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Technological clusters as a hub for the innovation: from the theoretical model to an Italian regional case study in the agrifood sector

Innovations are necessary for growth and competitiveness. Although agrifood production represents a pillar of Italian economy, it suffers a low propensity towards innovation. In line with current EU policy strategies, the creation of regional clusters promotes the innovation in order to increase the competitiveness of companies. This work aims to investigate the needs for innovation among SMEs in Italy, through a survey conducted on a regional cluster in Marche Region. Findings show a clear propensity of companies to innovate, although they face some structural constraints. Improving quality in each step of the supply chain is found to be the most relevant demand for innovation, being a successful strategy both for companies to compete in the global market and for the regional development.

1. Introduction

Food and drink industry represents a key pillar of the European Union (EU) economy, outperforming other manufacturing sectors. According to Food Drink Europe (2015), this sector is the largest manufacturing industry within the EU in terms of turnover (1,244 billion €), value added (1.8% of EU gross value added) and employment (4.2 million people). In addition, EU is the largest exporter and importer in the world, after USA (EU, 2016). In 2012, EU research and innovation for food and beverage sector counted for 2.8 billion €, driven especially by the following consumer expectations: pleasure, health, physical, convenience and ethics. These evidences are common for the Italian agrifood sector, due especially to Made-in-Italy brand. In 2014, the Italian agrifood industry was the second most important sector in terms of turno-

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ver (132 billion €), after metal and mechanical engineering industries (Marras *et al.*, 2014). Nowadays, the agrifood sector faces a constant increase of competitiveness, being relevant for EU and Italian economy. However, as suggested by many authors (Christensen *et al.*, 1996; Grunert *et al.*, 1997; Garzia-Martinez and Briz, 2000; Rama, 2008; Minarelli *et al.*, 2015), the agrifood sector shows a low intensity in research and development, especially for small and local farms and enterprises as at regional level. For instance, although the agrifood represents a leading sector in Marche Region, it registers a low propensity towards innovation. According to an official report (Lucchetti, 2017), in 2016 the agrifood sector in Marche Region accounted for 29,541 active companies, representing the 20% of total companies. With a total number of 30,700 employees, these companies produced about 1,184 million € (3.3% of the GDP of the region) in the same year. The agrifood sector of Marche Region includes both companies in the primary sector (26,806 for agriculture, 258 for forestry and 688 for fisheries) and manufacturing enterprises producing food and drink (1,694 and 95 companies, respectively).

The innovation process is a complex phenomenon, involving all the activities that participate in the making and transfer of scientific or technical knowledge into new or modified products and services as well as new processing techniques. At the farm level, innovation strategies aim at both increasing the efficiency (i.e., to achieve maximum benefits from the existing products) and creating new opportunities to face changing markets. This is evident in the Italian agrifood sector that, while being relevant to promote the economic competitiveness (especially in terms of turnover), shows only low research and innovation levels. This is due to the typical small size of Italian agrifood firms as small and medium enterprises (SMEs), which commonly can not commit on innovation in isolation, since they face some constraints (e.g. reduced financial capabilities) that restrict the possibility of introducing innovation in the firm, especially with regard to new products. However, it is worth remembering that small companies are not necessarily of low quality; in fact, they support local production of high quality and employment (Giampietri *et al.*, 2016a) to some extent, especially in marginal areas (Finco *et al.*, 2017).

In line with the EU-2020 strategy, that emphasizes the role of clusters to spread the innovation among the firms, Marche Region has implemented the Cluster Agrifood CIAM, representing a means to connect local actors involved in the agrifood sector in order to spread its innovation and competitiveness (Galvez-Nogales, 2010). Consequently, in order to support the implementation of S3 strategy at regional level, CIAM has provided its first operative contribution by means of performing an explorative survey among agrifood SMEs to reveal their potential for innovation.

This paper aims at sharing the experience of CIAM, presenting the above mentioned survey as a case study; in particular, the investigated agrifood SMEs were asked to elicit and describe their need for innovation through an e-mail questionnaire.

