

# **Innovation diffusion and bandwagon effect**

## **The palm oil in the Italian bakery industry**

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### **Introduction**

The Italian bakery products industry, a 7 billion Euros market, has been recently interested by a process of deep transformation ignited by the introduction of palm oil free products. In the second half of 2015 a market player introduced a new biscuit line with a palm oil free formulation, it supported the products with a massive communication campaign leveraging on increasing media attention on the possible health related issues of palm oil consumption. Suddenly a bandwagon effect started in the market and all major players reformulated their products eliminating palm oil, eventually flagship products with a strong and long lasting market leadership were interested by reformulation. Investments in advertising soared and more than one incumbent experienced significant discontinuities in its market and financial performances. The palm oil free formulation can be treated as a new technology that in less than one year become the industry standard following innovation dynamics already observed in other sectors [Blind, 2015]. In particular we observed that a pivotal role has been played by the media and by a highly educated customer base that ignited a bandwagon effect determining the affirmation of the new technology standards.

The phenomena that we observed in the Italian bakery products market can be investigated building on empirical evidence and relevant literature a System Dynamic conceptual model. The elaboration of our analysis will be supported by System Dynamics logical-analytical tools [Forrester, 1961, 1968], in particular by the use of the feedback concept and the distinction between stock and flow variables [Sterman, 2000]. We think that the use of SD will contribute to enhance internal consistency in our conceptual model as well as it allows to analyse the temporal evolution of strategic choices and the dynamic links between consumer behaviour and firms response.

The paper has an exploratory approach and has been developed mainly on empirical data retrieved from public source and from reserved access databases.

The paper is structured as follow: the first part is dedicated to the description of the bakery industry in Italy and the palm oil consumption, then we focus on the conceptual model and on igniting mechanisms that stimulated the adoption of innovation. In the third paragraph we analyse the bandwagon effect and in the fourth the balancing loops that mitigate the diffusion of innovation. The fifth part is dedicated to the model expected behaviour. Finally we investigate possible strategic alternatives for market leaders that refuse to adopt palm oil free formulations.

## 1. The Italian bakery industry and the use of palm oil

Until a few months ago almost every Italian food company was using palm oil as an ingredient for their products. This oil is mainly produced in tropical areas and for food processors it simply represented the optimal solution because it had several strong points. It was a very cheap ingredient whose production is much more efficient considering that the average oil yield per hectare is much bigger compared to other oils such as soybean or sunflower oils. Moreover, its molecular structure made it very easy ingredient to use particularly at high temperatures and it also allowed a better resistance of products to rancidness. This last characteristic allows to produce biscuits and cakes with a longer shelf life. Generally if the palm oil is substituted by other oils or fats the shelf life decrease forcing supermarkets to review procurement and logistical processes.

Italy is importing around 21 million Euros of palm oil and around 10% of it is used for bakery products. Palm oil consumption in the food industry accounts for 175.000 tons and 112 million Euros and considering the total size of bakery industry it accounts for around the 1,6% of revenues and 3% of total costs<sup>1</sup>. The numbers describe the typical situation of a product/components that has a secondary importance in the value chain because of the low incidence on the total costs. But, if we approach the problem from the technical side we discover that, despite the low economic impact, palm oil has a critical role in R&D and production process. All major players recipes have been developed around this component and its advantages.

However, several concerns related to palm oil were raised over the last decade: back in 2005 the CSPI (Center for Science in the Public Interest)<sup>2</sup> affirmed that this ingredient increased the probability of cardiovascular diseases, thus backing the opinion of some researchers of the University of Alberta that in 2002 sustained that palmitic acid could cause cholesterolaemic effect when combined with other dietary fatty acids. Further developments occurred over the last few months, particularly in Europe and, more specifically, in Italy. In February 2016 the Italian Istituto Superiore di Sanità (ISS) (the National Sanitary Authority) affirmed that, despite not being more harmful compared to other fats, palm oil is a relevant source of saturated fats which contribute, together with other fats, to cause cardiovascular diseases<sup>3</sup>.

In May 2016 the European Food Safety Authority (EFSA)<sup>4</sup> reported that palm oil contains Glycerol-based process contaminants that “*raise potential health concerns*”. These substances, in particular glycidyl fatty acid esters (GE) and 3-monochloropropanediol (3-MCPD), form during food processing and in particular when vegetable oils are refined at high temperatures. The researchers affirmed that glycidyl fatty acid esters are genotoxic and carcinogenic substances and that high exposures to 3-MCPD both exceed the tolerable daily intake (TDI) and represent a threat for the health.

