Bakery and Bake-off

Market Study

This report is an initiative of the FP7 'Low Energy Ovens' project (n°613581)
Executive Summary

The bakery industry is a large supplier of jobs and revenues for the European economy. Although not growing at a comparable rate as in developing countries, it presents a positive outlook due to its ongoing evolution from a very fragmented artisanal business-based sector, to a more industrialised one. This evolution, due to diverse socio-economic factors, drives the bakery companies to improve their productivity while still increasing their versatility, which will create opportunities for innovation of different kinds.

Particularly concerned companies are bakery equipment providers, especially bakery oven manufacturers, which will have to create innovative solutions to support the bakery companies to gain operational efficiency and flexibility. Still, the situation varies from one European country to another. Consumer habits, economic environment, or baseline bakery industry structure and dynamics are at different stages in different countries.

This report describes the current state of the European bakery and bakery oven industries and markets, as well as the trends for the next years.

The FP7 LEO project is a EC funded collaborative project entitled “Enabling small-to-medium sized oven technology producers and bakeries to exploit innovative Low Energy Ovens” that aims to develop innovative infrared baking ovens and prepare their commercialisation.

The key results to be exploited in the LEO project consist in an infrared oven technology developed for two types of batch oven and one conveyor oven. Compared to a standard baking oven, the pre-heating step with the prototype oven required between 20-40% less specific energy with a gain in time up to 70%. The invention has been patented by ONIRIS in 2009 (WO 2011/006955-A2).

More information on the LEO project and the development of the infrared technology can be found on the project website: leo-fp7.eu
Table of Contents

Executive Summary ................................................................. 2
1. Introduction ............................................................................. 4
2. Business Context ...................................................................... 6
   2.1. Political Environment ...................................................... 7
   2.2. Economic Environment ................................................... 8
   2.3. Social Environment ........................................................ 9
   2.4. Technological Environment ............................................. 10
3. Bakery Products Consumers .................................................... 12
   3.1. Convenience ..................................................................... 12
   3.2. Health ............................................................................ 13
   3.3. Taste and Authenticity .................................................... 14
   3.4. Value for Money ............................................................ 14
4. Bakery Production and Retail Industries .................................... 15
   4.1. Structure of the industry ................................................... 15
   4.2. Size and status ............................................................... 19
   4.3. Main Industry Players ...................................................... 27
   4.4. Industry trends and outlook ............................................. 30
5. Bakery Products Market .......................................................... 32
   5.1. Size and Status ............................................................... 32
   5.2. Segmentation ................................................................. 33
   5.3. Trends ............................................................................ 37
6. Bakery Oven Industry ............................................................... 39
   6.1. Structure of the Industry ................................................... 39
   6.2. Size and status ............................................................... 43
   6.3. Main Industry Players ...................................................... 43
7. Bakery Oven Market ................................................................. 44
   7.1. Size and Status ............................................................... 44
   7.2. Segmentation and trends .................................................. 46
8. Baking Technology Market ....................................................... 49
   8.1. Common bakery oven heating technologies ..................... 49
   8.2. New bakery oven heating technologies ............................ 50
9. Potential Customers for Low-Energy Bakery Ovens .................... 51
   9.1. Market Research Methodology ........................................ 51
   9.2. Target Customers Profile ............................................... 52
   9.3. Drivers of Purchase ....................................................... 53
10. Conclusion .............................................................................. 57
1. Introduction

This report was written in the frame of the European Commission funded FP7 project “LEO”. The main objective of the LEO project is to enable a commercial opportunity for an infrared-based low-energy technology for bakery ovens, developed by ONIRIS, a French public research organisation, in the frame of the previous FP7 EU-FRESHBAKE project (2006-2009).

![Figure 1: Low-energy infrared baking technology](image)

One activity in the LEO project consisted in conducting a market research of the bakery and bakery oven industries and markets, in order to support the business planning of the technology exploitation. However, this market research was also carried out with a public audience dissemination perspective. Thus, we hope to provide to any person with an interest in the bakery area a document that summarizes the key facts and trends of the industry and market.

The fact that the research was initially conducted to support a bakery oven technology introduction to market has influenced the structure of the report. Indeed, the market research’s purpose was to identify the customers that the new baking technology should target. However, it was assumed that an understanding of the whole value chain was necessary, since the needs of the bakery products’ consumers influence what the bakery producers or retailers need from their ovens.

For this reason, the concept of the present market research report is to divide the analysis into several markets studied in a bottom-up approach (bakery products market, bakery ovens market and baking technologies market), with analyses of the related industries (bakery production and retail, and bakery oven industry), this after an overall business context analysis.
The report is structured according to this approach:

- The **overall business context** is described in Part 2.
- Part 3 looks into the **bakery products consumers' trends**, which have an influence on the needs for bakery ovens.
- Part 4 analyses the **bakery production and retailing industries**, since they contain the customers for bakery ovens.
- Part 5 investigates the **bakery products market**, putting together the bakery producers, retailers and consumers.
- Part 6 describes the **bakery ovens industry** in regards to its factors influencing the infrared baking technology adoption.
- Part 7 deals with the **bakery oven market**, in which the bakers and some bakery products retailers are the customers.
- Part 8 reviews the current state of the **baking technology market**.
- Part 9 draws on all the previous parts’ information as well as a field work study, to describe the profile of **key customers** the infrared baking technology.
- The conclusion of the report summarises the **key findings** of the market research.

The organisation of the report is captured in the Figure 2 below.

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**Figure 2: Value chain of baking technology and organisation of the market research report**
2. Business Context

The aim of this section is to describe the overall political and socio-economical environmental factors that may or will influence and/or interact with the commercialisation of new low-energy baking technology.

The approach used is the widely known PEST analysis framework, which consists in reviewing the Political, Economic, Social and Technological factors that have the potential to influence a business.

“Arnaldo Cavallari”, a former pilot from the Alfa Romeo team, joined the miller and baker family business in 1982.

At the same period he decided to fine tune the old ciabatta recipe and to go into competition with the famous French Baguettes.
2.1. Political Environment

In Europe, the political environment is in favour of supporting energy saving technologies. This is motivated by environmental, geostrategic (energy independency), and economic (cost savings, competitiveness, and value creation) considerations.

The European Parliament has voted a directive\(^1\) to establish a European framework for the setting of eco-design requirements for energy-related products. This directive focuses on the design phase of low-energy technologies. Thus, energy-saving technology development is one of the objectives of the European Framework Programme "Horizon 2020" (Societal Challenge 3: "Secure, clean and efficient energy").

The directive emphasis is also on the improvement of information to consumers, especially SMEs, about the most energy-efficient technologies. It also states that standards should be set to constrain users to adopt energy saving technologies. A recent illustration is the phase out of incandescent light bulbs in the whole European Union.

Reduction of food wastage is another topic gaining political interest. A report, from the Food and Agriculture Organization of the United Nations - FAO\(^2\), has demonstrated that a third of the food produced in the world is wasted. The European Economic and Social Committee has submitted a motion\(^3\) to the European Parliament, the European Commission, and the EU Member States, to vote a resolution on avoiding food wastage. Although no restrictive regulation exists yet, this can happen in the near future.

The FP7 LEO project is a good illustrative example. The infrared baking technology is in line with the political commitment towards more energy-efficient technologies. In the future, similar technologies could also benefit from a consumer information campaign about low energy ovens, and maybe from a standard that would accelerate their adoption.

The political trends on energy savings will influence the practices of the industry and the consumers leading to a better management of baking batch size and the reduction of food wastage. The fast growth of the bake-off market is also going in this direction reducing food waste of the bakery industry.

