Innovation and R&D

Definitions

There are manifold taxonomies of R&D related activities.

One of the most extensive is the following:

- Basic research: creation of an idea, invention without any practical application in view;
- Applied research: research with a stated objective;
- Development: stage in which an idea or invention is brought to the stage of commercial production;
- Commercial production: full-scale production of a new product or application of a new process
- Diffusion: spread of the new idea through the firm and imitation and adoption of the innovation by other firms in the same industry.

Innovation and market structure
1) Neoclassical theory

What is the best market structure in order to foster innovation?

According to the neoclassical theory, monopoly is not the best structure: given that the monopolist is already earning abnormal profits, there could be insufficient stimuli for him to change technology in order, for example, to save costs or to increase quality.

Furthermore, monopolist could be tempted to invest resources more in attempts to maintain his position than in R&D activities (**rent seeking**).

2) Schumpeter and the creative destruction

- Differently from the neoclassical theory, according to Schumpeter **perfect competition is not the ideal structure**: large corporations have become so because of their innovative capacity and are the main drivers of progress and technological change.
- Technological change becomes the fundamental driving force for growth and development, in a process of **creative destruction**: the creative aspects of technological change result in new and improved goods and services. But with new technologies there is also a process of destruction: the market power of incumbents is endangered, new actors might emerge and old (and less innovative) actors might be forced to decline.
- The Schumpeterian hypothesis: it is not S determining C determining P, but the Conduct (C) of a successful innovator (P) is rewarded with the creation of a monopoly (S).
- However, the market power determined by successful innovation is **always temporary**, since there might be others introducing new technologies, new sources of supply of new organizational forms.

Technological change and market structure. Perfect competition vs. monopoly: which is the best innovator?

- Firms can earn abnormal profit to be invested in risky R&D programmes
- No competitive pressure means security within which it is possible to undertake risky initiatives
- The absence of competition gives the firm the time and space to develop and grow

Pros monopoly

- With no competitive pressure managers can become lazy
- There could be an excessive internal bureaucracy or x-inefficiencies (technical inefficiencies)
- In competitive markets there may be more teams working on the same problem and therefore a higher likelihood to succeed
- Monopolist could be tied to the existing technology

Cons monopoly

Technological change and market structure. Perfect competition vs. monopoly: which is the best innovator?

Not a final answer.

According to some economists **oligopoly** could be the most innovative structure, because there might be abnormal profits to be invested in R&D activities and there is also competition that forces firms to innovate.

Pace of technological change

Also important is the **SPEED** of the implementation of R&D projects: to increase the amount of resources invested in research might lead to a direct increase in the speed of technological change.

But **caution** is also needed because:

- Hiring more scientists could diminish marginal returns (law of diminishing returns) in the short run;
- Errors are more likely to occur if, in order to increase speed, research is moved to the next stage without waiting for validation of results;
- In order to increase speed, researchers may be induced to pursue several paths simultaneously, with an increase in costs;
- Slower paces mean smaller up-front costs, because total R&D costs are spread over a longer period of time.

Product innovation

It is possible to talk about innovation ONLY if the new product/process/idea arrives **on the market** (otherwise it is an invention) and it has to imply an **improvement** (otherwise it is simply a change).