2. The EU innovation policy

According to the Oslo Manual, an innovation is

the implementation of a new or significantly improved product (good or service), or process, a new marketing method, or a new organizational method in business practices, workplace organization or external relations. The minimum requirement for an innovation is that the product, process, marketing method or organizational method must be new (or significantly improved) to the firm (Mortensen and Bloch, 2005).

Started during the 60s, until the 90s the European Innovation Policy was developed through different measures that complemented research and industry policies. The first action plan supporting innovation was adopted by European Commission in 1996. Furthermore, the Lisbon Strategy added new trajectories in 2000, with the broader objective of increasing EU competitiveness in terms of research and innovation. In 2004 a mid-term evaluation of the Lisbon Strategy started and a task force was appointed by the European Council to work out a proposal on how to relaunch the strategy. This process led to a revised strategy which was approved in March 2005. The new integrated guidelines provided some specific areas for priority actions, and identified clusters in Europe as one of the nine strategic priorities for successfully promoting innovation. The new strategy reaffirmed that the dynamism of the European economy was crucially dependent on its innovative capacity and invited Member States to introduce innovation as a topic in their national reform programs (NRPs). Consequently, all the Member States developed their NRPs and submitted them to the European Commission for the first time in 2005, covering a three-year period until 2008. According to the renewed Lisbon Strategy, in March 2008 the European Council confirmed that the integrated guidelines would have remained valid all over the period 2008-2010. In 2010, research and innovation policies became one of the main tools available to promote the economic recovery and sustain EU growth in recent years. In this context, the adoption of a “Smart Specialization Strategy” (S3) was one of the recommendations put forward by the Innovation Union flagship initiative to increase the impact of Member States’ research and innovation policies.

According to EU Reg. 1303/2013, S3 refers to

national or regional innovation strategies which set priorities in order to build competitive advantage by developing and matching research and innovation own strengths to business needs in order to address emerging opportunities and market developments in a coherent manner, while avoiding duplication and fragmentation of efforts.

The Commission proposed the submission of a Smart Specialization Strategy being the *ex ante* conditionality in order to access to structural funds in the 2014-2020 period. In June 2011, the European Commission launched a 'Smart Specialization Platform' (S3 Platform) in order to assist regions and Member States to develop, implement and review their research and innovation strategies. At Italian level, the NRP identifies 12 specialization areas which take into account the industrial weight of their related production sectors, including the agrifood sector. Successively, the Italian Ministry for Economic Development (MISE) and the Ministry for Education, University and Research (MIUR) defined the National Smart Specialization Strategy (SNSI). Its main aim was to coordinate the interventions among the different levels of government in order to avoid duplications and encourage the synergy among the different actors involved. The SNSI identified five thematic national areas of specialization as: sustainable and smart industry, energy and environment; health, diet and quality of life; digital agenda, smart communities and intelligent mobility systems; tourism, cultural heritage and creativity industry; aerospace and defense. In parallel with the SNSI, 21 Regional Smart Specialization Strategies were created. Thus, the S3 both at regional and national level represents the strategic framework for the design and implementation of research, technological development and innovation policies. Nowadays, in Marche Region the S3 strategy focuses on four main areas as: mechatronics, ambient assisted living, sustainable manufactory, welfare and wellbeing. In particular, the agrifood sector is included in the last area, aiming to achieve the sustainable competitiveness of farms and companies, while addressing the EU challenge related to food security. For the implementation of the strategy, several priorities have been defined such as fostering collaboration between SMEs and research and innovation institutions, supporting international networking, creating favorable conditions for new innovative businesses and implementing ICT instruments such as technological platforms. In order to transform these priorities into actions, Marche Region has foreseen some specific interventions within its Regional Operative Plan, aiming to create new partnerships between universities and enterprises, spin offs and start ups, services and infrastructures, as well as SMEs placement of researchers and new and wider collabo-

rations between European and other international stakeholders involved in research and innovation. In this context, three innovating clusters have been created in Marche Region in the following sectors: agrifood, domotic and sustainable manufacturing. Thus, the creation of innovative clusters is a good premise for the implementation of smart specialization (Foray *et al.*, 2011; Foray and Goenaga, 2013). Clusters and S3 are both concerned with fostering the competitiveness of regions by leveraging the economic potential from a critical mass of key interacting actors and specific place-based assets (Aran-guren and Wilson, 2013; Ketels *et al.*, 2013).