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1 Last version: directive 2009/125/EC
3 Prevention and Reduction of Food Waste. References: CESE 1917/2012 – NAT/570
Overall, the political environment is very favourable to low energy baking technologies. However, there are some uncertain factors to watch in the future. The first is how the different EU Member States will manage their energy supply, especially the countries in a transition phase and/or largely dependent on external energy supply. It is very difficult to predict the evolution of the energy supply strategy in Europe. Different scenarios could have different impacts. The resulting cost of electricity in comparison to the one of gas will impact the demand for electrical heat emitters in bakery technologies.

2.2. Economic Environment

The economic crisis is expected to have long-lasting effects on the European GDP\(^4\). The crisis has severely affected emerging economies, through credit rationing, which has caused a decrease in the EU exports. In the EU, although some countries were more impacted by the crisis than others, the uncertainty led to a decrease in consumption in the whole Union, and an increase in private savings. To counteract the decrease in demand, the European Central Bank decreased the interest rates, to allow a better access to finance. The European Union is entering now a phase of recovery, albeit sluggish, but which already stimulates a return of demand. The current relatively easy access to finance for SMEs in most of the main bakery markets, is a positive sign for new baking technology, since it could support customers to purchase innovative bakery ovens.

The demand for low energy bakery ovens could also benefit from another effect of the crisis: the increase in productivity from industrial bakeries. This was due to the increase of demand from the consumers of low-value products, which needed an increase in production volumes\(^5\). By enabling lower energy expenses, low energy bakery ovens would appeal to customers seeking production cost reduction.

The crisis has also impacted the cost of commodities. Two are important for electrical-based baking technology. The first is the cost of gas which decreased after the crisis and could encourage bakers to substitute electric ovens to gas ovens, but it increased from 2010 to reach in 2013 a similar price as the pre-crisis one\(^6\). There is uncertainty about how the price of gas will evolve in the future in comparison to the price of electricity. Energy saving of electrical-based bakery ovens should be such that it becomes competitive with gas ovens.

The second main commodity for bakers is the raw materials. The volatility of the price has a deep impact on the industry cost structure. Until the crisis, the increase in raw material price was passed

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\(^6\) Eurostat. nrg_pc_203 database.
to the consumers. Since the crisis, the consumers demand for low cost products has increased, and the bakeries have less possibility to pass the raw material cost increase to the consumers\(^7\). There is an uncertainty on 1) the future evolution of raw material prices and 2) whether the consumers demand for low cost products will sustain in case of significant economic recovery.

Taking into account all these economic factors, in addition to an energy saving solution, the new low energy baking technologies should also be marketed as a productivity solution (especially to reduce waste in bake-off supply), since bakeries will look for more control over raw material expenses.

### 2.3. Social Environment

In Europe, the awareness of the citizens about environmental issues increases. The European Commission has developed a special barometer on European citizens attitude towards the environment (2011):

- A large majority of European citizens (83%) considers the efficient use of natural resources as a key to economic growth;
- 64% believe that changes should be made at the EU level;
- 81% support environmentally-focused legislation as a way to help solve the problem;
- 89% think that more funding should be allocated to support protecting the environment;
- 72% of the European citizens are willing to pay more for products which are specifically environmentally friendly; and
- 48% of people feel that environmentally-friendly products could be better labelled.

Hence, in addition to the political support mentioned in 2.1, low energy baking technologies could also benefit from a favourable public opinion.

This will however face the challenge that many citizens have a negative perception of food process innovation. A high proportion of consumers mistrust the conventional food chain. The processing systems used in the food chain are often portrayed as out-of-touch with public concerns, and driven by narrow disciplinary and commercial logics\(^8\). The more the consumers are unable to assess themselves the costs and benefits of a technology, the more the technology is prone to be perceived as uncertain and risky\(^9\). This effect is greater if the communication around the advantages and

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\(^7\) Data extracted from the Eurostat prc_fsc_anr database show that the consumer price of food commodities varies less after the crisis than before, for a comparable variation in agricultural commodities and producer price variation.


disadvantages of the technology is not consistent. The degree of uncertainty determines whether or not a technological innovation is categorised as a cost of a risk⁶.

This trend should be taken seriously with the infrared baking technology, especially if it is confused with food irradiation, which is highly rejected by consumers, despite no scientific evidence this technology is not safe⁶. This confusion is more likely to occur with consumers than bakers, since it is demonstrated that the higher the knowledge of a specific topic, the lower the risk perception⁷. However, bakers could also be reluctant to use innovative baking technology if consumers reject it, even if the bakers know it is a non-risky technology.

The consequence of these social factors is that innovative low energy baking technologies will need an efficient supporting communication to both benefit from the positive attitude toward environmentally-friendly technologies and reassure consumers about its safety.

2.4. Technological Environment

The technological environment for low energy baking technologies can be investigated at two scales: limited to bakery oven technologies, or at the much broader scale of energy-efficient technologies.

In the case of bakery oven technologies, innovation is limited, due to the fragmented nature of the industry. Section 8 reviews more in details the existing alternative technologies. However, it can already be said in this section that new low energy baking technologies have the potential to be well adopted by customers if they prove their high energy saving, reliability and other added-value.

This is not to say that the innovative baking technology will never have threatening alternatives. First, any existing technology relying on a source of energy that could become cheaper at usage. This is the case with gas heating bakery ovens. Although they are more expensive upfront, a low cost of gas could make it cheaper in the long-run than new baking technology, which is based on electricity. This is nonetheless hard to predict, since there is a high volatility in the price of gas. The aspect to monitor is the technological progress aiming at making gas heating bakery oven cheaper upfront.

Second, although the baking process will always be necessary for bakers, the technological threats are more related to new approaches to value delivery in the baking industry. There is currently not such a threat, but one trend has to be monitored: 'Home Baking'. Currently, home baking using home bread makers or bread dough to bake at home is very small and not threatening, but if it grows at the extent that a high portion of the consumed bakery products is home-made, this could become a threat.
The technological environment of new baking equipment should not only be seen as a set of competing technologies. There are also complementary technologies that can open opportunities. First, a given innovative system can be combined with other technologies to make baking even more efficient, e.g. heat recycling systems, insulating materials, or electronic thermostats to control the oven temperature in real time. Second, an energy efficient oven can integrate a set of technologies that improves the baker’s activity. For example, a system can be put in place to transform heat into electricity, and high-performance batteries to store it. The electricity used by the oven can also come from renewable energy production, hence make the baking process more sustainable. This type of technology combination will become more frequent with the advancement in sustainable energy technologies and their better affordability.

Case of the LEO infrared technology:
Regarding infrared baking in the broader scope of energy efficient technologies, despite its innovative aspect in the bakery industry, infrared as a general technology regardless the application is nothing but new. Infrared has been used in many applications, such as imaging, tracking, spectroscopy, astronomy, communication (remote control) and of course heating (radiators, industrial manufacturing, cooking etc.).

As a result, we can consider that the infrared baking innovation potential stands more in its new application area than in its intrinsic technology. With the exception of home baking, in which this technology may also be applied, the infrared baking technology will have a limited possibility to be transferred to other fields of application. However applying the infrared baking to the bakery industry is still a relevant and substantial opportunity.
3. Bakery Products Consumers

This section reviews the key trends regarding consumption of bakery products, which influence the bakery oven customers’ needs, and therefore indirectly influence new baking technology business cases.

These trends are numerous and not mutually exclusive, and by their combination, they result in many segments of consumers, and therefore a significant fragmentation of the demand. However, the purpose of the present section is not to quantify the bakery product consumers, especially because they also vary between European countries, but to provide a typology of the main factors influencing consumers’ behaviours.

