies and IFRA Europe.

clothes, when they fold the clothes, when they remove clothes from a cupboard (where they have been stored for some time), and when they wear the newly laundered clothes;

- Facilitates the delivery of extended fragrance experiences that meet emotional needs for positive moods, calmness and well-being, as well as signalling familial investments in caring within domestic settings;

- Offers opportunities to reduce raw material consumption, because of the capacity of encapsulation to deliver more efficient and longer-lasting dosing with greater control of the point of delivery;

- Provides brand owners with additional ways to create new emotional and functional benefits, to add value, and to differentiate in mature product categories

These benefits have powerful consumer appeal, and have stimulated significant investment by the Fragrance industry and downstream manufacturers in fragrance encapsulation. As a result, capsule technology has undergone a process of continuous improvement. This has led to the introduction of new capsule materials and production methods; increased efficiency in the use of polymers; enabled the development of bespoke fragrances designed for use in these new dosing mechanisms; and facilitated the employment of a wider range of fragrances and the delivery of more powerful fragrance experiences. Indeed, this process of investment in encapsulation technology, made in response to customer demands, continues day-by-day. New priorities include, for example, an even greater emphasis on sustainability.

3.2. Usage

Findings from a report drawn up by RPA for IFRA Europe in 2018 include an analysis of the types of polymers used for fragrance encapsulation systems across different product types[9]. The report concludes that Melamine-formaldehyde (Melamine-formaldehyde cross-linked polymers and Melamine-formaldehyde resin) based polymers are the most widely used across the different product categories.

These findings were confirmed by the survey of leading producers of fragrance blends known to use encapsulation carried out by IFRA in 2019. Evidence from the survey also suggests that the tonnage per annum of polymer used for fragrance encapsulation is at least 400 tonnes, and possibly materially higher. It confirms that the largest uses are in laundry detergents and fabric conditioners, and that usage has grown by 8-10% CAGR over the last five years.

[9] RPA 'Survey of Fragrance Encapsulation Systems – Undertaken Jointly with IFRA' (2018)

3.3. Market Penetration

In a number of product categories investments in encapsulation technologies have helped to reconfigure the overall value hierarchy, whilst in others the use of fragrance encapsulation is less advanced but has begun to trigger the emergence of new segments.

Initial use of fragrance encapsulation focused on laundry care product categories, specifically fabric conditioners and laundry detergents, both powder and liquid. In these categories, premium brand owners made extensive use of encapsulation to create added value and differentiation through meeting wide consumer functional and emotional needs. Use of encapsulation was significant in these categories from inception and its effective exploitation has established a new hierarchy of value propositions, thereby protecting overall category value and establishing a continuing dynamic for the development of added value. Today, in the European fabric conditioner market, all consumer segments, from lower tier to premium, make use of encapsulation as a means of cost effectively and efficiently delivering fragrance at point of use without the need for a very high free oil dosage.

Consumer spending on laundry care product categories in Europe in 2018 was over Euro 13 billion[10].

In other product categories, the use of encapsulation technologies still has huge potential for growth. In part, this is the result of the time taken to overcome technical problems associated with achieving effective deposition of capsules on skin and hair. Many of these difficulties are in the process of being overcome and, as a result, the use of fragrance encapsulation technologies in new applications is expanding rapidly. New segments, based on encapsulation, have emerged in “rinse off applications” (shampoo, hair conditioner, shower gel, and toilet soaps), skin care, antiperspirants, deodorants, and household surface cleaners. Indeed, new products, that make use of encapsulation, are being launched regularly. Most of these segments are at the moment relatively small, but all offer brand owners new ways to meet a wider range of consumer needs, to stimulate dynamism in mature categories, to differentiate, and to add value.

Overall consumer spending in Europe in product categories where fragrance encapsulation is being used in new applications to establish new segments was close to Euro 58 billion in 2018[11].

Global consumer goods brands, many of which are based in the EU or have long-standing global investments in Europe, also see major opportunities to use fragrance encapsulation to strengthen their competitive advantage against local and national brands in non-EU markets. In Latin America and Asia, for example, encapsulation is beginning to be used in hair care products to provide a long-lasting fragrance experience for customers who cannot afford fine fragrances. In the same markets, consumers associate superior product performance in laundry care with global brands, in part because of the long-lasting fragrance experience delivered by encapsulation.

[10] Source - Euromonitor
[11] Source - Euromonitor and study estimate

3.4. Market Evolution

Evidence from in-depth interviews with experts in the Fragrance industry suggests that, in the absence of mandatory restrictions, there will be continued significant investment in innovation in fragrance encapsulation. This is likely to include:

- Further exploitation in core product categories in laundry care applications in Europe;
- Expansion of emerging segments in new applications and new product categories, particularly in shampoo, hair conditioner, shower gel, toilet soaps, skin care, antiperspirants, deodorants, and household surface cleaners. This will create new sources of dynamism and added value in mature European markets;
- Expansion of new segments in emerging non-EU markets, particularly in laundry care, hair care, shower gels, toilet soaps, and household surface cleaners, strengthening the relative competitive advantage of global brands based in the EU;
- Development of improved capsule and fragrance technologies to meet emerging customer requirements for greater sustainability, including biodegradability and a greater efficiency of delivery (i.e. improved deposition and delivery of fragrance); and,
- Continued use of fragrance encapsulation as part of a palette of delivery and fragrance technologies available to meet emerging customer needs in all markets.

Fragrance encapsulation has become a core strategic technology for Fragrance companies and their downstream customers. It continues to have considerable potential for further exploitation and innovation, strengthening the Fragrance industry's capability to act as a "motor of innovation" for major consumer goods markets. And, in response to market demands, innovation in encapsulation is responding to more general trends to improved sustainability. Market forces are pushing this important delivery technology to contribute to the wider social goals of Europeans.

4. Potential Socio-Economic Impacts of a Restriction

4.1. Regulatory Context

This section sets out a series of potential socio-economic impacts of an immediate restriction on the future use of fragrance encapsulation by the Fragrance industry in Europe. It assumes, based on the findings of the report produced by RPA for IFRA Europe and ECHA, that there are no alternatives to

the existing fragrance encapsulation technologies currently available or under development that are capable of providing equivalent functionality and consumer benefit[12].

Indeed, RPA argued that all potential replacements do not provide a viable alternative to fragrance encapsulation due to one or more of the following parameters: lack of longevity of fragrance delivery (which is the primary benefit sought); lack of stability in formulated consumer products; severe limitations in the use of fragrance raw materials and hence the inability to design applicable and relevant fragrances; and consumer expectations for product performance are not met. These conclusions were supported by responses to the IFRA survey of fragrance blend producers carried out in 2019.