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<sup>1</sup> Author’s elaborations based on Food Industry Monitor data by the University of Gastronomic Science of Pollenzo,

<http://www.unisg.it/en/ricerca/food-industry-monitor/>

<sup>2</sup> <https://cspinet.org/topics/palm-oil>

<sup>3</sup> Istituto Superiore di Sanità (ISS), Parere tecnico scientifico sull’eventuale tossicità dell’olio di palma come ingrediente alimentare (2016) Address: [www.salute.gov.it/imgs/C\\_17\\_pubblicazioni\\_2481\\_allegato.pdf](http://www.salute.gov.it/imgs/C_17_pubblicazioni_2481_allegato.pdf)

<sup>4</sup> EFSA, Process contaminants in vegetable oils and foods, (2016), Address:

<http://www.efsa.europa.eu/en/press/news/160503a>

On the basis of these findings, some companies understood that keeping to use palm oil could have caused concerns for the consumers and immediately started to plan updates for their product line-ups.

Misura (Colussi Group) was the first company to abandon palm oil in July 2015, well before the start of the media wave. It was immediately followed by Biscotti Gentilini, a smaller company based in Rome specialized in the production of biscuits. After the publication of the ISS opinion in February 2016 the concern for the harmful effects of palm oil spread out and all the industry started to consider a change that involved not only food processors but also the main supermarket chains that were selling their own food products. Considering also main players of the distribution sector, Carrefour partially replaced palm oil in February, PAM-Panorama, Esselunga and Coop that launched several modified products in April and May. During the summer it was the turn of biscuit manufacturers Balocco, Pavesi and Barilla (Figure 1).

**Figure 1.** Introduction of palm oil free products by main players

<b>Company</b>	<b>Palm oil free product release</b>
Misura Colussi Group	May 2015
Gentilini	May 2015
Colussi Group	February 2016
Carrefour (private label, supermarket)	February 2016
Plasmon	February 2016
Pam – Panorama (private label, supermarket)	April 2016
Esselunga (private label, supermarket)	April 2016
Coop (private label, supermarket)	May 2016
Barilla	July 2016
Pavesi	September 2016
Balocco	September 2016

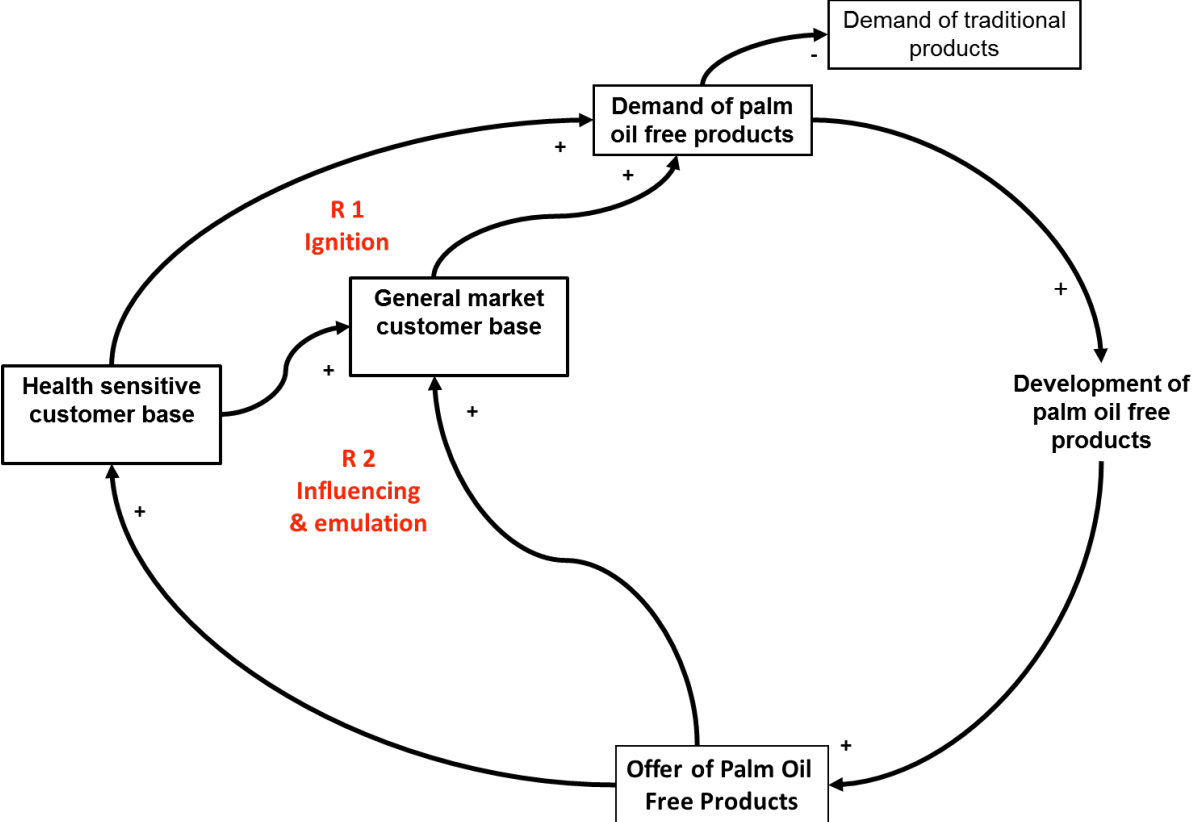
## **2. Demand dynamics and the role of the first mover**