The key current trends in bread consumption are convenience, healthy, tasty, authenticity and value for money.

*Murphy's Law dictates that buttered bread will always land buttered-side down.*
3.1. Convenience

The demand for convenience food, i.e. food that has been commercially pre-prepared and so requires minimum further preparation by the consumer, is growing. The definition of convenience food may suggest that most bakery products have always been convenience food, since they are baked in shops or plants and ready to be eaten as soon as they are bought by the consumers. In this case, convenience food refers to ready-meals that use bakery products, such as sandwiches. This means for the bakery industry a need to produce a growing number of small portion products.

Several factors explain this growing demand. First, there is a generation effect on the demand of convenience food: the younger the consumer, the higher the probability of consuming convenient food. This could be explained by the fact that, current older generations, when they grew up, did not have as much access to convenient food as they do now, and are more used to conventional cooking.

Then, the change in lifestyle, due to a growing proportion of people living in cities, tends to limit bread buying occasions to the weekends, favouring packaged/industrial bread which tends to stay fresh longer.

3.2. Health

Consumers' health awareness continues to grow. Bread is one of the oldest prepared foods, and has long been a prime source of carbohydrates in the human diet. However, it faces a movement of criticism from some people, for its too high carbohydrate content, for its cholesterol rising effect, for its high salt content, which contributes to high blood pressure, for the presence of phytic acid, which blocks some minerals absorbance, and for the gluten intolerance.

These concerns have influenced the formulation of adapted recipes. For example, wholegrain bread is promoted to have less energy, more fibres, more proteins, more minerals, more vitamins, and more antioxidants than refined flour based bread.

Gluten-free bread recipes are also more and more frequent. Salt reduction in bread is also taking place in most European countries, pushed by more restrictive regulations. Indeed, cereal products are the first source of salt in the diet.

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As a consequence, health concerns in consumers drive the creation of more new types of product, which in terms of baking operations require more and smaller batches production.

### 3.3. Taste and Authenticity

Growing demand for convenience and healthy products does not compromise the one for good taste and often related authenticity. Actually, some consumers even alternate moments in which they consume indulgent products with moments when they eat more healthy products. In the Innova TNS study\(^{12}\), the moments for indulgence are defined as weekend over weekdays, and spontaneous snacking over routine meals. In the Puratos survey\(^ {13}\), more than 90% of the consumers think taste is the most important purchase driver for bread.

The bakery products are associated with tradition in most of the European countries, due to their importance in the culinary culture. Traditional bakery products are thought to be the tastier. This is why tradition and authenticity are a very strong position in the bakery industry, and this is an important trend in the choice of the baking technology by bakers.

### 3.4. Value for Money

During the economic crisis, consumers preferred to restrain their consumption of high value products, while keeping on buying basic food stuff, such as bread, but at low-cost. It is expected that low-cost bakery product consumption sustains even in economic recovery\(^ {14}\). This influences the need for bakers to produce at a lower cost, which can be achieved by economy of scale.

However, economy of scale is compromised by the previous trends mentioned which require a greater production of diverse small batches of products. This is a reason why energy saving in the baking process can be a significant solution for bakers.

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\(^{12}\) Innova TNS  
\(^{13}\) Puratos (2010) European Bakery Trends. ASB Conference, 14th April, Melbourne (Australia)  
\(^{14}\) Food and Agriculture Organization (2010) The Impact of the Economic and Financial Crises on Agriculture and Food Security in Europe and Central Asia: a Compendium
4. Bakery Production and Retail Industries

This section is an industry analysis of the bakery products manufacturers and retailers, who are the end-users of bakery ovens.

We will analyse the production and distribution channels for bakery products and study their evolution and future trends. In this section the bakery products' market will be closely quantify and qualify.

Legend has it that whoever eats the last piece of bread has to kiss the cook.
4.1. **Structure of the industry**

Production and retail of bakery products are presented together in this report because traditionally, both are carried out by the same actors, i.e. the artisan/craft bakers. However, although artisanal baking is still a major form of production and retail, industrial production and modern retailing (supermarkets), which involve different actors for production and retailing, have become very important.

We define artisanal baking as the production from scratch at the point of sales using flour or pre-mixes. The products are directly sold to the consumers within a short time after production (fresh products). Artisanal baking is mostly found at bakers’ shops, which account for 34% of the total volume of production in the EU\(^{15}\). However, artisanal baking is also found at in-store baking units in some supermarkets, or at some restaurants, but these other forms or production only account for 5% of European volumes.

![Pie chart showing volume shares of bakery production methods in the EU in 2006 (Source: Gira Food)](chart.png)

**Figure 3:** Volume shares of bakery production methods in the EU in 2006 (Source: Gira Food)

With industrial production, products are manufactured in plants, then shipped to retailers. Industrial production is now the main form of production in Europe, with 61% of the EU volume.

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\(^{15}\) Gira Food, European BVP and BVP Companies Panorama 2006-2011
Industrial production encompasses several technologies, which imply slightly different supply and value chains:

- The pre-packed long-life products are branded products, which can be kept at ambient temperature for a long-time because of the modified atmosphere packaging used, and are sold at the self-service counter of supermarkets or small grocery stores.

- The pre-packed part-baked products are also directly sold to consumers at the self-service counter, but require a final baking done by the consumer at home. Those products can be sold at ambient temperature, chilled or frozen.

- The bake-off products are pre-baked products, which final baking is done in-store before selling to consumers. Bake-off retailers include supermarkets, bakery chains, gas stations or restaurants. This category of retailers requires bakery ovens.

- The fresh finished products are fresh bakery products delivered directly after production to the retailers for a rapid sale to consumers.

The following figure summarizes the different variants of production and distribution value chains of the bakery industry.

![Value Chain Diagram](image)

Figure 4: Main producers and retailers in the bakery value chain in Europe
Geography has a significant impact on the prevalence of artisanal or industrial bakery production. Thus, in some countries like Estonia, Ireland or Sweden, industrial baking dominates, whereas in other countries like Italy, Poland, France or Greece, artisanal bakers produce more than half of the bakery goods.

Figure 5: Volume share of artisanal or industrial supply in the EU bakery industry in 2006 (Source: Gira Food)
4.2. Size and status

The bakery industry in Europe is very big: with 98.4 billion Euros annual revenue, it is the fifth sub-sector of the European food industry, and the first sub-sector in terms of value added (20%). With 154,803 companies in the sector in Europe in 2012, the bakery industry is also the first sub-sector of the food industry in terms of number of companies (53.7% of all the food companies) as well as in terms of jobs (1.36 million jobs, 32% of all food industry jobs in Europe).

However, the bakery industry is also very fragmented: 99.7% of the companies in the industry are SMEs, with an average of revenue of 635,000 Euros revenue and less than 9 employees per company.
Still, the bakery industry in Europe is not homogenous.

First, as seen on Figure 6, the bakery companies are not distributed evenly across the European countries, with almost half of them being in only 2 countries - France and Italy - and 85% in 9 countries (France, Italy, Germany, Spain, Greece, Portugal, Poland, Romania, and Belgium).

Figure 6: Number of bakery enterprises in the EU + Switzerland in 2012
To make these data comparable,

Figure 7 represents them as a ratio of the number of bakery enterprises per 10 000 people. It still illustrates an uneven distribution within Europe.

![Figure 7: Number of bakery enterprises per 10 000 people in the EU + Switzerland in 2012](image)
The variation is also high in terms of economic performance.

Figure 8 shows turnover and expenses of the bakery industry per European country.