3. From porter's theory to new technological clusters

Clusters and networks are seen as one way to increase the chances to compete by generating synergies among the stakeholders and play an important role in the innovation process (Neven and Drögen, 2001; Janszen, 2002; Pittaway *et al.*, 2004; Daskalakis and Kauffeld-Mons, 2005, 2007; Musso and Francioni, 2015). According to Menrad (2004), companies prefer recurring to innovation as members of a network of different actors, instead of being isolated. Over the past decades, indeed, innovation became strongly directed by cooperation, as enterprises' flexibility and their ability to interact with other actors were found to bring the innovation to success (Camps *et al.*, 2004).

The cluster concept represents a subject of intense research studies and economic analysis (Rosenfield, 1997; Kuah, 2002; Cruz and Teixeira, 2010; Boja, 2011; Delgado *et al.*, 2014). Due to both globalization and the need of integration within EU policies, clusters and other organized ways of collaborating to increase the competitiveness of a region represent a political issue, nowadays (Beckeman and Skjoldebrand, 2007). Bosworth and Broun (1996) defined clusters as «the geographical concentration of industries which gain advantages through co-location». According to Porter (1998), clusters are

geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (for example, universities, standards agencies, and trade associations) in particular fields that compete but also co-operate.

Thus, clusters are found to drive productivity and innovation: firms that are located within a cluster, indeed, can transact knowledge more efficiently, share technologies, operate more flexibly, start new businesses more easily, and perceive and implement innovations more rapidly (Porter, 2007). According to Porter (1990), an innovation

includes both improvements in technology and better methods or ways of doing things. It can be manifested in product changes, process changes, new approaches to marketing, new forms of distribution, and new conceptions of scope.

Being a type of economic agglomeration, clusters are formed by firms involved in the same field of production and in which the innovation is an important force that motivates the competition and the development of firms. In line with this, Malmberg *et al.* (1996) provided a model to better understand different types of agglomeration, highlighting their conceptual differences with clusters: there are four kind of economic agglomeration known as “dimensions”, as: metropolis/urban agglomeration; industrial districts; creative regions/innovative agglomeration; clusters. The first one (metropolis) relates to general economies concerning all firms and industries within a particular location, attracting a wide range of economic activities and therefore it is suitable for headquarters of large international corporations. Moreover, the second type (industrial districts) comprises economies that relate to firms engaged in correlated industries. These two types of agglomerations can be explained mostly by efficiency and flexibility. The other two types, creative regions and clusters respectively, can be explained as centers of knowledge creation and innovation. Emphasis is put on regional variety of skills and competencies where the unplanned interaction among different actors might lead to new and unexpected ideas and creative designs, products, services and business concepts (Fronkova, 2012). The members of clusters are involved in synergistic relationships that leverage the economic development from shared access to marketing intelligence, supply chain management, knowledge and information flows (Lee *et al.*, 2015). Indeed, clusters affect competition in three ways. Firstly, by increasing the productivity of companies based in the area. Secondly, by driving innovation’s direction and pace, which underpins future productivity growth. Finally, by stimulating the formation of new businesses, which expands and strengthens the cluster itself. A cluster allows each member to benefit as if it had greater scale or as if it had joined with others formally (Porter, 1998). According to Boja, (2011) the economic development based on cluster models represents a policy adopted by many economies that can, theoretically, bring multiple benefits in terms of regional development and industrial competitiveness. In addition, it can generate an economic environment that more easily can adapt itself to events such as economic crises or other social transformations. However, it can be expected that the possible benefits of regional networks depend upon the characteristics of the firm and the specific region (Gellynck *et al.*, 2006, 2007). Based on this theoretical framework, nowadays cluster model has been reintroduced, both at national and regional level (Daniel *et al.*, 2011), as an economic phenomenon in which many businesses gen-