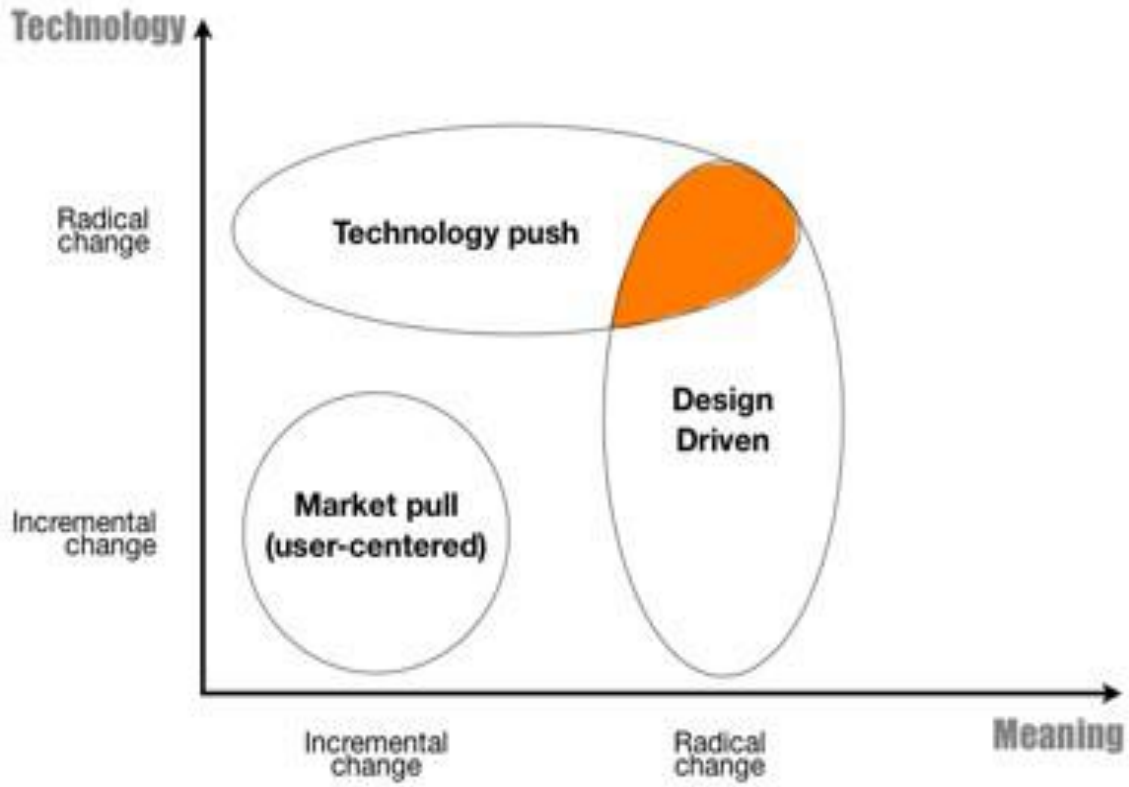
What is a NEW product?

1. New for the market;
2. New for the firm but not for the market;
3. New for a market but not for others nor for the firm **(repositioning)**;
4. Extension of the product line;
5. Improvement of existing products;
6. Cost reduction.

The «sources» of product innovation

The change can be in the **technology** or in the **meaning** associated to the product/service

- **Market pull**: innovation arises from market requests and usually implies a simple improvement of the existing product.
- **Technology push**: the firm actively explores new technological possibilities and tries then convince the market to accept them.
- **Design driven**: firms actively look for new socio-cultural models, often leading to innovations that customers did not actively required and that are based on latent needs.



R&D strategies

Investment in R&D is not only motivated by short-run profit maximization. It is often the consequence of a long-run strategy:

- **Offensive strategy**: try to dominate the market through new technology (patents). Ex. Apple, Sony
- **Defensive strategy**: R&D is needed to follow the technological change initiated by competitors whose strategy is offensive (low resources or risk adversity). Key: quick response. Ex. Samsung
- **Imitative strategy**: the imitator is content to copy (licence or free knowledge). The R&D investment required is low, but it can have some other advantages to exploit, such as cheap labour or a captive market (in some countries imitation is encouraged in order to acquire technology developed elsewhere). Ex. Matsushita
- **Dependent strategy**: no autonomous R&D. The firm has a subservient role in relation to another firm (supplier or subcontractor).

Technological change and firm size

Is there a best size to successfully innovate?

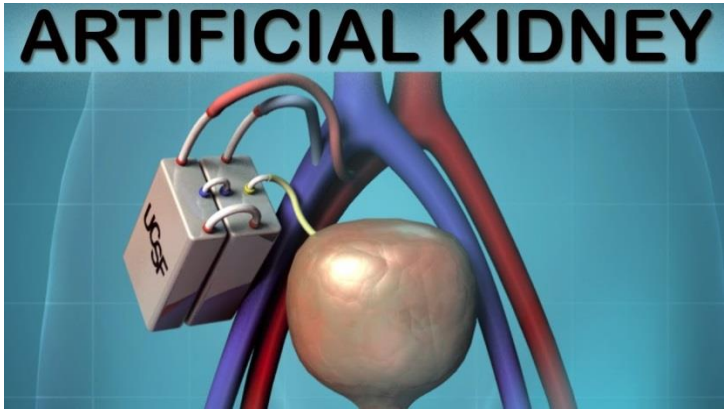
Pro large firms:

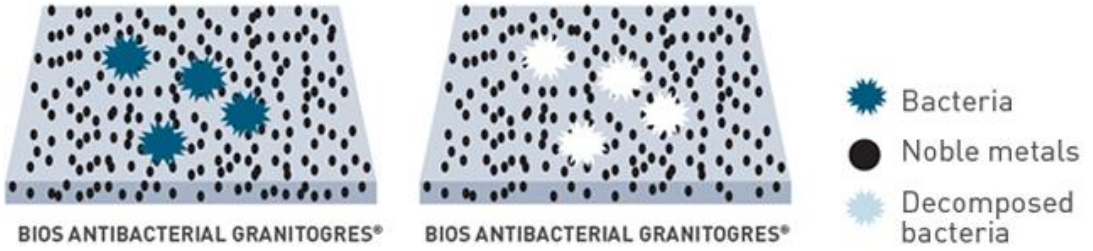
- Modern labs are expensive to build, equip and staff;
- Large firms can work simultaneously on several projects, spreading the risk among them;
- R&D requires lot of funding but it is risky and it is therefore difficult to obtain external funding. Large firms might more easily rely on internal funding or might be able to borrow money more cheaply;
- If the large firm is diversified, knowledge acquired from research in one area might be applied in others.

Cons large firms:

- The internal incentive structure of large firms sometimes discourages creative thinking and employees with good ideas might find it difficult to appropriate the commercial rewards originating from it
- Internal bureaucracy might reward behaviours that conform to norms

Are these innovative ideas?