We started to model the diffusion process focusing on the demand dynamics that have stimulated by the action made by the first mover. Colussi Group developed a new biscuit line targeting families with children, they eliminated palm oil, introduced a new crude wheat and designed a modern packaging that explains in a creative way the features of the new products. Their communication campaign was based on the absence of palm oil and directed to families, they made relatively little advertising and relied on word of mouth. The market share of the company started to grow and performance were beyond expectations after few months from the launch.

The innovation process has been ignited by Colussi targeting a healthy sensitive part of the demand (mainly families with children), a group of customers that were particularly aware of negative effects of an excessive consumption of palm oil, unsatisfied with existing product, that was waiting for a solution to their needs (Figure 2, feedback loop R1). This part of the demand was ignored or misperceived by leading players that are “in the comfort zone” thanks to their actual market position and don’t look systematically for new market opportunities.

During 2016 the high sensitive customer base started to influence the general demand giving force and consistency to the diffusion dynamic represented by the feedback loop R2 (Figure 2). High sensitive customers are educated people that have a good food culture and a modern approach to social network and communication and play the role of “influencer” thanks to their active presence on social networks.

**Figure 2.** Reinforcing loops: ignition



**3. Imitation process and bandwagon effect**

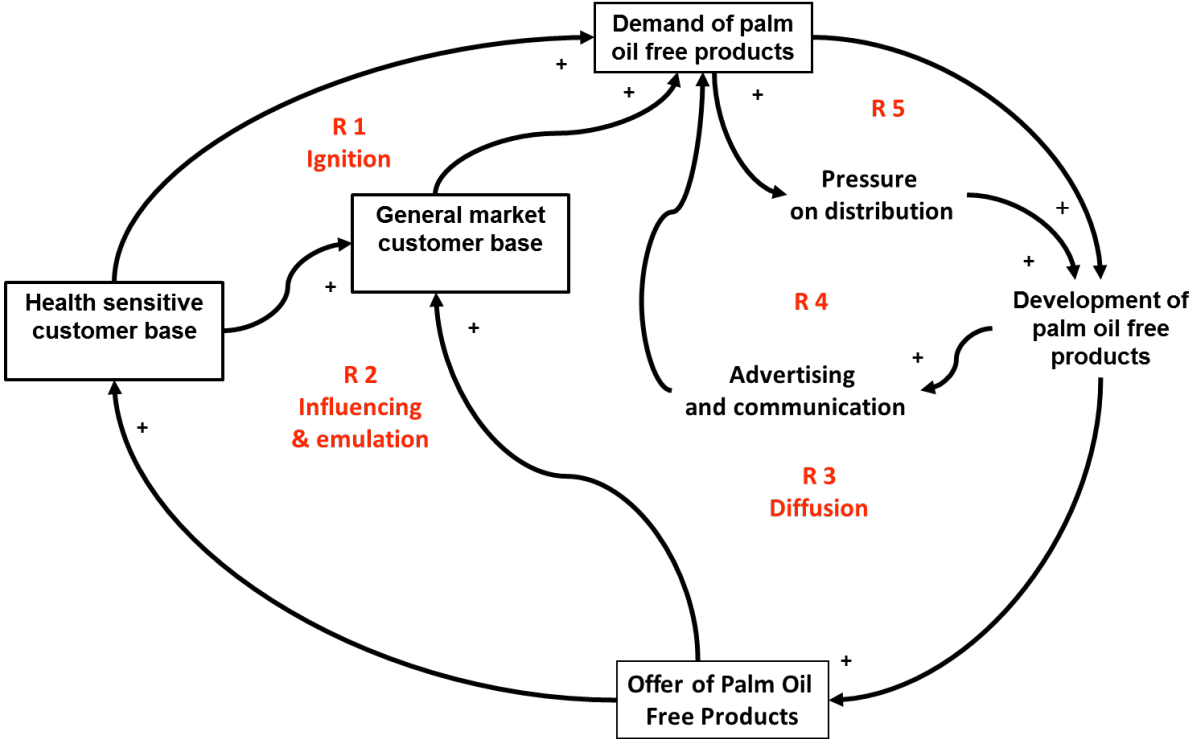
The bandwagon effect [Stermann, 2000], that describe essentially a competitive escalation [D’Aveni, 1994, 1995, 1999; Stermann 2000, Romme et others, 2010], played an important role in the evolution of the Italian market. The effect was boosted by the move of the market leader, Barilla that recognized an increasing interest from the general market customer base, decided to switch progressively its entire production to palm oil free recipes. The company redesigned in about six months all its all major products, including some best sellers items.