Figure 8: Turnover and expenses of the bakery industry per European country in 2012
A meaningful comparison of the countries can be done using the profit margin calculated as such:

\[
\frac{\text{turnover} - \text{expenses}}{\text{expenses}}
\]

This profit margin measures for each country the amount of profit accruing to the bakery industry from their sales. It is also a measure of business efficiency since it captures the amount of surplus generated per unit of the product sold.

Figure 9 shows that the profit margin varies greatly between European countries. This figure intentionally ranks the countries according to their turnover represented in Figure 8, to show that the profit margin is not correlated with the turnover.
Among possible explanations, one can notice the operating costs difference between countries, especially in how the distribution of expenses is organised (Figure 10).

Figure 10: Main operating costs in the bakery industry per country in the EU (Eurostat data averaged between 2008 and 2001) – Note that not all data are available for all countries.
This is worth mentioning that, although that in all countries, personnel costs are the most important expenses, they are not impacting negatively the profit margin. Indeed, as seen on Figure 11, profit margins are higher in the countries with the highest salary costs. This is due to a difference in productivity, since the labour productivity, defined by the average value added per employee is strongly correlated to the average personnel cost ($r=0.96$).

![Figure 11: Profit margin in function of average personnel cost per employee (each dot represent one European country)](image)
If productivity is a possible factor explaining profit margin, selling price is also an important variable.

Figure 12 shows that a change has occurred in the bakery industry since the 2008 economic crisis. Prior to it, bakery retailers could increase the consumer price in case of an increase of production costs due to raw materials price increase. Since the crisis, because the consumers have become more price sensitive (see section 0), the flexibility in bakery products prices have reduced and bakery products retailers can no longer pass to the consumer price the increase in production cost. The profit margin is therefore affected, so only the most productive companies can support this economic pressure.

Figure 12: Evolution of bread and cereal products price in the European Union from 2005 to 2014


4.3. Main Industry Players

As mentioned in section 4.2, the European bakery industry is very fragmented and geographically diverse. Most bakery enterprises are SMEs. As a consequence, there are no large company producing bakery products with a broad international presence and high market share.

Still, some industrial bakery products manufacturers have large production units and operate on a national or international market. They usually sell branded products or supply other brands, especially supermarket private labels. Table 1 lists the main industrial bakery products manufacturers. These companies require large output production equipment, contrary to the artisanal bakers, who need smaller production equipment.

Table 1: Key bakery products manufacturers in Europe (Source: Gira Food)

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Country</th>
<th>Main Location</th>
<th>Subsidiary</th>
<th>Brand</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allied Bakeries</td>
<td>UK</td>
<td>UK</td>
<td>IHE</td>
<td>TK</td>
<td>Ölz Meisterbäcker</td>
</tr>
<tr>
<td>Ankerbrot</td>
<td>AT</td>
<td>Germany</td>
<td>BG</td>
<td>PL</td>
<td>Oskroba</td>
</tr>
<tr>
<td>Bake Five</td>
<td>NL</td>
<td>Netherlands</td>
<td>ES</td>
<td>IT</td>
<td>Pägen</td>
</tr>
<tr>
<td>Bakkersland</td>
<td>NL</td>
<td>The Netherlands</td>
<td>DE</td>
<td>IE</td>
<td>Pan Star</td>
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<td>Italy</td>
<td>DE</td>
<td>FR</td>
<td>Panavi Vandemoortele</td>
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<td>Italy</td>
<td>EL</td>
<td>IE</td>
<td>Panrico</td>
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<td>Spain</td>
<td>DE</td>
<td>DE</td>
<td>Panrico</td>
</tr>
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<td>Spain</td>
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<td>Penam</td>
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<td>Spain</td>
<td>FR</td>
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<td>Penam</td>
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<td>Bridor</td>
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<td>Spain</td>
<td>IT</td>
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<td>Simid-1000</td>
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<td>BE</td>
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<td>DK</td>
<td>Two Sisters</td>
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<td>Coppenrath &amp; Wiese</td>
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<td>UK</td>
<td>DE</td>
<td>United Bakeries</td>
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<td>UK</td>
<td>UK</td>
<td>ES</td>
<td>BE</td>
<td>Uno Bakery Corporation</td>
</tr>
<tr>
<td>CSM Benelux</td>
<td>BE</td>
<td>Belgium</td>
<td>SE</td>
<td>FR</td>
<td>Vaasan</td>
</tr>
<tr>
<td>CSM Iberia</td>
<td>ES</td>
<td>Spain</td>
<td>LV</td>
<td>PL</td>
<td>Vamix</td>
</tr>
<tr>
<td>Cuisine de France</td>
<td>IE</td>
<td>Austria</td>
<td>DE</td>
<td>GB</td>
<td>Vandemoortele</td>
</tr>
<tr>
<td>Dan Cake</td>
<td>PT</td>
<td>Portugal</td>
<td>FR</td>
<td>CZ</td>
<td>Vel Pitar</td>
</tr>
<tr>
<td>Dan Cake</td>
<td>PL</td>
<td>Denmark</td>
<td>AT</td>
<td>DE</td>
<td>Wewalka</td>
</tr>
<tr>
<td>Delifrance</td>
<td>UK</td>
<td>The Netherlands</td>
<td>PL</td>
<td>FR</td>
<td>Zito</td>
</tr>
</tbody>
</table>
With retailing, the situation is different. With the exception of the artisanal bakers’ shops, most retailers are chains with multiple points of sales across a large territory, including several countries for some supermarket chains. Table 2 lists some of the main supermarket chains in Europe. This list of 35 companies account for 131,622 points of sales in which bakery products are sold in one form or another (pre-packed, fresh or bake-off).

Table 2: Key supermarket chains in Europe

<table>
<thead>
<tr>
<th>European Rank</th>
<th>Company name</th>
<th>Home Country</th>
<th>Global Rank</th>
<th>2013 European Retail Sales (m€)</th>
<th>2013 European Retail Stores</th>
<th>Percentage Retail Sales Outside Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Schwarz Gruppe (Lidl, Kaufland)</td>
<td>Germany</td>
<td>6</td>
<td>69,320</td>
<td>11,757</td>
<td>0%</td>
</tr>
<tr>
<td>2</td>
<td>Tesco PLC</td>
<td>United Kingdom</td>
<td>4</td>
<td>63,810</td>
<td>4,987</td>
<td>20%</td>
</tr>
<tr>
<td>3</td>
<td>Carrefour</td>
<td>France</td>
<td>2</td>
<td>61,047</td>
<td>8,097</td>
<td>30%</td>
</tr>
<tr>
<td>4</td>
<td>Metro Group</td>
<td>Germany</td>
<td>8</td>
<td>60,012</td>
<td>2,069</td>
<td>6%</td>
</tr>
<tr>
<td>5</td>
<td>Auchan</td>
<td>France</td>
<td>14</td>
<td>46,960</td>
<td>3,123</td>
<td>7%</td>
</tr>
<tr>
<td>6</td>
<td>Rewe</td>
<td>Germany</td>
<td>16</td>
<td>45,866</td>
<td>13,914</td>
<td>0%</td>
</tr>
<tr>
<td>7</td>
<td>Edeka</td>
<td>Germany</td>
<td>17</td>
<td>43,914</td>
<td>15,354</td>
<td>0%</td>
</tr>
<tr>
<td>8</td>
<td>Leclerc</td>
<td>France</td>
<td>22</td>
<td>36,250</td>
<td>717</td>
<td>0%</td>
</tr>
<tr>
<td>9</td>
<td>Intermarché</td>
<td>France</td>
<td>27</td>
<td>32,479</td>
<td>3,911</td>
<td>0%</td>
</tr>
<tr>
<td>10</td>
<td>Sainsburys</td>
<td>United Kingdom</td>
<td>30</td>
<td>28,498</td>
<td>3,137</td>
<td>0%</td>
</tr>
<tr>
<td>11</td>
<td>Walmart</td>
<td>USA</td>
<td>1</td>
<td>25,765</td>
<td>573</td>
<td>93%</td>
</tr>
<tr>
<td>12</td>
<td>Aldi Süd</td>
<td>Germany</td>
<td>23</td>
<td>23,296</td>
<td>3,275</td>
<td>32%</td>
</tr>
<tr>
<td>13</td>
<td>Morrisons</td>
<td>United Kingdom</td>
<td>37</td>
<td>21,851</td>
<td>589</td>
<td>0%</td>
</tr>
<tr>
<td>14</td>
<td>Casino</td>
<td>France</td>
<td>13</td>
<td>20,592</td>
<td>8,408</td>
<td>60%</td>
</tr>
<tr>
<td>15</td>
<td>Aldi Nord</td>
<td>Germany</td>
<td>31</td>
<td>18,937</td>
<td>5,048</td>
<td>25%</td>
</tr>
<tr>
<td>16</td>
<td>Mercadona S.A.</td>
<td>Spain</td>
<td>43</td>
<td>18,678</td>
<td>1,456</td>
<td>0%</td>
</tr>
<tr>
<td>17</td>
<td>Coop Schweiz</td>
<td>Switzerland</td>
<td>45</td>
<td>18,264</td>
<td>2,162</td>
<td>0%</td>
</tr>
<tr>
<td>18</td>
<td>Migros-Genossenschafts Bund</td>
<td>Switzerland</td>
<td>47</td>
<td>18,010</td>
<td>2,298</td>
<td>0%</td>
</tr>
<tr>
<td>19</td>
<td>Système U</td>
<td>France</td>
<td>48</td>
<td>17,528</td>
<td>1,598</td>
<td>0%</td>
</tr>
<tr>
<td>20</td>
<td>ICA Group</td>
<td>Sweden</td>
<td>56</td>
<td>15,228</td>
<td>2,020</td>
<td>0%</td>
</tr>
</tbody>
</table>