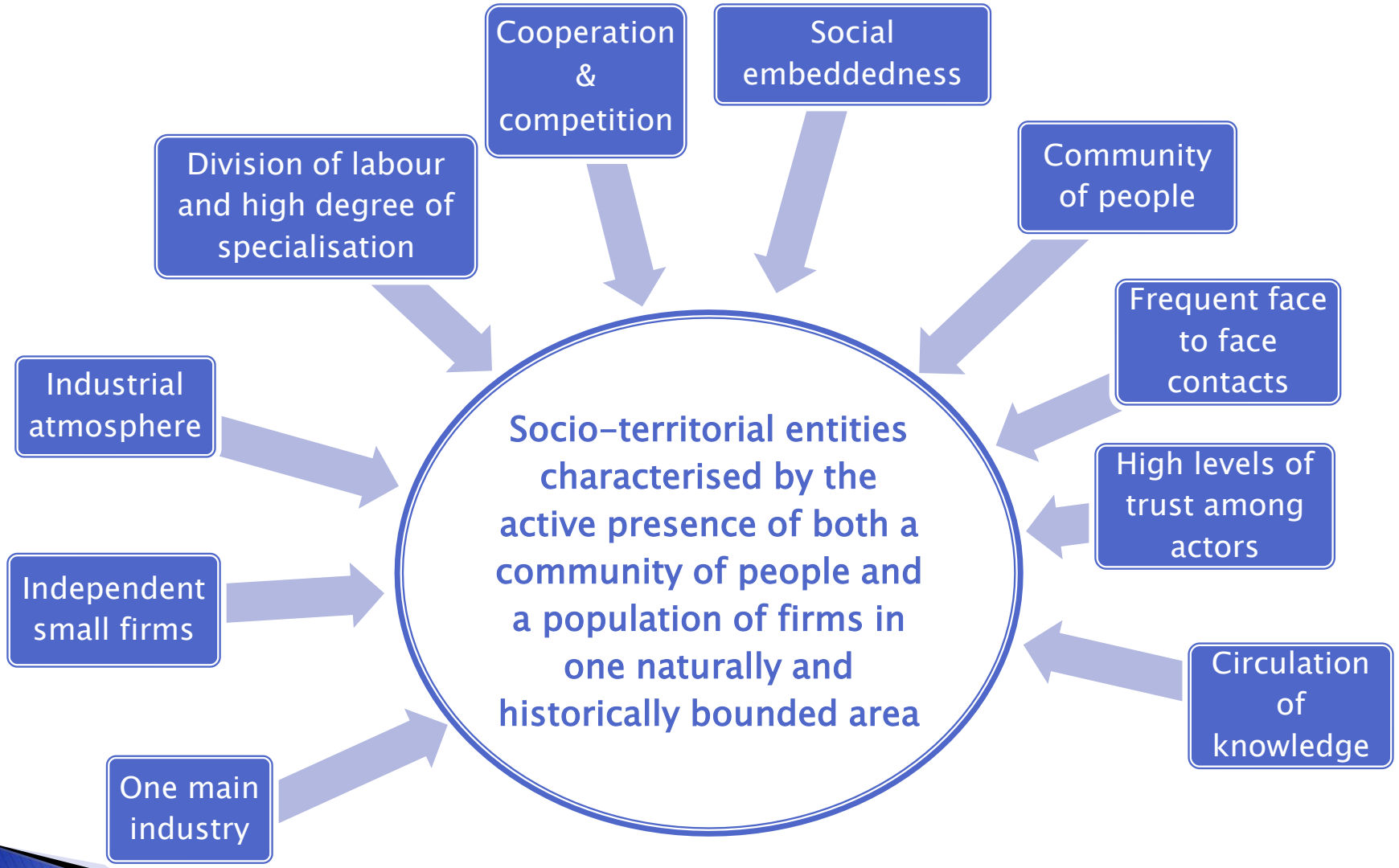


Number of manufacturing firms in Italy by size

	2011
"Small Firms (1–49 employees)"	4,247,169 **99.38%**
"Medium Firms (50–249 employees)"	22,759 **0.53%**
"Large Firms (250+ employees)"	3,630 **0.085%**

Source: National Census, ISTAT (2012)

Industrial districts



The success of the Italian industrial system derives from:

- Micro and small firms,
- specialized in traditional industries (Made in Italy),
- strongly embedded in their territory, and
- connected to each other.

The efficiency of the Italian industrial system is based on **industrial districts** that in most cases were born spontaneously as:

Spin-off from large firms

Derivation of a widespread handcrafted culture.

The governance of industrial districts

✓ **Comitati di distretto (district committees)**: bodies promoted by public institutions, firms (in particular small firms), trade unions and business associations which agrees to coordinate their strategies in order to favour the development of the district;

✓ **Fondazioni (foundations)**: bodies promoted with the participation of local institutions, universities, public research centers and business association to strengthen the identity of the district, to favour the circulation of knowledge and to find out potential international partners;

✓**Centri servizio (service centres)**: specialised bodies in charge of providing the firms of the district with specific services such as professional training and advice, general information, design support, etc.;

✓**Associazioni and Consorzi (associations and consortia)**: cooperation between firms and local institutions, schools, research centres, etc. The main aim is to design and implement specific productive policies in order to favour an harmonic development of the whole district;

✓**Osservatori (observatories)**: in charge of collecting, processing and diffusing studies on the sector of the district;

✓**Federazione dei distretti industriali (federation of industrial districts)**: non-profit organization that promotes a coordinated governance of the 50 associated industrial districts.

Some examples of successful Italian industrial districts

Carousels ROVIGO

Size: 100 firms employing about 3,000 people (2012).

Export value: 250 m. € (2012) (+7,5% in three years). 90% exported

Products: Carousels

Origin: Since Middle Ages there were labs in the area renowned for carousels production. During the 1920s' crisis, many people started the activity of "travelling performers", also producing the carousels by themselves. During the 1950s' the local trade fairs became places where to have fun and "lunaparks" started to become popular. The recent crisis has changed the habits of people: for their leisure time they look for places close to home.

Supporting institution: Through CNA, firms are coordinated tor the implementation of innovative projects. Recently they have coordinated a meeting with 30 big buyers. Important projects have been implemented for safety and maintenance (remote control of carousels sold abroad – Venezuela).

Structure of the district: On the territory there are some relatively large producers and a network of very small component manufacturers, highly specialized and complementary.

Carousels ROVIGO

Main customers:

SHANGHAI DISNEY RESORT
上海迪士尼度假区

CONEY ISLAND - NY

DINOSAURS PARK - BEIJING

TECHNICAL PARK - COPENHAGEN

Carousels ROVIGO

Focus on innovation:

- Safety
- Energy saving
- Decreasing weight
- Maintenance
- Interactivity
- Learning

Flying fury:

- Solar panels and exceeding energy redirected to other carousels
- Interactive

Leather products FIRENZE

Size: More than 2500 firms employing about 17,000 people (2012). 6 b. € of turnover (2011), 38% of which from exports (+12,3%).

Structure: mainly small firms coordinated in cooperating filieres.