*Product innovation and acceleration.* Following Barilla all major players introduced new products without palm oil and with enhanced formula and redesigned package that reported clearly the indication that the product was without palm oil. The imitation process was stimulated by the increasing pressure exercised by the distribution system (Figure 3, feedback loop R4) that amplified the demand created by the customer stimulating a rapid

substitution of traditional products. Supermarkets pushed the substitution introducing immediately palm oil free products with their private labels.

*Communication and investment in advertising.* The feedback loop (Figure 3, feedback loop R5) that represents investments in advertising has been deeply influenced by the previous described loops. Investments in product innovation must be communicated to stimulate the adoption rate. All players boosted their expenses on advertising (see Annex 1) to present redesigned products this generated an immediate positive reaction of the demand and has positive externalities also for minor players that already have palm oil free products but couldn't invest in advertising. In some cases some minor players, that historically have produced palm oil free products, redesigned their packaging to communicate the recipe and promoted advertising campaign to communicate that they “never used palm oil”. Due to the size of advertising investments made by leading players the awareness level of the final customers increased significantly and this contributed to increase the demand for palm oil free products jeopardising the demand for traditional products.

**Figure 3.** Reinforcing loops: imitation, communication and pressure from distribution



#### 4. The role of balancing loops: product development and process redefinition

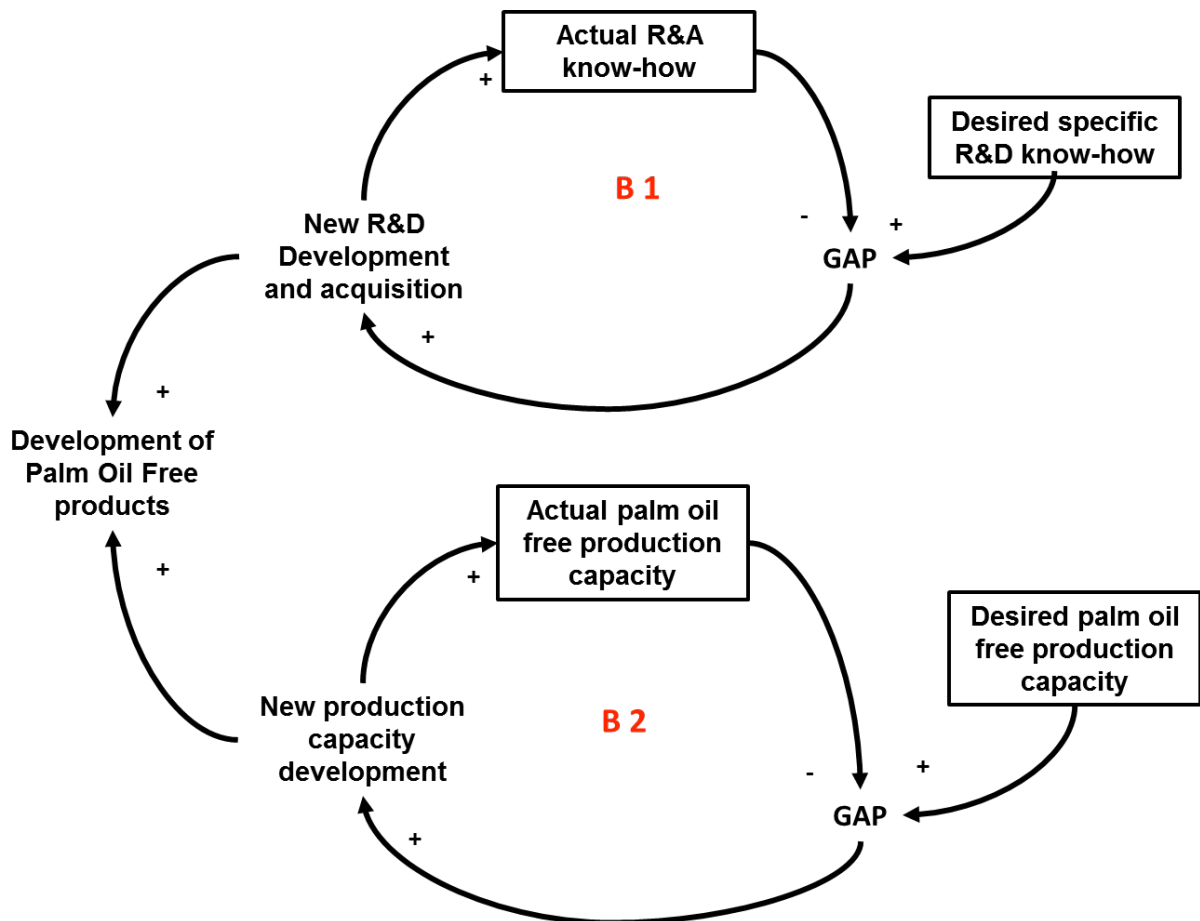
The dynamic of the demand and the deep pressure to innovate stimulated firms to introduce minor changes on the products formula just to follow the flow and don't loose contact with market. The largest part of companies that reformulated their products didn't introduce radical changes, they substituted palm oil with other fats, determining, in certain cases, the alteration of the original taste. In fact the complete redefinition of the recipe requires specific R&D capabilities that cannot be develop in few months [Teece and others, 1997; Eisenhardt, 2000; Barney, 2001; Helfat and others, 2007]. For this reason the new product development process is characterized by delays (Figure 4, feedback loop B1). In certain cases players estimated that the change in product taste will generate some loss in the customer base, that will be compensated by customers attracted by the palm oil absence. Other players preferred to focus on package design introducing a clear health-oriented communication thanks to which they attracted new customer despite the taste modification.