Retail chains do not necessarily work with a centralized operation system, most adopt franchise, subsidiary or cooperative business models.

Source: Kantar Retail, Top 50 retailers ranking 2013. The ranking was adapted to keep only food retailers.
Regarding the petroleum retail market, in which many stations have a food retail service with bakery products, 49% of Europe’s service stations belong to the major and international oil companies listed in Table 3. 23% belong to national state oil companies, 8% to supermarkets and 20% to other categories of owners (such as independent owners or garages).

Table 3: Key petroleum retail networks in Europe in 2013 (Source: CRBE Global Research and Consulting)

<table>
<thead>
<tr>
<th>Company</th>
<th>Number of service stations in Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shell</td>
<td>10,000</td>
</tr>
<tr>
<td>Total</td>
<td>6,500</td>
</tr>
<tr>
<td>Esso</td>
<td>6,300</td>
</tr>
<tr>
<td>Eni</td>
<td>5,950</td>
</tr>
<tr>
<td>BP</td>
<td>5,900</td>
</tr>
<tr>
<td>Repsol</td>
<td>4,100</td>
</tr>
<tr>
<td>Q8</td>
<td>3,900</td>
</tr>
<tr>
<td>Lukoil</td>
<td>3,800</td>
</tr>
</tbody>
</table>
4.4. Industry trends and outlook

The economic crisis had a restructuring effect on the bakery industry.

First, after a significant decline in the number of companies between 2008 and 2009 (-7%), this number increased again in 2010 and since then, it has stabilised at almost 155000 companies (Figure 13).

![Figure 13: Number of enterprises in the bakery production sector from 2008 to 2010 (Source: Eurostat)](image)

In the meantime, although the number of companies reduced, the number of jobs slightly increased: there were 13.5 million jobs in the bakery industry in 2008, it grew to 13.6 in 2011. As a result, the average number of employees per company increased, still, the industry remains mainly constituted with SME’s (99.7% of the companies).

While the industry consolidated, the productivity increased, since although the turnover of the whole industry decreased after the crisis (93 billion Euros in 2008 to 90 billion Euros in 2009), it went back to its pre-crisis level in 2010 (93 billion Euros), and even overtook it in 2011 (95 billion Euros). In 2012, the bakery industry generated a total turnover of 98.4 billion Euros (Figure 14).
By accounting for the inflation over our period of interest, we can see that the average revenue per company has greatly increased: +17% from 2008 and 2012, in 2012 present values (Figure 15).

The conclusion of this trend analysis is that overall, the outlook for the bakery industry in Europe is positive, and that the trend is at an increase in productivity. The reality has to be contrasted per country of course, as we will investigate more in the next section with a study of the European bakery products market.
5. Bakery Products Market

The purpose of this section is to analyse the market in which bakery products are exchanged between consumers and retailers/producers, and understand how this market influences the one for bakery ovens.

In ancient Egypt, bread was a form of currency used interchangeably with money.

In fact, bread was so important to ancient Egyptians that loaves were often placed in tombs for the deceased to take to the afterlife.
5.1. Size and Status

We saw in section 4.2 that the bakery industry was not homogeneous across Europe, with variations in number of enterprises, cost structures and operating results between the countries. This goes with a similar trend of disparity between the European countries in terms of markets, not only regarding the size, but also the dynamics. Thus, the first market in value, France (19 billion Euros in 2011), is the second in volume (5.2 million tons), whereas Germany ranks first in volume (8 million tons) but second in value (16.2 billion euros) More interestingly, the leading markets in volume and value are not the first in consumption per capita, which are Czech Republic (133 kg/person/year), then Romania (133), and Cyprus (119). These numbers show that national bakery markets in Europe show different realities, we will investigate more into details through various segmentations.

Figure 16: Bakery products national markets volumes in Europe in 2011 (Source: Eurostat)

5.2. Segmentation

5.2.1. Segmentation by Product Type

The bakery market offers different types of products. The product segmentation usually uses the following categories:

- Bread
- Pastries
- Viennoiserie (croissants and alike)
- Savoury pastries

In volume, Bread is by far the first category (79% - 31.7 million tons in 2011), followed by Pastry (10% - 4 million tons), Viennoiserie (8% - 3.21 million tons), and Savoury pastry (3% - 1.2 million tons).
However, the dominance of bread in volume varies in extend between countries, from 52% in Cyprus, to 91% in Latvia.

Figure 17: Volume shares of bakery products types in Europe in 2011 (Source: Gira Food)

Figure 18: Share of bread consumption in total bakery products consumption in Europe in 2011 (Source: Gira Food)
5.2.2. Segmentation by Supply Method

We saw in section 4.1 that bakery products can be supplied through artisanal or industrial supply chains, which themselves have different routes from the production to the consumer. As showed in Figure 19, all the forms of industrial supply (in blue in the figure) grouped together dominate in Europe (67%). However, as a single category, artisan bakers are the first type of supply (30%).

As was showed in Figure 5 in section 4.1, the distribution of supply between industrial and artisanal chains varies a lot between European countries, from an almost entirely industrial supply in some countries such as Estonia or Ireland to more than half of artisanal supply in France, Greece or Poland.

5.2.3. Segmentation by Production Technology

Bakery products can be sold fresh, pre-packed baked (long-life products), or pre-packed part-baked: 68% of the bakery products are sold fresh (74% for bread volumes, 67% for viennoiserie, 62% for patisserie); 25% of the products are pre-packed long-life (25% for bread, 31% for viennoiserie, and 26% for pastry); and 4% are pre-packed part-baked (2% for bread, 2% for viennoiserie, and 9% for patisserie).
The percentage of fresh products ranges from 8% in Estonia to 91% in Portugal.