Looking at the fragrance value chain as a whole, as well as considering potential global spill-overs, through the operation of stigmatisation mechanisms, and possible risk-risk pathways, the following socio-economic impacts have been identified:

- Reduced innovative capability of the Fragrance industry (section 4.2.)
- Negative market impacts for brand owners in EU product categories (4.3.);
- Reduced consumer welfare (4.4.);
- Challenges to the competitiveness of EU global brands in non-EU markets (4.5.);
- Risk-risk outcomes (4.6.); and,
- Threats of economic damage to the overall fragrance value chain (4.7.)

4.2. Fragrance Industry

In the event of a restriction on the continued use of fragrance encapsulation, the Fragrance industry will face two major challenges: reformulation and a search for alternative dosing technologies capable of matching the benefits offer currently by fragrance encapsulation.

In the first instance, it will need to reformulate at least 4,500 unique capsule-fragrance combinations, without the possibility of using an alternative dosing technology offering similar functionality to encapsulation or making use of older, and far less efficient, pre-encapsulation technologies. Changes in market structures, such as the shift away from powder and towards liquid laundry detergents, and the development of bespoke fragrance combinations optimised for specific encapsulation

[12] See RPA 'Survey of Fragrance Encapsulation Systems – Undertaken Jointly with IFRA' (2018)

technologies, increase the number of unique capsule-fragrance combinations that must be reformulated and limit the possibility of seeking to return to the technological solutions used for dosing prior to the advent of encapsulation, such as far higher perfume dosages. Consumer preferences for long-lasting fragrances also limit consideration of older solutions.

Experts within the Fragrance industry believe that, during this initial phase of reformulation, the most credible technological solutions are likely to involve up-dosing, whereby the use of more expensive fragrance ingredients would be substantially boosted so as to try and protect the "top notes", the most decisive for consumer choice. Even with these solutions, the reformulated blends would not provide the long-lasting scent delivery provided by encapsulation. This would significantly erode the benefits provided to brand owners by the Fragrance industry, reducing margins and turnover whilst at the same time increasing raw material input costs and increasing the volume of discharge of perfume oil into the environment[13].

Whilst this process of reformulation is being undertaken, the Fragrance industry is likely to concurrently invest in trying to develop new alternative, long-lasting dosing technologies, in response to pressure from brand owners to restore the consumer benefits previously provided by encapsulation. This may, however, not be possible technologically within the short or medium-term. As well as investment in scientific knowledge, creativity, and market understanding, such technologies are likely to require REACH registration and new manufacturing investment, further lengthening the period of development.

Taken together, these two phases of activity represent a form of 'Defensive R&D': a diversion of innovative resources in response to regulatory requirements that seeks to maintain existing technologies or customer benefits rather to advance technological frontiers or consumer benefits.

As a result of these responses by the Fragrance industry to the new regulatory context, the industry is likely to experience a series of negative impacts on its overall capacity to act as a "motor of innovation" for the Personal Care, and Household Care sectors. Specifically:

- **Loss of production and development activities** – facilities related to the use and development of encapsulation technologies, many of which are relatively new, are likely to be closed, leading to job losses, destruction of "know-how", human capital and other intangible assets, and an erosion of business value (new assets represent investments in future earnings, and hence their scrapping results in a direct reduction in the capitalised business value).

  Responses to the survey of producers of Fragrance blends known to make use of encapsulation carried out by IFRA in 2019 confirmed these likely impacts. Evidence from the survey suggests that most production in Europe of blends that make use of encapsulation is likely to cease, and that plants outside the EU will be used to provide encapsulated products

[13] Insights gained from confidential interviews with experts within the Fragrance industry were confirmed by responses to the IFRA survey of producers of fragrance blends carried out in 2019.

to non-EU customers. De-localisation is likely to take place, it is suggested, because of the lack of alternative, equivalent product technologies in the EU and the need to maintain competitiveness, against local competitors, in non-EU markets.

- **Loss of turnover and gross margin** – restriction of the use of fragrance encapsulation, and the lack of available equivalent technologies, is likely to diminish the value of reformulated blends. This will reduce turnover and gross margin, eroding the capacity of the Fragrance industry to create retained earnings to fund innovative activity throughout the value chain;

- **Decreased operating efficiency** – an increase in dosing to retain "top notes" would lead to a significant increase in raw material costs. These costs must be passed on to powerful brand owners in downstream markets. This is likely, however, to be difficult to fully achieve. Reformulated fragrances will offer significantly fewer consumer benefits, diminishing the ability of brand owners to meet the needs of end-users, to differentiate, to add value, and to protect product category values. In this context, it is unlikely that all additional raw material costs will be "passed through", reducing further the gross margins of the Fragrance industry and its capacity to fund innovation;

- **Diminution of the palette of fragrance development technologies** – the loss of fragrance encapsulation cannot be considered in isolation from the other technologies used by the Fragrance industry to create fragrance ideas. It is a strategic technology that is deeply embedded as part of a palette of different forms of knowledge. This palette will be distorted, restricting the development of new forms of innovation;

- **Decreased environmental performance** – up-dosing would result in a significant higher use of ingredients as the most likely reformulation solution. Production of reformulated fragrance blends, based on up-dosing, would increase the need for ingredients, consume an additional amount of additional energy, and produce additional waste. In contrast, current encapsulation processes are highly energy efficient, and result in almost zero waste;

- **Major increase in Defensive R&D**[14] – the industry is likely to incur significant levels of Defensive R&D over at least a 6-8 year period as it seeks to reformulate existing blends that make use of encapsulation whilst at the same time seeking to find alternative long-lasting dosing technologies capable of restoring the current benefits provided by encapsulation.

  This two-phase process will impose major costs on the Fragrance industry. These will be met entirely by the diversion of resources currently allocated to innovation: no new resources will be made available.

[14] These estimates have been developed with the support of experts within the world's leading Fragrance companies. They reflect detailed reviews of the number of unique fragrance-capsule combinations that will need to be reformulated and all of the steps that will be needed to achieve this. Estimates of the cost of developing alternatives are based on expert insights that reflect typical development cycles for similar, complex technologies. Again, estimates take account of all steps that must be concluded before new technologies can be placed on the EU market. Evidence from the survey of producers of fragrance blends undertaken by IFRA in 2019 confirmed these estimates. Indeed, respondents suggested that the reformulation phase, leading to less efficacious replacements would take 2-3 years, and the development of functionally equivalent alternatives could take at least 6-8 years.

The cost of reformulating at least 4,500 unique capsule-fragrance combinations is estimated to be in the range Euro 135 - 225 million over a 2-3 year period. Experts within the Fragrance industry believe that the cost of reformulating will be in the range of Euro 3-5 million per 100 blends, after taking account of creativity by perfumers, R&D activity (stability, interaction with ingredients used in finished products, performance etc.), and regulatory procedures. To achieve this, moreover, will require between 300,000 and 450,000 hours of labour.