*Production capacity adaptation.* Production capacity adaptation is a complex task for companies that want to switch the product line to palm oil free products (Figure 4, feedback loop B2). Production plants require minor technical modifications to be adapted to new fat and oils however, because economies of scale are fundamental to compete in the bakery business, plants have to run at maximum capacity utilization also with new recipes [Banterle et others, 2016]. This requires a complex switching process made of several trials, that can require months before the plant can run at the optimal load factor. We calculated that the entire Italian bakery industry will have to invest from 280 to 360 million euros in 2017-2018 to modernize product lines and adapt them to palm oil free products; typically the switch for a single line can cost from 2 to 4 million Euros<sup>5</sup>. While the switching process is under completion companies must maintain old formula production to assure a constant presence on the market. So, the adaptation of the production adaptation process is complex and time consuming and will generate delays.

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<sup>5</sup> Investments in process innovation were estimated using confidential data provided by Colussi Group and through interviews with the company management, conducted by the Author.

Figure 4. Balancing loops



## 5. Model expected behaviour

According to relevant SD literature and considering system archetypes, the behaviour that we expect from the model is an exponential development of palm oil free product and an exponential decay for the products that contains palm oil [Maier, 1998; Miller and others, 2002; Kazumori and others, 2010]. The presence of two balancing looks will generate oscillation for a limited amount of time, then the exponential trend should prevail. In the long term the growth of the palm oil free product will be aligned at the general growth rate of the bakery market.

The speed of the substitution process is influenced the following variables:

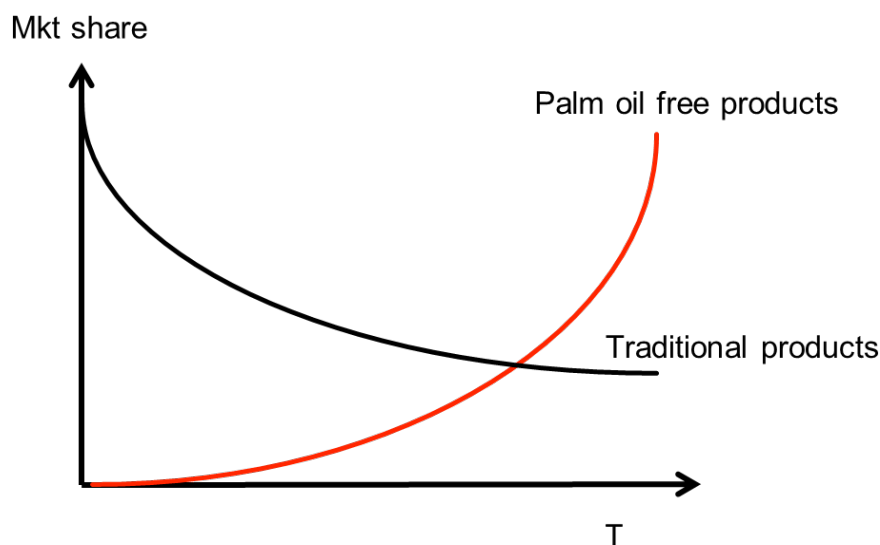
- the adoption rate of the distribution system (supermarkets) that will require more healthy products to increase sales and rotation index;
- investments in communication that will stimulate also the more reluctant part of the demand to switch towards healthy products.