![Figure 20: Bakery products consumption volumes in Europe in 2011 broken down by production technology (Source: Gira Food)](image)

5.2.4. Segmentation by Channel of Distribution

In 2011, the first channel of distribution for bakery products was modern retailing (supermarkets), with 42% of the market volume. Artisanal bakeries were ranked second, with 22%, just followed by catering (20%). Bakery chains represent 8%, such as the other retailing channels, which include gas stations.

The ratios are similar when we look at fresh bakery products only, except for artisan bakeries taking shares on modern retailers.
5.3. Trends

The consumer trends described in section 3 favour segments of the industry that are better at productivity and versatility. Hence, the bakery industry has already started a shift of distribution channel, from traditional artisanal bakers to modern retailing. Between 2011 and 2016, modern retailers, which are already the first distribution channel for bakery products will have the biggest growth in terms of volume (1.3%). By contrast the second distribution channel, the artisanal bakeries, will decline by 2.3% within the same period (Figure 23).

Figure 22: Breakdown of bakery products distribution in Europe in 2011 (Source: Gira Food)

Figure 23: Annual volume growth per distribution channel in the bakery industry in Europe from 2011 to 2016 (Source: Gira Food)
This trend is accompanied with the shift in supply method from artisanal to industrial. The artisanal bakery supply will decrease by 2% between 2011 and 2016, whereas the bake-off supply will increase by 4%. The other industrial supply methods will also increase: pre-packed long-life will increase by 1% and pre-packed home baking by 2% (Figure 24).

Figure 24: Annual volume growth per supply method in the bakery industry in Europe from 2011 to 2016
(Source: Gira Food)

One factor that could explain this restructuration of the bakery industry is the fact that the consumer demand for low-cost products pushed bakers to change their strategy to offset commodities price increase. Before the economic crisis, the price increase was simply passed to the consumers. Since the beginning of the crisis, the price to consumers has remained stable, despite a new significant increase of the commodities price in 2010 and 2011. The bakers have simply undertook new raw material procurement strategies, such as long term supply contract, raw material price hedging, or joint purchasing, and this has favoured larger actors, hence the observed industry consolidation.
6. Bakery Oven Industry

The bakery oven industry is a business to business industry targeting bakers and bakery products retailers. The present section is an overview of this industry, with the aim of providing information to support the development of a strategy to foster the adoption of innovative baking technology by the industry.

The word sandwich that we use today was born in London during one night in 1762 when an English nobleman, John Montagu (1718-1792), the Fourth Earl of Sandwich, was too busy gambling to stop for a meal.

The legend goes that he ordered a waiter to bring him roast-beef between two slices of bread. The Earl was able to continue his gambling while eating his snack.
6.1. Structure of the Industry

6.1.1. Threat of New Entrants

Industry Cost Structure Influence on New Entrants
To start manufacturing bakery ovens, a significant initial capital is required, which can constitute a barrier to entry to newcomers in the industry. Moreover, there is a limited but efficient economy of scale making the biggest players' margin exceed significantly the smaller ones (for example, Bongard with a 70 million Euros turnover\(^{18}\) have a 32% margin, while Caplain with 4.3 million Euros turnover operate at 15% margin).

The bakery oven industry is very fragmented. The absence of a major player in the industry prevents from the possibility of predatory pricing. However, during the crisis, the main players decreased their prices by up to 20%, making it difficult for the small players to align, as their margin is much lower.

Industry Technological Requirements Impacts on New Entrants
There is definitely know-how and learning curve advantages for incumbent firms; however, the technicality of manufacturing ovens is not high compared to other technologies. There is no need for an intensive upfront research and development to enter the market, and therefore no significant sunk cost. Moreover, the intellectual property in the industry is relatively low. Some incumbent companies do focus on innovative patented technologies, but none of the patents prevent a new entrant to design a bakery oven. In this industry, innovation is done by the biggest market players to differentiate, not to block new entrants.

Industry Supply and Distribution Structure Influence on New Entrants
There is no company in the industry with a control of resources. The raw materials and parts used for manufacturing ovens are common and easy to procure. So as human resources. This results in the absence of vertical integration in the industry, and a very low incentive to do it.

The delivery to customers implies high shipment costs, which explains why many firms market locally, and why in the end there are so many players in Europe. In addition, each firm secures its distribution channel by specific agreements with local distributors.

Industry Marketing Practices Impact on New Entrants
Advertising expenses are not very high and do not give marketing power to incumbent firms. However, incumbent firms developed a customer loyalty advantage over new entrants, which is necessary because buying a bakery oven is a complex and high involvement purchase for the customer. Consequently, customers give a high credit to the firm's reputation and history, and

\(^{18}\) Note: this turnover does not come from only oven sales.
above all their experience with it. This compensates for the absence of a technical switching barrier. The customer loyalty advantage of incumbents is reinforced by distributor agreements that makes it difficult for new entrants to reach the key retailers.

*Industry Regulation Impact on New Entrants*

The industry is not constrained by restrictive governmental regulations. Although the products do need to comply with basic quality and safety standards, there are no legal requirements such as licenses or permits that would enhance the cost to enter the industry. And within the European Union, trade does not face any tariffs, which allows the entry to virtually all European markets.

6.1.2. **Threat of Substitute Products or Services**

Bakers cannot operate without a bakery oven, and have no substitute to it. The only substitute service a retailer can use for baking from scratch in its premises is selling bread baked elsewhere, which from a bakery oven manufacturer's point of view, just transfers the usage of its product from one customer to another. The only potential substitute could be if consumers bake most bread at home, either using bread machines, or baking in their kitchen oven long-life fresh bread.

6.1.3. **Bargaining Power of Customers**

As there are many brands customers can choose from, and the product differentiation is limited, customers have a high bargaining power through their possibility to switch from one brand to another. In response to this threat, bakery oven manufacturers' strategy is to develop customers' loyalty beyond product quality, e.g. by supplying more added-value services, such as training, maintenance, consultancy on how to improve productivity, etc.

During the crisis, because a high number of bakery oven manufacturers accepted to significantly discount their prices, customers have engaged in more negotiation and could become more price sensitive in the long run. In addition, as most of the sales are done through intermediaries, the bakery oven manufacturers can also face a bargaining power from them.

6.1.4. **Bargaining Power of Suppliers**

Some parts, such as steel panels used for the outer structure of the oven are very easy parts to supply. In contrary, some more elaborated parts such as electronic control systems or certain types of heating solutions can have a more limited number of suppliers. In any case, there is never a single supplier for any of the materials or parts required.
6.1.5. **Intensity of Competitive Rivalry**

The industry is very fragmented in Europe, especially in the main bakery markets, but most of the companies market their products locally. The biggest companies export, but their local sales remain prevailing. This is due to the national leadership of all the key players, which on the one hand, protect them from foreign new entrants, but on the other hand limit their geographical growth in the rest of Europe.

6.1.6. **Porter’s Five Forces Analysis Summary**

- **COMPETITION**
  - High
  - Fragmented industry, with many local leaders. Hard to penetrate new markets in Europe

- **THREAT OF NEW ENTRANTS**
  - Moderate
  - Low technology leadership, no resource control, no constraining regulation, market channels saturation, high customer loyalty, significant capital cost

- **BARGAINING POWER OF CUSTOMERS**
  - Very high
  - Fragmented industry, buyers have choice between many similar offers

- **BARGAINING POWER OF SUPPLIERS**
  - Low
  - Not so much rare resources

- **THREAT OF SUBSTITUTES**
  - Very low
  - No serious substitute
This analysis shows that the key strategic priorities in the bakery oven industry are linked to its fragmented nature: if a bakery oven manufacturer wants to grow in the European market, it needs to differentiate from its competition in one form or another of innovation (product, business model, production, etc.). Innovation is actually a key opportunity in this industry, because it is hardly used, except by few companies. However, it is made difficult in terms of resources, reason why the few innovative bakery oven companies are only the ones of the top tier of the industry (see section 6.3).