Origin and evolution: In 1921 Guccio Gucci established in Florence a firm producing leather articles for travelling and horse riding. With the beginning of 2000 firms started to experience a crisis because of the increasing international competition. This has induced firms to reorganize: the largest firms has decreased their size to become more specialized and flexible, subcontracting many function to local craftsmen. Local leading firms (Gucci, Ferragamo, Prada) have stimulated the upgrading of the smaller ones , with a strong focus on quality upgrading, also thanks to the proximity to Santa Croce leather district. Recently the filiere has expanded to include jewels, packaging and mechanical firms producing machinery for metal parts.

Many world leaders use local producers for very high quality items (Cavalli, Montblanc, Trussardi, Tod's, etc.). Small firms are more recently reorganizing themselves in networks to increase their competitive capacity.

Supporting institutions: the High School of Italian Leather Products trains highly specialized workers. The "Consorzio 100% Italiano" works to highlight the origin of materials and components.

Leather SANTA CROCE

Size: More than 600 firms employing about 8,000 people (2011) (+ satellite sectors). They account for 35% of national production of leather and for 98% of national production of sole leather.

Exports: 1050 m. € (2011) (70% of turnover).

Structure: mainly small firms coordinated in cooperating filieres. During the years introduction in the district of the leather processing machineries production.

Origin: Half of the 19th century.

Supporting institutions: Many activities are collectively organised: from sectoral trade fairs to environmental issues. In fact there is a tight network of local institutions: Associazione Conciatori di Santa Croce, Consorzio Conciatori di Ponte a Egola, Associazione Lavorazioni Conto Terzi, Consorzio Calzaturieri Pisa, Consorzio Depuratore Santa Croce, Conzorzio Acquarno, Consorzio Recupero Cromo, ecc. They operate together especially for the promotion of environmental-friendly production (more than 98% of polluting by-products are depurated). Furthermore there are export-promoting institutions, consortia for the promotion of common brands ("Vero cuoio italiano", "Pelle di Toscana").

PELLE DI TOSCANA

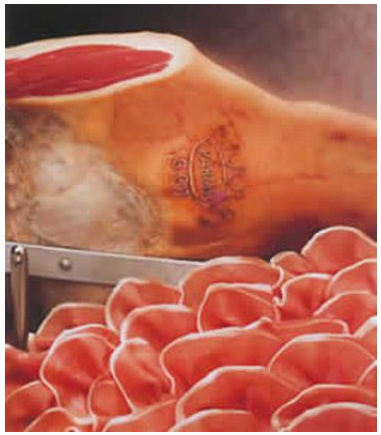
Vero Cuoio Italiano

Sotto le migliori scarpe del mondo

An example of collective brand: the “Prosciutto di Parma” Consortium

Established in 1963 on a voluntary basis (now it includes 150 producers) to:

- Control the production (but also the sell) in order to ensure the respect of laws and regulations
- Manage the economic policy of the sector
- Protect the «Prosciutto di Parma» name and the «Corona Ducale» brand, registered in 90 countries
- Valorize the product at national and international level, with advertising and informative campaigns
- Assist associated firms to improve production and sell through consulting activities



PARMA

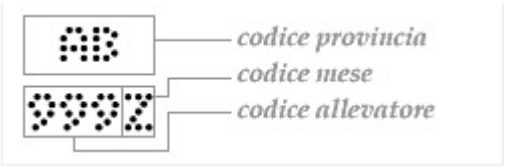
The “Prosciutto di Parma” Consortium

Prosciutto di Parma is a DOP (Denominazione Origine Protetta) product: in order for a ham to be called «Prosciutto di Parma», strict production and origin rules have to be respected:

- Specific pig races utilized;
- Specific area of production;
- Strictly controlled origin of raw material;
- Methods of production;
- Characteristics of the finished product.

All the producers belonging to the consortium have to fully follow the rules and they agree to be checked in every stage of the production process so as to obtain the denomination and the brand.