Whilst this expenditure is being incurred, it is likely that the fragrance industry will seek to develop and bring to market alternative, long-lasting dosing technologies capable of restoring existing consumer benefits. Expert estimates suggest that, in the event that these technological developments are possible, then **investments equivalent to 30% of existing expenditure on science will need to be made over a 6-8 year period. In total, this would lead to investment of between Euro 400 million and Euro 500 million**.

Taking these two stages of activity together, the level of Defensive R&D incurred by the Fragrance industry would be 35% of current innovative investment for the first three years and then 20% for the remainder of the programme horizon. In total, this would lead to investment of Euro 535 million to Euro 725 million over 6-8 years (Exhibit 4), significantly reducing in the capability of the Fragrance industry to support innovation, and hence the scale of work and GVA that <u>are supported by fragrance technologies, throughout the value chain.</u>

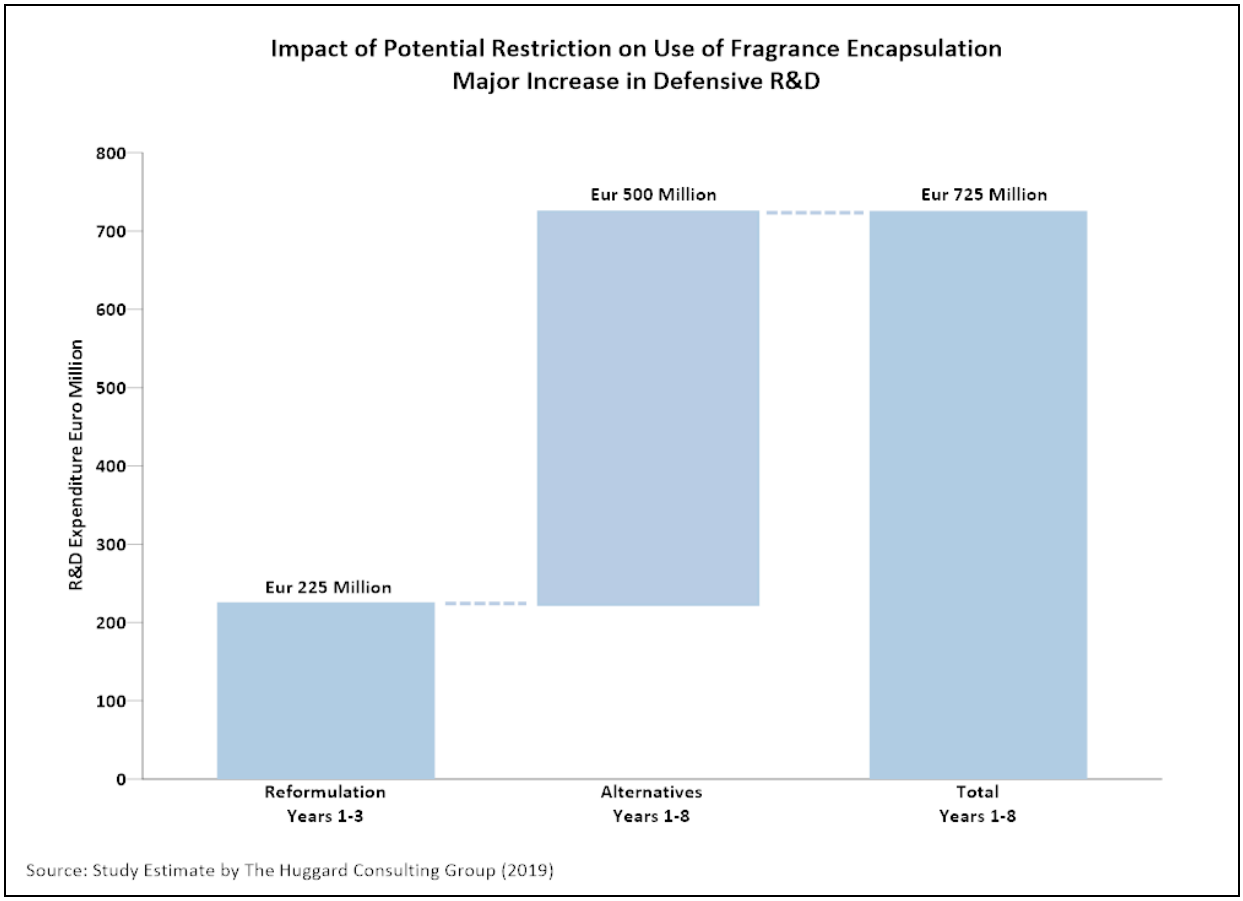

Exhibit 4: Impact of Potential Restriction on Use of Fragrance Encapsulation: Major Increase in Defensive R&D

4.3. Downstream Brand Owners in European Markets

Loss of fragrance encapsulation technologies is likely to have important negative impacts for brand owners in a range of product categories in Household Care, and Personal Care markets in Europe.

Problems are likely to be greatest and most immediate in product categories, most notably laundry care (laundry detergents and fabric conditioners), where fragrance encapsulation has had the greatest impact on differentiation, value added, and thus the overall value hierarchy. In contrast, product categories where fragrance encapsulation is rapidly developing new segments there will less immediate damage but potentially significant longer-term negative outcomes.

In laundry care product categories, restrictions on the continued use of fragrance encapsulation are likely to lead to a collapse of the current value hierarchy, triggering restructuring, and posing a risk of category commoditisation. These outcomes will be difficult to avoid:

- Category growth has averaged around 0.5% per annum in nominal terms over the last 5-8 years, and the increased use of fragrance encapsulation has played a major part in achieving this. It has helped to maintain the value of laundry care product categories. Whereas initially, fragrance technologies were used to overcome obstacles to purchase, by masking odours, and to articulate functional benefits, they are now used to deliver freshness over time, to create different moods, to signal caring, and to contribute to well-being. This process has, in turn, increased the relative extent to which added value and employment supported by laundry care is dependent on fragrance technologies.

- The loss of fragrance encapsulation will also highlight the difficulties of delivering innovation and hence differentiation and added value through other means. Most functional properties are widely available, and recent efforts by premium brands to grow value have emphasised 'soft' factors, particularly new fragrance experiences.

- A further problem is the inability of older fragrance delivery technologies to replace encapsulation. They deliver sub-optimal fragrance experiences and fail to create long-lasting delivery of smell. They no longer meet the needs of consumers.

- Market trends also make it difficult to re-use old fragrance technologies. As an example, the liquid format dominates the laundry detergent market today: a market that was historically based on powder, and the fragrance formulation is not the same.

- No credible alternative dosing technologies currently exist that are able to replace the consumer benefits provided by fragrance encapsulation.

- Finally, continuous innovation is one of the defining characteristics of fast moving consumer goods markets. Without innovation, product categories lose dynamism, leading eventually to commoditisation and the erosion of brand equity.