6.2. Size and status

In Europe, the number of bakery oven manufacturers is high, since it is a fragmented industry with no leader with substantial market shares. Data on this industry are scarce, but a search on business directories (Kompass and Europages) hits 58 companies. They are concentrated in the main bakery markets (22 companies in Italy, 11 in France, 6 in Germany, etc.) and most operate on a local or regional market.

The industry is worth 529 million Euros in sales\(^\text{19}\).

6.3. Main Industry Players

The following table includes some of the key bakery oven manufacturers.

<table>
<thead>
<tr>
<th>Name</th>
<th>Country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bongard</td>
<td>France</td>
</tr>
<tr>
<td>Mondial Forni</td>
<td>Italy</td>
</tr>
<tr>
<td>Polin</td>
<td>Italy</td>
</tr>
<tr>
<td>Miwe</td>
<td>Germany</td>
</tr>
<tr>
<td>Ramalhos</td>
<td>Portugal</td>
</tr>
<tr>
<td>Revent</td>
<td>Sweden</td>
</tr>
<tr>
<td>Tagliavini</td>
<td>Italy</td>
</tr>
</tbody>
</table>

\(^{19}\) Eurostat data, extracted on 10/03/2014
7. Bakery Oven Market

The present section is an overview of the market in which bakery ovens are sold between manufacturers and their customers (the bakers and bakery products retailers).

Breaking bread is a universal sign of peace. Bread is closely tied to religious expression and communion.
7.1. Size and Status

In 2011, 160,600 bakery ovens were sold in Europe, which represents 529 million Euros of sales\textsuperscript{20}. Thus, in average, a bakery oven is sold at around 3,300 Euros, although the price varies a lot depending on the type and size of oven.

The increase in productivity in the bakery industry led to a rise of electric oven sales, compared to other types of ovens. In 2008, electric ovens accounted for 14\% of the bakery equipment sales, close to the non-electric oven sales (15.8\%); in 2012, it grew to 28.4\%, while non-electric ovens sales decreased to 13\%. Hence, the electric bakery oven market doubled in five years.

![Figure 25: Market shares of electrical and non-electrical bakery ovens in total bakery machinery market in Europe from 2008 to 2012 (Source: Eurostat)]

\textsuperscript{20} Eurostat data, extracted on 10/03/2014
7.2. Segmentation and trends

The main segmentation criterion is the geography. Most bakery oven manufacturers operate mainly in their country. Only a few - the biggest players - have international sales networks as well. Consequently, national markets in Europe vary in size and dynamics.

Figure 26: Electric bakery ovens sales in the five first European markets from 2008 to 2011 (Source: Eurostat)
Figure 26 teaches several facts about the five first electric bakery ovens markets in Europe:

- Germany has consolidated its position of first market in Europe for electric-bakery ovens through a very high increase in volume between 2008 and 2011.
- Italy and France had a similar dynamic in this period: after an increase in volume, their markets contracted, but at the same time the sales values increased (at a higher growth rate in Italy). It means that either these two countries transit to a higher-end offer in the market, or that they simply increased their prices.
- The Spanish market has decreased both in volume and value.
- The fifth market, Portugal, is stable.
- We already saw in section 7.1 that while the electric bakery oven market grew since 2008, the one for non-electric bakery ovens decreased. We can see in more details in Figure 27 that this is due to the fall of the French market, and to one extend also to the one of the Spanish market, which however managed to compensate the fall in unit number by a higher unit selling price.
- The other key markets remained relatively stable.
- As for electric ovens, Germany is also the first market for non-electric bakery ovens.

From these facts observed between 2008 and 2011, and by putting them into the perspective drawn from the previous sections, i.e. the bakery market oriented toward productivity and versatility of production, we can anticipate that the future of the bakery oven market will favor solutions relevant to these facts, and that electric ovens will gain shares.

They are indeed the must-go-to solution to the fast-growing bakery segments such as the bake-off market. However, this assumption should be critically assessed on the basis of each national market, which, as we have seen, differ greatly from one another.
Figure 27: Non-electric bakery ovens sales in the 6 first European markets from 2008 to 2011 (Source: Eurostat)\(^2\)

\(^2\) Italy was not considered in this chart because of an overly represented number of units, probably due to the fact that the Eurostat category “Non-electric ovens” include ovens for pizza, which have high sales figures in Italy.
8. Baking Technology Market

This section focuses on the heating technologies used in bakery ovens and reviews the most common ones as well as the new technologies\textsuperscript{22}.

\begin{quote}
Napoleon gave a common bread its name when he demanded a loaf of dark rye bread for his horse during the Prussian campaign. "Pain pour Nicole," he ordered, which meant "Bread for Nicole," his horse. To Germanic ears, the request sounded like "pumpernickel," which is the term we use today for this traditional loaf.
\end{quote}

\textsuperscript{22} This section is a summary of the Food Service Technology Center report 5011.03.26
8.1. Common bakery oven heating technologies

An oven is a fully enclosed insulated chamber used to heat food. This requires a mean to create heat and transfer it to the food to cook it.

Bakery ovens use three fundamental heat transfer methods (alone or in combination):

- **Convection**: transfer of heat to the food through the air in the oven cavity, which can be forced using fans to reduce baking time and improve baking quality.
- **Conduction**: transfer of heat to the food by contact with a heated material.
- **Radiation**: transfer of heat through waves of energy.

The source of heat can be gas burners, wood burners, electric resistances, tubes filled with heated fluid or gas acting as heat exchangers, and less used in Europe, fuel burners. These can be direct (placed in the oven cavity) or indirect (placed out of the oven cavity, which requires a system to transfer the heated air into the cavity). In addition, bakery ovens have also a system to inject steam into the oven cavity, which is useful for the baking process.

8.2. New bakery oven heating technologies

- Infrared emitters used as heating parts in bakery ovens are not new but are currently evolving by being more energy efficient. Infrared burners are also being introduced to replace atmospheric burners in gas ovens, which this requires a combination with fans to force convection.
- Quartz halogen lamps use a combination of infrared energy and visible light to precisely control the penetration of heat into the food. The benefit is a much more rapid cooking, but the technology requires as much or more energy than conventional ovens.
- Innovations also use combination of heating technologies to improve baking performance and versatility. For example, quartz halogen lamps and microwaves.
- Not heating technologies per se but contributing to the heating process, some technologies are introduced in bakery ovens to better manage the baking process. Examples include versatile control systems with control functionalities coupled with temperature sensors, or communication outputs to record temperature information which can be useful in HACCP.
- Recirculation of heated air also exist to recycle the already heated air and save energy by not heating new air.
- In conveyor ovens, new features include independently controlled cooking zones within which the temperature can be adjusted differently, or “air curtains” at each end of the conveyor to reduce idle energy off the oven. Air impingement is also used, which consists in direct jets of air onto the food.
9. Potential Customers for Low-Energy Bakery Ovens

This final section will take into account all the information presented between sections 2 to 8, and combine them with the results of a research conducted with bakery oven users, to establish the profile of the low-energy bakery oven customers.

A recent survey shows that 81% of people skip the first slice of bread, just because it’s ugly.
9.1. Market Research Methodology

A quantitative research study was conducted in 2014 with 15 European bakery oven users (artisan or industrial) who were asked to fill in a questionnaire focusing on demographics, bakery oven usage and purchase. The majority of the questions were closed-questions with a predefined set of possible answers, but every time it was given the possibility to the respondents to answer open-format questions to express what they could not do with closed-format questions.