The “Prosciutto di Parma” Consortium: recognizability



1. Both pig’s thighs are tattooed by the farmer with his identification code and the month of birth of the animal

2. The slaughterhouse puts a fire stamp with its identification number

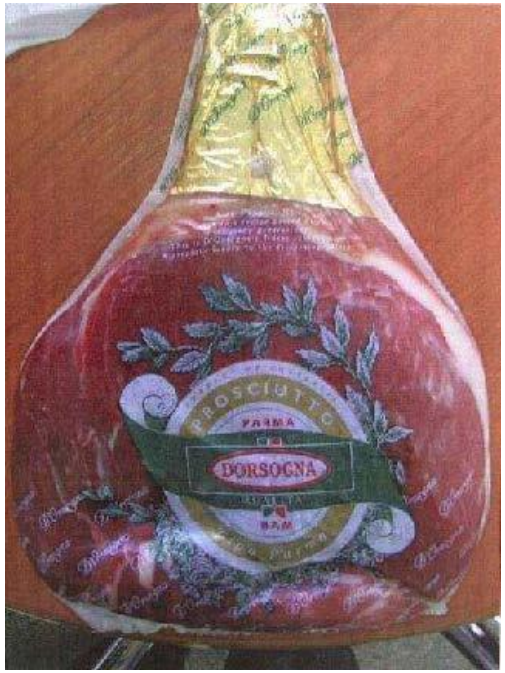
3. Month and year of beginning of aging are put in relief along with the acronym of Consorzio Prosciutto di Parma in a rounded metal seal

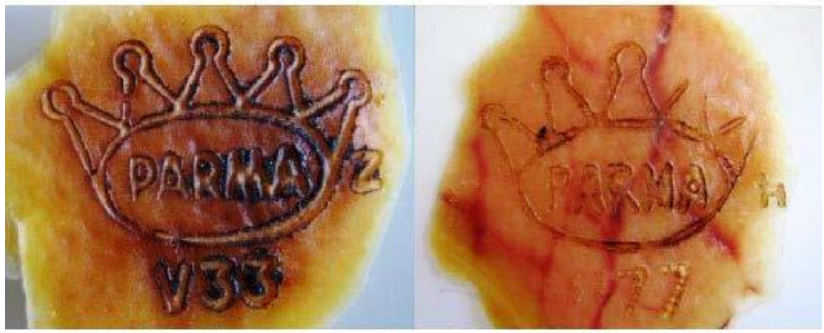
4. If all requirements are met, including tasting tests, after 12 monthsa fire stamp is put with the logo, and the identification code of the firm of production.

This final stamp has a very high legal value, because it certifies the authenticity of the product.

The “Prosciutto di Parma” Consortium: recognizability

The “Prosciutto di Parma” Consortium: fakes





Marchio originale Marchio contraffatto

The “Prosciutto di Parma” Consortium: some numbers

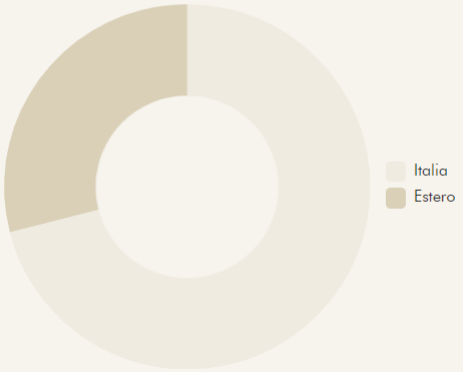
140

aziende produttrici di Prosciutto di Parma

8.900.000

Prosciutti di Parma marchiati nel 2019

Distribuzione



Valore Prosciutto di Parma

820 milioni

valore della produzione Prosciutto di Parma

260 milioni

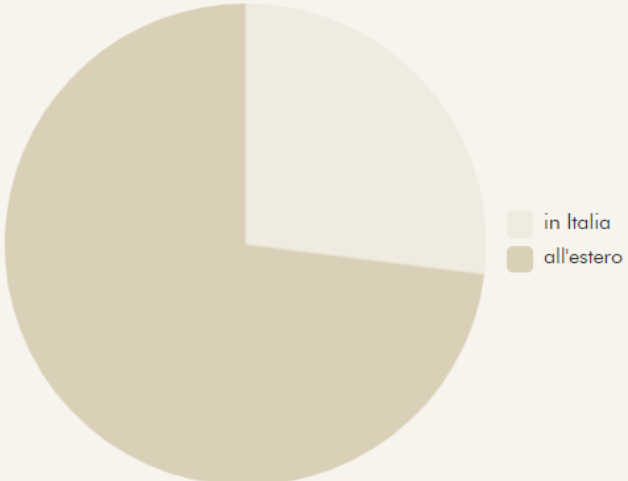
fatturato delle esportazioni

1.5 miliardi

giro d'affari complessivo

Mercato pre-affettato

82 milioni confezioni vendute



Summary

- Definitions
- Innovation and market structure
- Product innovation
- R&D strategies

Reading list

- Chapter 17: 17.1, 17.2, 17.3 Lipczynski et al., 2013