Brand owners in other downstream product categories will face different challenges. In product categories where the use of fragrance encapsulation is growing rapidly and creating new end-user segments, there will be a loss of new ways to differentiate, to develop new products, and to add value. A restriction will lead to the loss of these emerging segments and the value added they sustain.

Over time, there may be additional negative consequences. Loss of access to fragrance encapsulation may undermine the dynamism of a wide range of product categories including shampoo, hair conditioner, skin care, shower gel, deodorants, antiperspirants, and household surface cleaners. In contrast to the situation facing laundry care product categories, however, the potential impacts of restrictions on the continued use of fragrance encapsulation in these applications are unlikely to be as damaging.

4.4. European Consumers

A restriction on the continued use of fragrance technologies is likely to reduce consumer choice and welfare for very large numbers of Europeans. It may also trigger increases in overall household costs. This will occur, primarily, because of an evident reduction in the functional and emotional benefits provided by a significant proportion of all laundry care products: a range of consumer goods purchased and used by tens of millions of Europeans every month.

Users of laundry care products that make use of fragrance encapsulation enjoy valued emotional and functional benefits. Freshness is perceived to be long-lasting; a series of powerful sensory experiences contribute to positive moods and overall well-being; and, a sensation of caring and homeliness is created within domestic contexts. All of these benefits are explicitly valued by many end-users. They create consumer satisfaction, leading to robust value hierarchies within laundry care product categories.

The loss of fragrance encapsulation is likely to have the following negative impacts on European consumers:

- There will be a loss of consumer satisfaction and choice, particularly amongst existing users of laundry care products that employ fragrance encapsulation;

- Wash frequencies are likely to increase, because of the loss of the benefit of long-lasting freshness. Consumers will incur, as a result, higher energy and water costs. There will also be greater fabric damage and reduced garment longevity, further increasing household costs. (The potential impacts of such potential behavioural changes on the level of risk to the environment are discussed in Section 4.6.)

4.5. Global Brands in Non-EU Markets

Outside the EU, premium global brands have begun to make use of fragrance encapsulation. In an increasing range of product categories, it is providing a means for some of the world's leading consumer goods companies, many based in the EU or with significant strategic investments in Europe, to strengthen their relative competitive advantage. In laundry care, for example, it strengthens perceptions in Asian and Latin American markets that global premium brands produce more efficacious cleaning, as well as delivering long-lasting freshness, signalling caring, and enhancing well-being.

For example, in China, Western brands account for over 25% of the Laundry Care market and in Indonesia, they account for over 33%. In Brazil, the laundry care market is dominated by Western brands with over 55% market share[15].

Fragrance encapsulation is also being used increasingly in selected non-EU hair care markets to create alternative long-lasting personal fragrances for consumers who lack the financial means to invest in fine fragrances. It has become one of a range of technologies created by the Fragrance industry that facilitates the penetration by global brands of major non-EU markets, enabling them to

[15] Source: Euromonitor (2018)

meet wider consumer needs and to enjoy relative competitive advantages in the face of continuing market pressure from local and national brands.

For example, Western brands have achieved very dominant positions in the shampoo markets of China and Indonesia with 60% and 66% market shares respectively, and also account for a large proportion of the Brazilian shampoo market, with a market share of over 40%[16].

Alongside well-known brands with indigenous, European origins, other global brands have located major strategic marketing, R&D, and product development assets in Europe. All of these global brands have created powerful intangible assets based on science, creativity, branding, and marketing; structural strengths of Europe that are difficult for other areas to replicate. Europe and its citizens enjoy economic benefits, in terms of high quality jobs, exports, and capital inflows, because of the global success of these brands.

Some of these gains may be placed at risk, in the event that the use of fragrance encapsulation technologies is restricted in Europe.

Decisions by Europe to ban the use of substances or technologies communicate social concern about safety and risk. These concerns are, increasingly, amplified, and shared globally, by activists, media, investors, and downstream users. Global 'spill overs' of this type, particularly when they involve widely used consumer products, involuntary exposures, and vulnerable groups or the environment, quickly create stigmatisation. In response, some local or national governments impose bans or restrictions, copying the European approach. There are also voluntary restrictions, often imposed by major downstream users, such as large-scale retailers.

In the face of this process of stigmatisation, owners of global brands using fragrance encapsulation technologies in non-EU markets will face difficult challenges. Market usage may be restricted by national or state-level risk management laws or by major retailers imposing their own product standards. There will also be reputational risks. Brand owners may be unwilling to use in non-EU markets technologies that are banned in the EU, because of threats to a wider licence to operate and corporate reputation.

Taking these factors into account, it is likely that global brand owners will reduce the use of fragrance encapsulation in non-EU markets, if it is restricted in the EU. If this occurs, then it will weaken the relative competitiveness of global brands in a wide range of product categories (including laundry care, hair care, shower gels, toilet soaps, skin care, and household surface cleaners). It will be more difficult for global brands to sustain market position and create value in the face of strong market pressure from powerful national brands. Over time, this will have negative effects for jobs and value added in the EU.

Such problems are unlikely to be confined to the fast developing markets of Asia and Latin America. They are also likely to emerge in the USA, where state legislatures, public interest groups, and dominant retailers act rapidly to stigmatise technologies restricted in non-US markets.

[16] Source: Euromonitor (2018)

4.6. Risk-Risk Outcomes

The concept of risk-risk has become well established over the past twenty years, defining situations where attempts to reduce or eliminate risks of one kind lead to the generation of other risks[17]. The most notable example was where the decision to stop chlorine treatment of drinking water, because of concerns related to cancer, led to deaths due to cholera. It is widely accepted by regulators that risk-risk should be considered when assessing the potential impacts of proposed risk management measures, and that such decisions should, as a result, ensure that net risk is reduced[18].

A potential restriction on the continued use of fragrance encapsulation, before alternatives have been fully developed, raises the possibility of creating additional environmental risks downstream in the value chain.

Consumers have become used to controlled fragrance experiences delivering signals of freshness for clothes and bed linen that have been stored for considerable periods. Removal of these signals is likely to lead to behavioural changes. Consultation with experts suggests that there would be an increase in the number of washes, rather than simply a return to the pre-encapsulation status quo. Consumers would need to refresh the items by rewashing to achieve the level of satisfaction obtained hitherto.

Industry experts believe that, after taking account of the use of fragrance encapsulation in laundry care products, approximately 2-3% of all washes would be redone. Based on data published by the JRC of 160 to 210 washes per year for each household, this expected increase would equate to an average of 4 to 5 additional washes per household per year. Based on the number of EU households this would equate to around 1 billion additional washes per year: the environmental impacts of this change in household washing behaviour would be significant:

- **Increased consumption of water and electricity, contributing to higher carbon emissions** - data from a range of research sources and from the European Commission's impact assessment (Ares (2018) 476605 – 26/01/2018) places total current electricity consumption at 36TWh/annum and water use at 1,600 million m^3. Indeed, a 2-3% increase in wash frequency would eliminate a major proportion of the Commission's projected electricity, water and emissions savings for 2030 under its proposed revision of the Ecodesign and Energy Labelling Regulation.