Scholars [Rogers, 2003; den Uijl and others, 2013] evidenced how the adoption of a technology standard, like VHS vs Betamax rather than Microsoft Windows vs Apple OS has been influenced by the presence of complementary products, like media contents and compatible software. In this case the adoption rate and the success of the new product formulation is essentially generated by endogenous factors that are embedded in the demand and in customer attitude and culture. These factors have been “activated” by the deliberate



actions of the first mover generating a bandwagon effect that stimulated from one side the market demand and from the other side followers that reformulated all products.

**Figure 5.** Model expected behaviour



## 6. Towards a dominant strategy

According to our previous analysis the only dominant strategy is the innovation adoption that must be realized removing obstacles to new products development inside companies. Follower has to rapidly reformulate products acquiring appropriate R&D capabilities and redesigning production processes. We tried to approach the issue of the strategic alternatives for followers applying some basic rules of the game theory.

Ferrero, the largest and most renowned Italian food company, with a significant presence in the bakery market (they don't produce biscuits but in cakes) decided to develop an alternative strategy refusing the introduction of palm oil free products and developing an aggressive PR and communication campaign to reaffirm that the palm oil contained in its products come from the fair trade and is not dangerous even for children. This decision is coherent with the market inertia [Leonard Burton, 1992; Gilbert, 2005, Teece, 2010] typical of a market leader with a consolidated competitive advantage largely based on unique production process<sup>6</sup>.

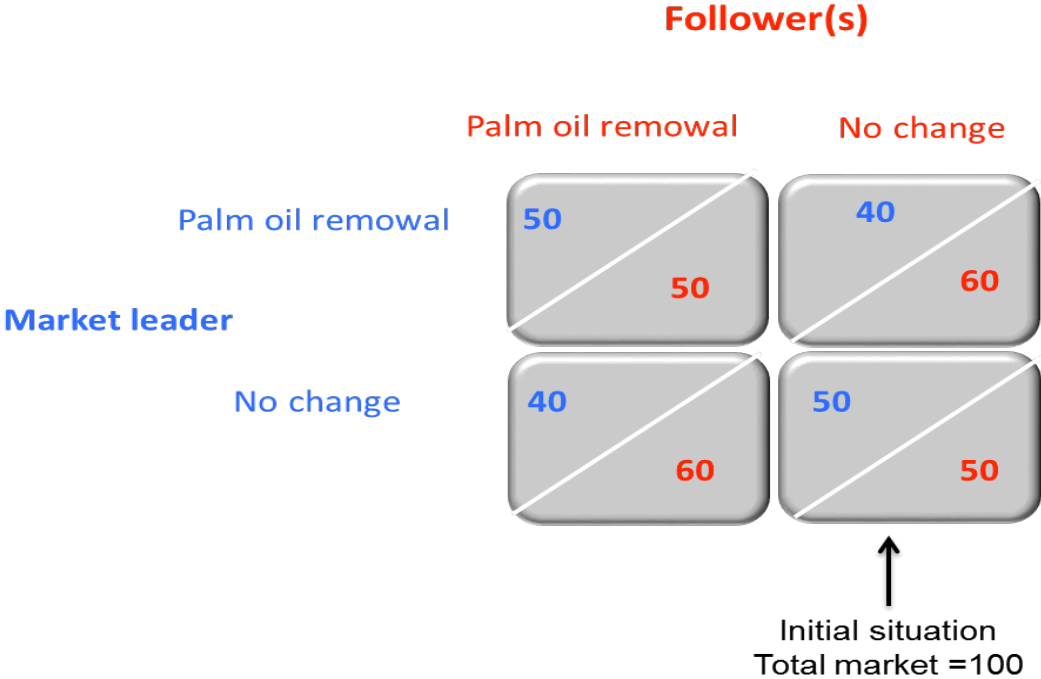
The bandwagon effect that we are observing in the Italian market is market driven (feed by the demand) and is boosted by product innovation strategies sustained by communication and media actions, for this reason resistance strategies could be very unproductive.