erate synergies to gain different economic advantages and spread innovation. In Italy, national technological clusters collect different stakeholders in different fields as: aerospace, agrifood, green chemistry, smart factory, vehicles and systems for ground and maritime mobility, life sciences, technologies for life environments, technologies for smart communities. In addition, such clusters are retraced at regional level, involving SMEs, to enhance local development and economy. In particular, the innovation in agrifood sector represents an important objective for Europe (Dwyer, 2013). However, it assumes a complex issue due to the necessary incorporation of all the actors involved in the food supply chain, especially producers and processors. In this context, the current Common Agricultural Policy (CAP) 2014-2020 has included innovation within its second pillar as an horizontal priority, in order to contribute to the territorial development. Accordingly, the new Rural Development Policy (Reg. EU 1305/2013; art. 53, 55, 56, 57) introduced some new instruments as the European Innovation Partnership (EIP), the Operational Groups (OGs) and different technological clusters, representing the most suitable hub to spread the innovation. More specifically, the EIP represents a new approach to coordinate the innovation process actors in a specific area; it consists in an interactive platform where a multiplicity of OGs can share knowledge, experiences and projects built around a concrete innovative idea. Accordingly, as above mentioned, OGs are a key element of EIP, bringing together the innovation stakeholders as farmers, researchers, advisors, businesses, consumers or other NGOs to advance innovation in different fields as the agrifood sector (EC, 2014). Hence, the promotion of innovation represents itself the real innovation of the current CAP: being strategically transversal, it has been necessarily incorporated into the integrated process of rural development (Giampietri *et al.*, 2015). In line with this, the Cluster Agrifood Marche (CIAM) provides a representative example of regional network (Bentivoglio *et al.*, 2016). CIAM was born in Marche Region (Italy), in April 2015, with the legal form of an unincorporated association. Being part of the Italian National Agrifood Cluster (CIAN), it is the result of a combination of different actors, such as universities and other research institutions, local companies, service companies and professional associations. Accordingly, CIAM's aim is to connect the regional policy strategies for the innovation to specific needs of local production. Nowadays, CIAM includes 69 members. It offers a constructive way to shorten the dialogue between the public and the private agrifood sector, successfully contributing to the local rural development. In line with EU policy and the above mentioned cluster models, CIAM's mission is to increase the competitiveness of local companies and all the other stakeholders involved in the field of food, nutrition and health. Starting with an interdisciplinary approach that aggregates multiple skills, CIAM's search for innovation focuses on different top-

ics as: food traceability, certification, nutrition and health claims; food supply chains management; functional foods and nutraceuticals; precision farming; territorial marketing; agrifood waste and by-products valorization; technology for high quality products; new market opportunity and internationalization.