- **Increased consumption of fragrance oils** – in the event that a restriction on the continued use of fragrance encapsulation leads to reformulation of products to contain a higher concentration of fragrance oils, so as to deliver some elements of performance, there is the potential for significant increase in the use of fragrance oils. This will, in turn, increase resource use, such as the land and water required for farming plants used for natural oils;

[17] This concept was initially articulated by two academics at Harvard University. See, Graham J. D. and Wiener J. B. 'Risk vs. Risk: Trade-offs in Protecting Health and the Environment' (1997)
[18] See OECD 'Recommendation of the Council on Regulatory Policy and Governance' (2012)

- **Greater release of micro-fibres to the environment** - in addition to the above impacts, there is considerable interest among NGOs and academics on the contribution of micro-fibres produced in washing to the global burden of micro-plastics. An estimate suggests that more than 700,000 fibres could be released per wash[19]. Other recent research from the University of Bonn suggests that currently available filter technology is not capable of efficiently removing these fibres without a "harmful effect on washing behaviour and/or washing results". Clearly, further adding to this problem would not be desirable.

- **More regular replacement of clothing, increasing the carbon footprint of textile production** - there is also the issue of the environmental impact of the need to replace clothes earlier due to the deleterious effect of the additional washing.

In the light of these expected behavioural changes, it is, moreover, possible that fragrance encapsulation has historically made a favourable impact on the trend in the number of washes per household. A ban on this technology would have the effect of reversing these gains[20].

Finally, given the change in consumer expectations that has taken place due to the ability of the encapsulation technology to signal freshness, there will be market pressures to attempt to duplicate this. The most likely approach would be by increased dosing of fragrance materials with, of course, the attendant environmental consequences. There could also be further behavioural changes including consumers dosing more the reformulated encapsulate-free product so as to re-create the same level of scent benefits, leading to more waste.

4.7. European Fragrance Value Chain

Understanding the extent to which fragrance encapsulation technologies support employment and Gross Value Added (GVA) in Europe throughout the fragrance value chain provides an important insight into the potential scale of economic damage that might occur in the event of restrictions on their continued use.

In 2018, it is estimated that the distinctive contribution of fragrance technologies supported GVA of more than Euro 63 billion and more than 1.1 million jobs, taking account of direct, indirect, and induced impacts. Usage of fragrance encapsulation technologies contributes directly to this. In laundry care, its extensive usage underpins the overall value hierarchy and has increased significantly the importance of fragrances as a source of value added across all relevant product categories. Elsewhere, the growing use of fragrance encapsulation in shampoo, hair conditioner, shower gel, toilet soaps, skin care, antiperspirants, deodorants, and household surface cleaners is creating new segments, providing new opportunities for value added and differentiation. Whilst these segments are

[19] European Parliament Research Services 'Environmental Impact of the Textile and Clothing Industry' (2019)

[20] There is on-going research by the JRC and the German Oko-Institut in this area examining competing trends in data on consumer washing behaviour, including number of washes per household, the size of the load, changes in household size, and the type of clothes washed, such as delicates, mixed fibres etc.

at the moment small, they have contributed to an increased importance of fragrance as a source of added value in a wide range of product categories.

Based on this pattern of usage of fragrance encapsulation and its impact on different product categories, it is possible to identify the scale of jobs and GVA that these technologies currently support. Including direct, indirect, and induced impacts, it is estimated that in 2018, fragrance encapsulation technologies supported over Euro 4.5 billion GVA in Europe. Of this, Euro 2.5 billion is Direct GVA, with Euro 1.3 billion as a result of indirect multiplier impacts from European-based suppliers of goods and services, and Euro 0.7 billion in induced multipliers due to higher levels of household spending in the economy (Exhibit 5).

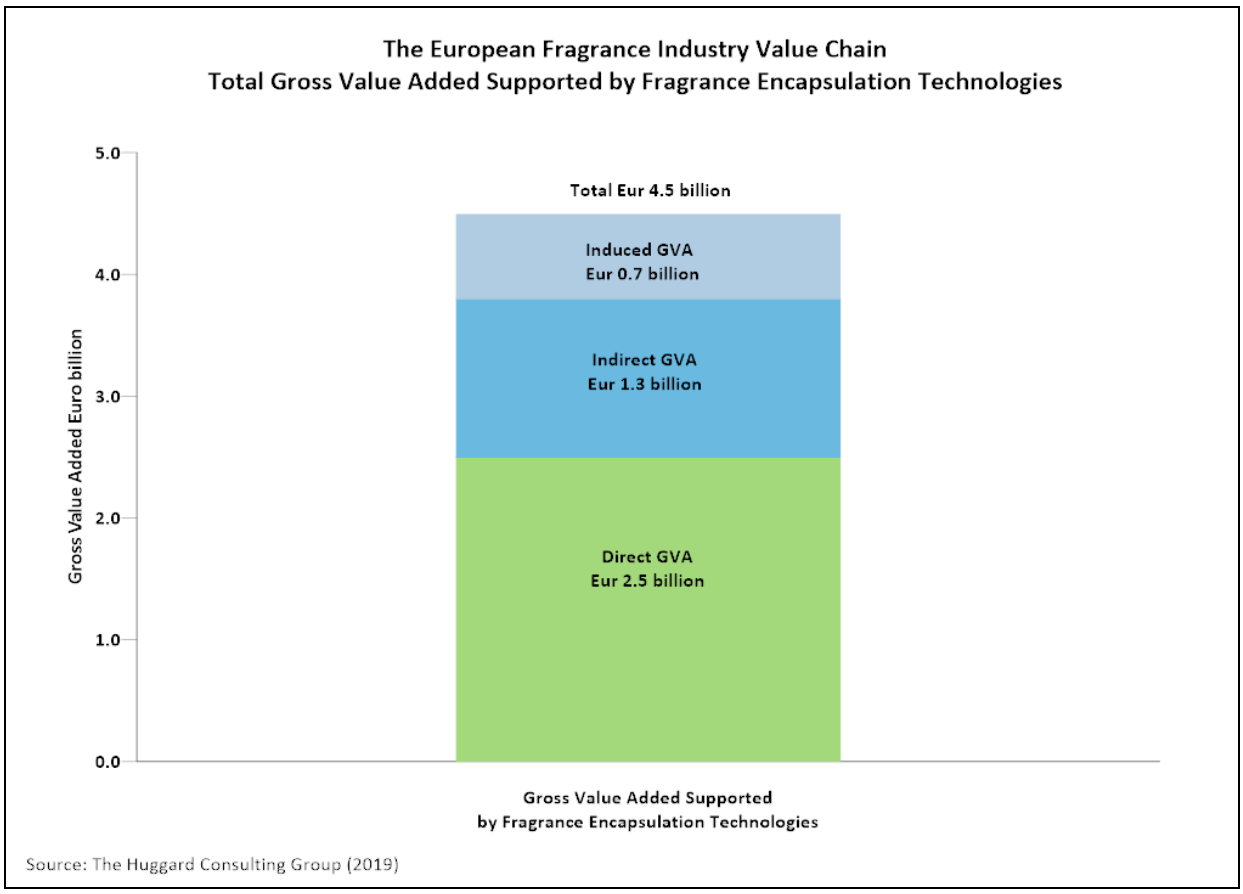

Exhibit 5: The European Fragrance Industry Value Chain: Total Gross Value Added supported by Fragrance Encapsulation Technologies