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<sup>6</sup> A relevant part of the success of Ferrero can be explained with unique production capabilities that allowed the company to produce some difficult to imitate bestseller products like Nutella or real coffee filled chocolate Pocket Coffee.

An analysis based on game theory should help us to have a better understanding of the situation [Başar, 1998]. We considered interactions between an hypothetical market leader (namely Ferrero) that controls the half of the market and followers that share the other half of the market (Figure 6). We use the hypothetical market share to define payoffs. The starting point is represented by the equilibrium situation in which the leader controls the 50% of the market while a number of followers control the other 50%. If followers introduce new palm oil free products, under the hypothesis of a market demand characterised by an high sensitivity level to health related issues, they maximize their payoffs independently from the leader’s decision. If the leader don’t react they increase their market share, if the leader reacts introducing palm oil free products they can preserve their original market share. Their payoff in the case they remove palm oil (50,60) is higher that the payoff that they have if they don’t remove it (40,50). Also for the leader the decision to change the strategy offering palm oil free products proves to be more productive in term of payoff (50,60) respect to the situation in which the market leader is resisting to change (40,50). This game allows us to conclude that if we consider the actual market situation and the power of bandwagon effect also market leaders should accept to change.

**Figure 6.** Alternative strategies analysis



The real problem that we cannot easily address with the game theory is the effect of time on the leader reaction. If the leader doesn't react immediately customers will switch to other players and they will hardly return back when the leader will offer palm oil free products, furthermore its reputation could be compromised. For this reason in the upper left quadrant of the matrix the payoffs will be valid only in the case of a fast leader's reaction.

The real question that should be addressed is how much time has the leader to manage the adoption of the innovation? To answer to this question we should investigate, in a dedicated study, complex mechanisms that govern the consumer behaviour and the relations with the distributions.

## **Conclusions**

A first finding of our analysis that the diffusion process has been ignited by the existence of a qualified demand made by customers that are not fully satisfied with existing products. In this case the innovator targeted a small segment that can influence the entire market behaviour. This can be a very effective strategy to push industry change.

Bandwagon must be stimulated by massive communication campaigns that must leverage on specific cultural heritage and characteristics of certain groups of consumers, in our case the cultural background is constituted by high sensitivity to health issues and a genuine interest for quality food. Again, is important for players that want to leverage on a bandwagon effect to know very well the potential behaviour of their targeted customers and the possibility that they can influence the entire demand.

Imitation process is essential for innovation diffusion, the existence of a critical mass of players that offer products with new technology clearly determines in customers and distributors the idea that the new technology have a market potential so it should be adopted. However as we have seen, imitation process has certain delays generated by the development and acquisition of certain capabilities. The delays and difficulties in developing certain capabilities explain different performances between first mover and followers and among followers with different business models.

We explored the existence of alternative strategies for a relevant player that refuses to adopt innovation and tries to contrast the bandwagon effect. We can conclude that is unproductive to contrast the bandwagon effect when the largest part of the market is adopting innovation, furthermore a late adoption strategy can result in a permanent loss of market share.

Our analysis showed how is possible to use SD modelling tools to have an in depth view of industry dynamics generated by innovation diffusion. Relevant variables and main feedback loop structure that we identified with the present paper will constitute the starting point to build a simulation model that we plan to develop collecting specific empirical data on recent market evolution. In our simulation model we intend to focus on the investigation of the following aspects: the behaviour of specific groups of customers and the dynamic of innovation adoption in firms characterised by different business models.

## Credits

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The author is the sole responsible of the paper contents.