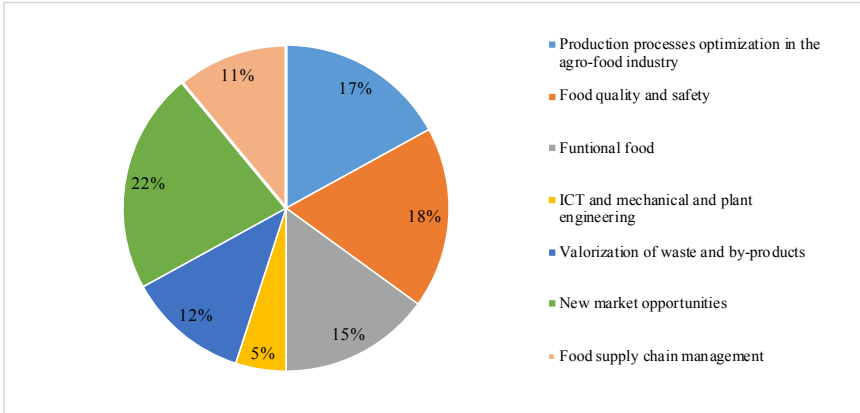
4. Data and methods

CIAM activities were carried out to support the development of the S3 strategy in Marche Region, which was implemented through a regional mapping, in order to identify the agrifood sector's priorities. In details, to explore the need for innovation in the agrifood sector at regional level, an e-mail questionnaire was administered on a sample of 91 SMEs between August 2015 and January 2016, including both actual and potential new members of CIAM. Although it was previously sent to a wider number of firms, the final amount of fully answered questionnaires is, however, provided to be illustrative and not definitive or comprehensive for the analysis. The questionnaire was divided into four sections. In particular, the sample of descriptive profiling (e.g. contact person identity, size of the company and the related sector) (section 1) was followed by questions investigating a previous participation to EU, national and regional innovative projects (section 2). Moreover, different questions investigated the specific field in which the innovation could be addressed (section 3) and, finally, an open-ended question was used to elicit the innovative idea of the respondent (section 4). In relation to section 3, seven questions investigated respondents' need for innovation within the following seven different fields of application: 1) production processes optimization in the agrifood industry; 2) food quality and safety; 3) functional food; 4) ICT and mechanical and plant engineering; 5) valorization of waste and by-products; 6) new market opportunity; 7) food supply chain management.

5. Results

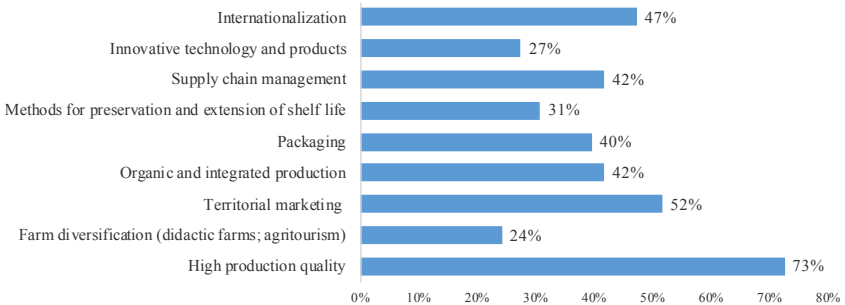
In relation to the first section, the sample was made of farms (51%), food processing SMEs (27%), service companies and professional associations (13%), firms associations (3%), university (2%), private research institutions (2%) and agro-tourism and restaurants (2%). Moving on section 2, only a minority of respondents (34%) stated they had participated to previous research and innovation call for tenders at EU (36%), national (36%) and regional (28%) level. In relation to the next section (Fig. 1), the following three main areas requiring technological innovations were chosen: new market opportunities (22%), food

Fig. 1. Areas of innovation



Source: Our elaboration.

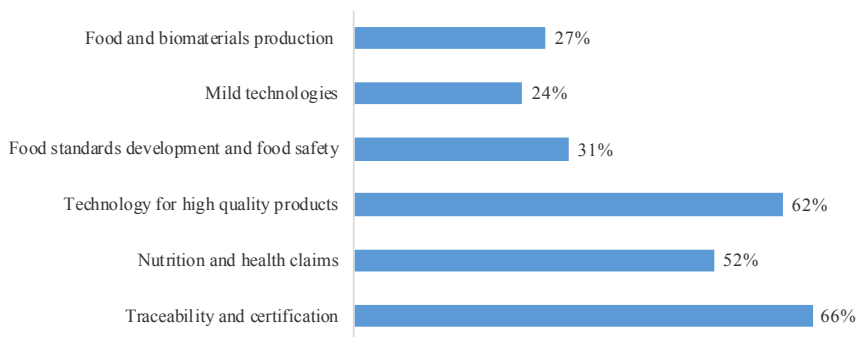
Fig. 2. The innovation fields to achieve new market opportunities



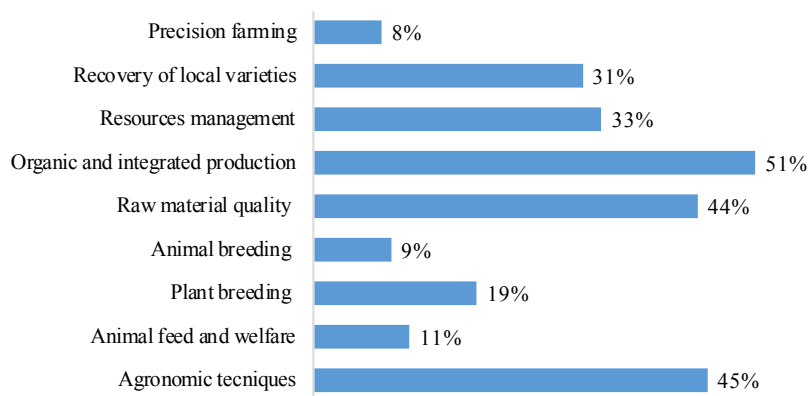
Source: Our elaboration.

quality and safety (18%), and production processes optimization in the agro-food industry (17%).