Moreover, it is estimated that in 2018, fragrance encapsulation technologies supported over more than 60,000 jobs in Europe, including direct, indirect, and induced impacts (Exhibit 6). Of the jobs that currently are supported by fragrance encapsulation more than 40,000 are within retailers and manufacturers of products that make use of fragrance technologies, whilst the remainder are the result of indirect multiplier impacts from European-based suppliers of goods and services (more than 10,000 jobs), and induced multipliers due to increased household spending because of higher levels of direct and indirect employment (nearly 10,000 jobs).

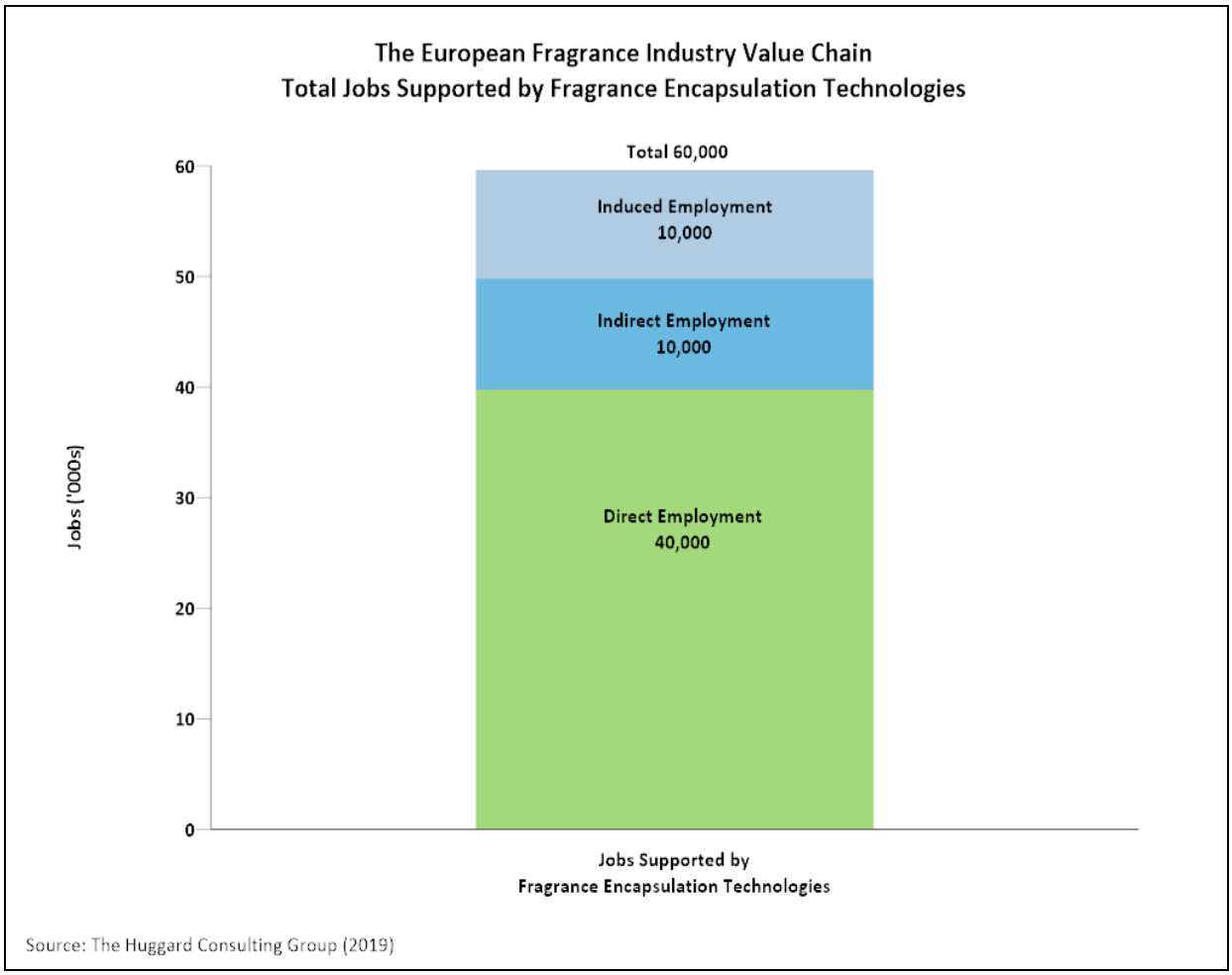

Exhibit 6: The European Fragrance Industry Value Chain: Total Employment supported by Fragrance Encapsulation Technologies

5. Conclusions

The Fragrance industry is a "motor of innovation": a specialist upstream industry that, through investments in science, creativity, consumer understanding, and safety, creates technologies that support work and wealth for Europeans, as well as improving the quality of their lives. Gross Value Added of more than Euro 63 billion and over 1.1 million jobs are supported by fragrance technologies.

Delivering these benefits depends upon major investments in innovation by a relatively small industry. Expenditures equivalent to 16-18% of turnover by an industrial sector with European turnover of only Euro 2.2 billion lie behind a significant proportion of the valued added and employment associated with over Euro 120 billion in final sales values, excluding taxes. Ensuring that this 'multiplier' can continue to be effective is a challenge for regulators when considering the potential impact of proposals that might restrict the innovative potential of this extremely important upstream sector.

Fragrance encapsulation is one of the most important delivery technologies used by the Fragrance industry. It provides unique functional and emotional benefits that have transformed the value hierarchy in laundry care product categories, and is being actively exploited to create new sources of added value in a wide range of additional categories. It is also being used by global brands, many with European heritage and assets, to penetrate fast-growing markets in Asia and Latin America. Today, more than 60,000 jobs and over Euro 4.5 billion of GVA are supported by fragrance encapsulation in Europe.

A proposed restriction on the continued use of fragrance encapsulation is likely to have important negative socio-economic impacts. It will undermine the capacity of the Fragrance industry to continue to support innovation in major parts of Europe's economy, because of the scale of Defensive R&D needed to maintain existing consumer benefits and the lack of feasible alternatives. It will hamper the ability of Europe's global brands to maintain competitive advantage and exploit new opportunities in non-EU markets. It will remove the consumer benefits that support a significant economic surplus and a large number of jobs. And, it may lead to an increase in net risk rather than a reduction.