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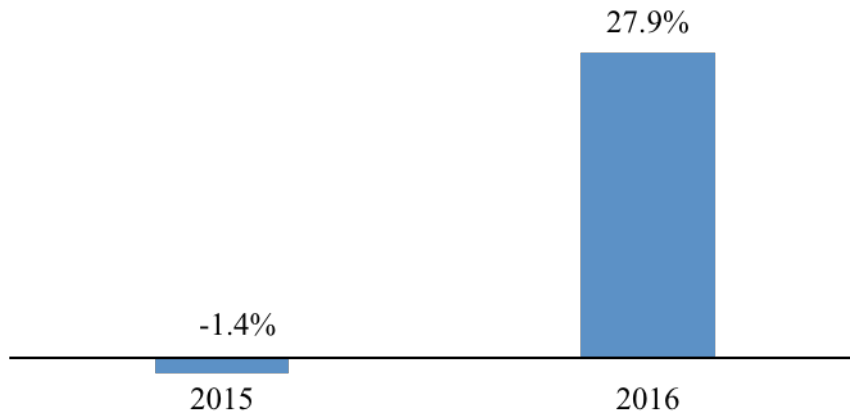
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<https://cspinet.org/topics/palm-oil>
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**Annex sources:** elaboration on GFK data

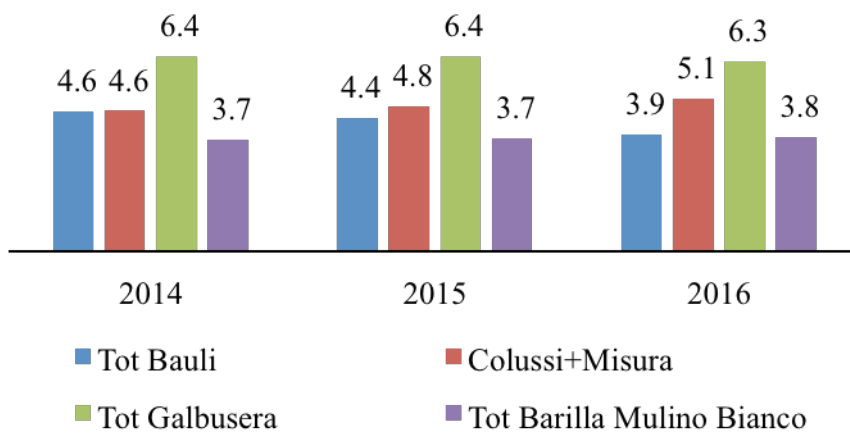
**Annex 1.** Investments in communication made by leading players in the Italian bakery industry

<b>Company</b>	<b>Jan-Sept 2015</b>	<b>Jan-Sept 2016</b>	<b>Δ 15-16</b>
MULINO BIANCO	9.175.282	12.106.561	31,9%
PAVESI	7.156.986	7.400.759	3,4%
BALOCCO	3.738.803	4.227.193	13,1%
COLUSSI	-	3.397.726	n.a.
SAIWA	1.581.391	2.903.344	83,6%
DORIA	-	2.084.281	n.a.
GALBUSERA	1.402.424	1.629.100	16,2%
BALCONI	1.296.025	1.502.700	15,9%
DIVELLA	993.327	624.230	-37,2%
CAMPIELLO	596.462	620.475	4,0%
BAULI	5.014.402	580.340	-88,4%
DI LEO	29.659	550.545	n.a.
GENTILINI	-	372.549	n.a.
MELEGATTI	186.169	252.568	35,7%
<b>TOTAL</b>	<b>31.170.930</b>	<b>38.252.371</b>	<b>22,7%</b>

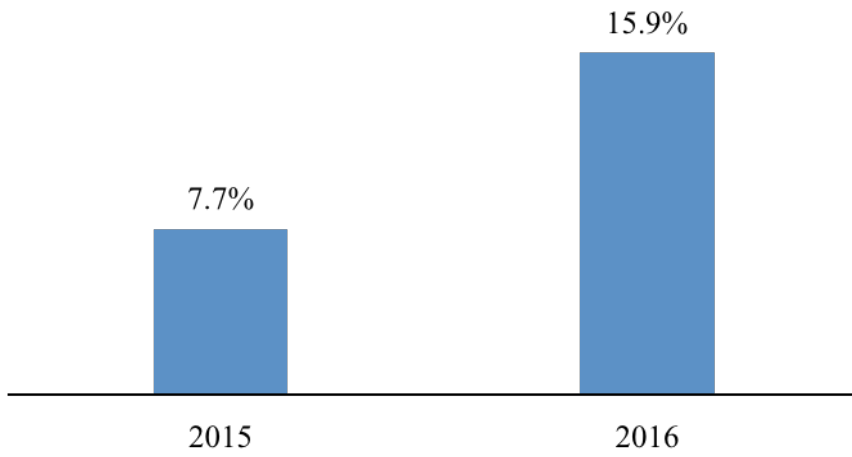
**Annex 2. Colussi market share growth, cookies  
(value)**



**Annex 3. Cookies average price**



**Annex 4. Colussi market share growth, sweet snacks  
(value)**



**Annex 5. Sweet snacks average price**