It is important to warn the reader that this study, although using a quantitative questionnaire to target specific research objective needs, was considered as a qualitative approach because of the lack of a sufficiently representative panel of respondents, due to the difficulty of reaching them.

Therefore, the demographic questions were not used to define quotas based on demographic data, since it was too difficult to reach enough respondent to fill each segment cell. They were not used either to provide contingency variables to test segmentation hypotheses, because the number of responses obtained was too low to perform statistical clustering.

Instead, the demographic data were used to describe the profiles of the respondents who took part in the study.

9.2. Target Customers Profile

Out of a total of 15 respondents, 7 considered both pre-heating time should be as short as possible, and energy-consumption as low as possible. Two additional respondents considered ovens should consume as little as possible and there is an optimum pre-heating time. These 9 respondents were considered as the target for the low-energy ovens, and therefore the main analyses were conducted on their data. This sample being too small to allow representative statistics, the present analysis should be considered as qualitative, and will only highlight consensual characteristics among the individuals in the sample.

Six out of 9 respondents were craft bakers and 3 worked in industrial bakeries. Compared to the unscreened sample of 15 individuals, the ratio is not different (9 craft bakers out of 15 respondents, about 2 thirds in both cases). Thus, there is no reason to believe that craft bakers would show more interest in the value delivered by low-energy ovens than industrial bakers.

The most used design is deck oven (6 respondents), but 5 of the deck oven users also use rack ovens. In total, 6 respondents use several types of ovens. Knowing that most respondents are from small businesses, this suggests that they tend to combine different types of ovens to allow production flexibility, rather than production capacity. In the total sample, 8 respondents out of 15 use several types of oven designs. The ratio (53%) is lower than in the screened sample (67%). Within the
limitation of the study, we will assume that the targeted customers use more different types of ovens than “average” customers.

On the contrary, the targeted customers tend not to diversify the source of energy they use for their ovens: only two respondents combine several types of energy. However, the trend is not specific to the targeted segment: electricity and gas are used by the same rate of users (5 for each in the targeted segment, 7 and 6 in the total sample).

Regarding the heating system they use, there is no clear consensus: 5 stick to 1 system, 4 use several systems, and 5 different systems are used among the 9 respondents.

In conclusion, the only demographic differentiator of the customers interested in the low-energy value is the fact they tend to combine different types of oven designs more than the average oven users. Otherwise, such as most oven users, they are either craft or industrial bakers, use either gas or electricity but rarely a combination, and are diverse in their choice of heating system. This suggests that low-energy ovens should come in deck and rack designs, and that targeting should not focus on demographic segments, but rather on needs, such as explained in 9.3.

9.3. Drivers of Purchase

The first question that allowed to define drivers of purchase concerned the features that are important in an oven for their users. The results to this question were treated as contingency data, i.e. the number of respondents selecting a given feature defined the importance of the feature (the more respondents chose the feature, the more important it is). This approach assumes that the features to develop in priority are the ones likely to please the most people. A cutting point was arbitrarily chosen at 50% of the respondents’ choice were not considered. In Figure 28, the results are represented for both the targeted segment of customers interested in the low-energy oven value, and the segment of non-interested customers. The aim is to highlight the feature preferences that are specific to the targeted customers.

Similarly, the category-scale questions about oven features that can be quantified (capacity, size, weight, baking time, temperature inertia, temperature reactivity, safety) were treated through contingency analysis, with categories as contingents (the less the better, optimum, the more the better, and “I don’t mind the value”), this for each feature. Energy consumption and pre-heating time features were already used to segment the customers. Results on the importance of oven features are presented in Figure 29.
Figure 28: Key oven features expected by the customers

- Allows a flexible temperature range
- It requires low maintenance
- The heat distribution is uniform
- Allows to bake continuously
- It is robust
- The temperature is stable
- It's easy to use
- Presence of a system to adjust temperature in real time
- Presence of a system to prevent heat loss
- Presence of an inner light
- Presence of vaporisers
- The startup time can be programmed

Figure 29: Key levels of magnitude for oven features expected by customers
Contrary to the demographic factors presented in section 9.3, for the feature preferences, there are clear differences between the target customers segment and the other customers:

- **Heat control**: The targeted customers pay more attention to the capacity of the oven to allow users’ control of heat. 89% want the oven to allow a flexible temperature range (versus 50% for the non-targeted customers); 89% require a uniform distribution of the heat inside the oven (versus 67%); 67% appreciate a system to adjust the temperature in real time (versus 50%), and more customers in the targeted segment wants a fast temperature reactivity (44%) than in the non-targeted segment (20%). In addition, 67% of the targeted customers expect the oven to prevent heat loss (versus 33%). The only agreement between the two segments is found in the requirement for temperature stability (78% for the target segment, 73% for the non-target segment), but it confirms the importance for the targeted customers to control heat. Also, although it is not related to heat control but to the quality of baking, 67% of the targeted customers prefer the presence of vaporisers (used to brown the bread) versus only 17% of the non-targeted customers.

- **Ease of use**: 67% of the targeted customers expect the oven to be easy to use versus 33% of the non-targeted customers. This can be combined with other features that allow an effortless usage of the oven: 89% of the target customers want their oven to require a low maintenance (versus 67%), 78% want it robust (67%), and 67% like the presence of an inner light (versus 33%).

- **Maximum availability**: one of the criterion to screen the targeted customers was a reduced pre-heating time. Another result suggests that these customers want the oven to be operational during as much time as possible: 78% want the oven to allow continuous baking. This is coherent with the previous conclusion about ease of use: by wanting an easy-to-use oven, which require little maintenance, the bakers can spend more time baking. Interestingly, they are not interested in reducing baking time (89% think there is an optimum degree). This suggests that time should be saved on anything but baking, which on the contrary, is what the customers want to control, as suggested in the first point about heat control.

Design features, such as size, capacity, and weight, do not clearly discriminate between and within the two customers segments, and should be within an optimal range, as suggested by Figure 29. This was not the purpose of the present question to estimate the ideal size, capacity and weight, but results suggest a future survey should address it.

The results of the open question about the criteria used by the customers during the purchase of an oven are summarised in Figure 30. Due to the low number of data with an open question, it is important to interpret them with care. However, three criteria received 4 spontaneous elicitation. The first is energy efficiency, which confirms its importance mentioned previously. Cost is also a critical factor. Finally, the capacity is the other most important criterion, which is an information to combine with the previous observation that the capacity has an optimum degree.
Figure 30: Bakery oven purchase criteria spontaneously mentioned by the respondents
10. Conclusion

Although the initial context of the present work was the development of an energy-efficient baking technology, this report aimed at giving an overall overview of the European bakery and bakery oven industries and markets which could benefit a broadest audience.

The main findings were the following:

- The bakery industry and market in Europe are a very important sub-sector of the food industry, with more than 154,000 companies; 1.36 million jobs and 98.4 billion Euros annual turnover.
- This is a very fragmented industry, dominated by SME’s.
- This industry was moderately impacted by the economic crisis, but the crisis accelerated an overall restructuring from a dominance of artisanal bakeries to a rise of industrial production and modern bake-off retailing.
- The current driving forces in the bakery sectors are an increasing need of versatility and efficiency in production, which opens opportunities to product, process or business model innovations.
- However, not all the European national markets are comparable in their size, financial performance, and dynamics.
- The bakery oven industry is also fragmented and closely tightened with the bakery market. It will have to enter in innovation to accompany the bakery companies in their strategy to increase productivity.