Household washing behaviour is likely to change, if fragrance encapsulation is banned. Loss of long-lasting scent experience is likely to induce more re-washing: more micro-fibres will be released into the environment, and greater use of energy and water will have additional negative impacts.

The loss of fragrance encapsulation will reduce the scale of investment by the Fragrance industry in new and improved technologies. Resources will be diverted to maintaining or restoring existing consumer benefits rather than creating new ones. Technology-specific rules will distort development pathways, making it more difficult for the Fragrance industry to respond to market pressures for greater biodegradability. There will be "arrested development" of the potential of a technology, through progressive improvement, to make an important contribution to well-being and sustainability.

The Huggard Consulting Group

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Appendix A: The Importance of Fragrance Technologies: A Methodological Approach

1. The Valuation Approach

1.1 Valuation Factors

The valuation of the economic contribution of fragrance technologies in Europe is based on ***the distinctive benefits that fragrance technologies create for end users and the economic value of those benefits.***

Our estimates of the distinctive impact of fragrance technologies on the value of product category sales take into account a number of factors:

- Fragrance is only one source of benefit for end consumers of fine fragrances and beauty, household care products, and personal care products. Product functionality and brand image are also major sources of benefits for users. Any valuation concept must seek to identify the distinctive contribution of fragrance technologies, after recognising the potential role of these other sources of benefit for consumers.

- For consumer goods manufacturers, fragrance is only a very small proportion of the material cost of fine fragrance, household care, and personal care products. It ranges from between 2% and 10% of cost[21]. This is, however, not a good indicator of the contribution of fragrance technologies to the final value of a product category. This is determined by the "value proposition" created for end consumers and their willingness to pay for it. Cost of materials is not the same as willingness to pay for value. Fragrances are, in general, a source of value and not simply a cost of material.

- Fragrance technologies are predominantly used in fast moving consumer goods applications. These are products that consumers buy regularly throughout the year. They may buy a personal care product, for instance, ten or more times in a year. For such types of product, the overall value of sales and margins in a product category depends upon initial purchases by consumers and then, more importantly, on patterns of re-purchase. Whereas 'image' may play an important role in inducing initial sale, fragrance and functionality may be the principal determinants of re-purchase. Indeed, in some product categories, fragrance may be the primary reason for re-purchase, especially if it delivers unique emotional benefits or articulates an important functional claim. Overall, the role of fragrance in influencing the overall value of product categories is complex, and may be disproportionately important because of its impact on patterns of re-purchase.

- In a wider sense, the impact of fragrance technologies on the value of product categories differs between applications. For some applications, fragrance technologies deliver the primary benefits (such as malodour control). In other applications, fragrances increase consumer acceptance, because they mask the unpleasant smells of the ingredients used. Finally, there are applications where fragrances are combined with functional benefits to add value through either articulation of functional benefits (where this is difficult to experience directly, for instance) or by adding emotional dimensions to the functional experience or both.

- In many of the personal care and household care categories that make use of fragrance technologies, most competing products have achieved a high level of functional excellence,

[21] After taking account of other costs incurred by manufacturers of FMCG products and luxury goods as well as retail margins, fragrance ingredients represent, on average, only 1-2% of final selling price.

and customers have become used to this. There is, moreover, often little difference in functional performance between competing offers. Within this context, it is difficult for brand owners to sustain the value of product categories without innovation and differentiation. In many product categories, fragrance has become the principal mechanism for achieving these objectives. Fragrance is, therefore, becoming a more important source of benefits for customers, whilst the impact of functionality declines in relative terms.

- Brand image is an important source of benefits for end users. At its simplest it conveys messages of quality, consistency, and value. More sophisticated imagery focuses on lifestyles, social positioning, and other emotional factors. For fine fragrances, for instance, image plays an important role in triggering initial purchase. However, re-purchase is determined by fragrance: it delivers the proposition illuminated by the imagery. Fragrances interact with image. They, along with functionality, provide the experiential dimensions of the purchasing cycle either reinforcing or, if unsuccessful, undermining brand image.

- So-called “fragrance free” products have little consumer appeal. These are widely available but account for less than 5% of sales in most product categories. “Fragrance free” is, moreover, a misnomer and misleading. Such products all require fragrance technology to mask the unpleasant smell of ingredients.

1.2 Valuation Methodology

To identify the distinctive contribution of fragrance technologies to the overall economic values of Fine Fragrance and Beauty, Household Care, and Personal Care product applications, a multi-stage methodology was used in 2012:

Step One (Typology of Benefits) – in this stage, a typology of benefits created by fragrances for end consumers was established, using information obtained from interviews with fragrance industry experts and desk research. Specifically, five groups of benefits were identified:

- **Masking Benefits for Non-Beauty Applications** – products included in this category are purchased and re-purchased by end consumers primarily for functional or emotional reasons that are not associated directly with fragrance technology. Applications included are, moreover, not associated with beauty or personal care. It includes applications such as floor polishes, stain removers, and automatic dishwasher detergents. Fragrances do, however, play an important role in building the value of these product categories because they mask the unpleasant smell of the ingredients used in these articles, increasing the volume and value of products purchased.

- **Masking Benefits for ‘Beauty’ Applications** – fragrance technologies play very little direct role in stimulating initial purchase and subsequent re-purchase. Instead, fragrance technologies, through their ability to mask the foul smell of ingredients, play an indirect role, increasing consumer acceptance and raising volume and values. Applications included in this valuation category are, however, used to enhance personal appearance or are applied to the human body. (Typical applications include hair colorants, face care, make-up, and sun care.) In view of this close contact with skin or hair, it is considered that the value of the masking benefit is higher because the negative impact of unpleasant smells on consumer acceptance is likely to be greater for such applications.

- **"Articulates the Benefit"** – for applications included in this valuation category, fragrance technologies play an important role in influencing re-purchase rates because they articulate to end users some of the primary functional benefits of the product, such as freshness, softness, caring, and cleanliness. At the same time, all of the applications offer strong functional characteristics. Examples of this type of application include toilet soaps and surface cleaners. For these applications, fragrance technologies demonstrate the effectiveness of the product, reinforcing strong functional attributes. Applications in this valuation category are, therefore, purchased and re-purchased for a range of reasons and fragrance technologies complement and define the functional performance of the product. Without fragrance technologies, however, consumers would be less aware of the performance of the product, limiting consumer satisfaction and eroding value added. Fragrances also provide masking benefits, further increasing consumer satisfaction.

- **"Articulates the Benefit" and Meets Wider Emotional Needs** – in this category fragrance technologies play three important roles; first, they mask the unpleasant smell of ingredients; second, they articulate important functional benefits; and finally, they meet wider emotional needs, such as creating mood or demonstrating caring or enhancing distinctiveness and allure. All of the applications also deliver important functional benefits to consumers. Fragrance technologies act alongside these to raise value added by satisfying a wider range of customer needs, as well as reducing obstacles to use and demonstrating effectiveness. Typical applications include shampoos, shower gels, deodorants and body sprays, baby care, laundry detergents and fabric care.

- **Primary Functional or Emotional Benefit** – for a number of applications, fragrance technologies deliver the primary function or emotional benefit that determines rates of purchase and re-purchase. Indeed, these applications could not exist without fragrance technologies. For most of these applications, however, other parts of the marketing mix (such as the use of advertising, sales promotion, and packaging to create image) stimulate part of the purchase decision. The main applications that fall into this category are air care products (air fresheners, aromatherapy, and scented candles) that deliver functional benefits and fine fragrances that deliver emotional benefits.

Step Two (Categorisation of Applications) – in this next part of the valuation process, all fine fragrance and beauty, personal care and household care applications were allocated to one of the five parts of the typology of benefits. This was based on information obtained from confidential interviews with experts from the fragrance industry and its downstream users.

Step Three (Valuation of Impact of Fragrances) – for each part of the typology of benefits, the proportion of the value of the application that is primarily determined by fragrance technologies was estimated. Estimates were based on the views of experts from the fragrance industry and its downstream users obtained through an interview programme; on confidential market research data undertaken by a number of fragrance companies; and, on the assessment of the project team. Part of the process involved identifying a series of 'marker' products, for which market research and other forms of industry evidence was available, and assessing the relative contribution of fragrances to the overall value of the product application. Product applications reviewed include laundry detergents, shampoos, deodorants, household cleaners, body sprays, fabric softeners, air fresheners, scented candles and fine fragrances.

Using this methodology, the following estimates were made:

Typology of Benefits of Fragrance Technologies	% of Category Value Depending on Fragrance Technologies
"Masking Benefits" – Non Beauty Application	20%-30%
"Masking Benefits" – Beauty Application	30%-40%
"Articulates the Benefit"	40%-50%
"Articulates the Benefit" and Meets Wider Emotional Needs	60%-70%
Primary Functional or Emotional Benefit	80% plus

2. Economic Impact Methodology: 2012 Approach

To undertake this 2019 review, The Huggard Consulting Group up-dated the estimates of the quantified socio-economic contribution of fragrance technologies in Europe using the methodologies developed for IFRA in 2012. This section summarises the methodologies employed in the 2012 report.

The 2012 study provided quantitative estimates of the impact of the fragrances value chain on employment, gross value added (a measure of contribution to national output), labour income, labour taxes, and taxes on value added in Europe. Using a conservative approach, estimates were based on the direct value chain activities (fragrance innovation and production, the manufacture and sale of consumer goods that make use of fragrances, the manufacture of products that use fragrances for institutional and industrial customers, manufacture of products for export markets, store and non-store retailing of consumer goods that make use of fragrances, and the supply of services to end-consumers that depend on fragrance-based products), along with relevant indirect and induced multipliers.

A multi-stage approach was used:

- In the first stage, the main end use applications that make use of fragrances were identified using a process of expert in-depth interviews with managers in the Fragrance industry. These applications are found predominantly in three consumer sectors: Fine Fragrances and Beauty, Personal Care, and Household Care. Similar types of products are also produced for business-to-business markets in the Professional Cleaning and Hygiene sector.

- The next stage focused on drawing up expert estimates of the final 'output' values for each of the principal product categories that make use of fragrance technologies. For consumer markets, values were based on retail selling prices (excluding VAT and similar taxes). In business-to-business markets, manufacturers selling prices were used. Published market research studies (including studies by Euromonitor International, Kline and Freedonia), European Commission data (including Eurostat 'Structural Business Statistics' database), data from Cosmetics Europe, AISE, and the European Candles Association (the EU-level trade associations for the personal care, home care, and candle manufacturing industries respectively) and expert interviews informed the development of the estimates.

- After identifying the scale of the final output value for products that use fragrances, the next stage focused on estimating manufacturing output values for the same group of products. This was achieved using Eurostat data, UN COMTRADE Import-Export data, published market research studies, and the company accounts of 12-15 major manufacturers.

- The next stage of research focused on developing estimates of direct economic impacts in the retail part of the fragrances value chain. Using published market research, estimates were made of the scale of sales of products that make use of fragrances through each major type of store and non-store retail format in Europe. Sales of services that are linked to products that make use of fragrances were also identified, using data from national accounts, Coiffure EU (the EU-level trade association for hair salons), and Seldia (the EU-level trade association for direct selling businesses). This analysis provided an estimate of the scale of the relevant sales value for each major retail format. The direct economic impacts of these sales were then estimated by drawing up an analysis of the cost structures for each retail format. Analyses identified retail gross margin, bought-in goods and services (not for resale), in-house labour costs, and operating surplus (prior to taxes and payments to providers of capital). Cost and margin structures were based on EU-level data from Eurostat combined with data from Verdict, Mintel, Euromonitor, Coiffure EU, Seldia, Cosmetics Europe, AISE, national statistical offices, and from an analysis of the accounts of 20-25 major European retailers.

- A similar analysis was undertaken of the manufacturing stage of the fragrance value chain. This used Eurostat data (such as sector specific data for appropriate NACE codes), company annual accounts information, and a proprietary data base of cost structures, to develop estimates of bought-in-goods and services, in-house labour, and operating surpluses for the principal manufacturing sectors. Estimates of direct economic impacts were based on a "whole company approach", ensuring that in-house sales, marketing, administration, R&D, distribution, and other head office activities were included within the scope of the manufacturing stage of the fragrances value chain.

- For the initial part of the fragrance value chain, expert interviews with 15-20 senior managers, published studies by Freedonia, and analyses of company accounts were used to develop estimates of the output and cost structure of the fragrance industry. These estimates allowed direct economic impacts to be identified.

- The next stage of research involved the identification and quantification of the indirect impacts of the sale and manufacture of products that use fragrances. For each stage of the fragrance value chain, an analysis was drawn up of the principal categories of bought-in goods and services. The value of these purchases, adjusted for estimated levels of import penetration, was then used to estimate indirect economic impacts. Relevant industry-level data from Eurostat informed these analyses. (This is a conservative approach, focusing only on suppliers most immediately affected by purchases of goods or services by participants in the fragrances value chain.)

- After estimating direct and indirect economic impacts, the likely scale of associated taxes on labour income and on value added was identified using data from the OECD Tax Database.

- The final part of the analysis involved making estimates of "induced impacts", reflecting the impact on household spending of direct and indirect employment linked to the fragrance value chain. This has been done on an indicative and conservative basis. It takes into account experience from other studies undertaken by the project team, expert academic advice, and evidence from other, similar studies.