Among those included in Figure 1, we now focus on the three main fields of innovation that were chosen. In relation to identify new market opportunities, Figure 2 shows that the majority of the sample (73%) requires to improve the quality of their production in order to compete in a global market, followed by respondents' looking for enforcing territorial marketing strategies (52%) and, as suggested by Gellynck *et al.* (2006; 2007), to achieve the internationalization (47%) and increase their growth. Small companies generally boast a national or regional market orientation. Thus, it is important to both

Fig. 3. The innovation fields to achieve food quality and safety

Source: Our elaboration.

Fig. 4. The innovation fields to reach the optimization of production processes in the agri-food industry

Source: Our elaboration.

optimize the flow of research and knowledge internally at the country and, at the same time, to stimulate firms to open up to new market opportunities, as abroad; however, companies, in particular the small ones, denounce some difficulties in setting up procedures and partnerships for that purpose. It has been demonstrated that clusters play an important role in the process of firms' internationalization (Valdaliso *et al.*, 2011; Parrilli, 2016): indeed, they can support firms in relation to their intention to export and also to increase the

attractiveness of marginal territories for direct investments from other countries (Kowalski, 2014).

As above mentioned, the second most relevant field of innovation is related to food quality and safety issues. As shown in Figure 3, in order to achieve this goal, the majority of the sample (66%) confirms the importance of improving the traceability and certification schemes of their products, followed by the enhancement of technological production processes (62%). Moreover, obtaining nutritional and health claims turns out to be relevant in order to valorize products' nutraceutical properties, in line with the current market expectations and consumer preferences (Kühne *et al.*, 2010; Giampietri *et al.*, 2016b, 2017). The network integration helps to increase the quality of local food products through the improvement of the traceability of food origin and thus food security (Bosona and Gebresenbet, 2011). Quality can be reached through different innovative strategies as: the sustainable production (e.g. organic) and selection of qualitative raw materials; the optimization of technological production processes as well as the use of more performing traceability and certification schemes along the production and supply chains.

Finally, in relation to the interest in enhancing the optimization of production processes in the agrifood industry (Fig. 4), respondents mostly stated to be interested in investing on organic and integrated production methods (51%), followed by improving agronomic techniques (45%) and achieving raw materials of high quality (44%).

6. Conclusion

The ability of a country to increase research and innovation is a crucial element in terms of benefits for companies and, more generally, it leads to the renewal of economic competitiveness at all levels for all sectors. Over the last years, small companies showed an intense interest towards innovation but this has been found to be a difficult task for them. However, the creation of regional networks could overcome this difficulty, in line with Porter's theory. Nowadays, EU policies support the effectiveness and the potential contribution of cluster organizations to the smart specialization strategy. In this context, fostering clusters became an important objective of the policy agenda all over Europe, in particular at regional level. The research and innovation smart specialization strategies (RIS3) are advocated in a context where most European regions have established clusters, seeking to facilitate the cooperation between firms and between firms and public research institutions (i.e. University). In this context, the Cluster Agrifood Marche represents a valiant example, aimed at connecting local needs and the policy to support research and innovation,

by bringing together different actors that are involved in the agrifood sector (e.g. SMEs, research centers).

This work collected and investigated local needs for innovation of agrifood SMEs, in order to support the implementation of S3 strategy in Marche region. The analysis confirms the propensity of companies (also farms) to innovate, although this requires them to adapt to new strategies as cooperation and to new innovative productive frontiers, in order to compete in the global market. More in detail, our evidences point to the following three main fields, as being the most significant areas to realize the innovation process and to target specific financial resources: new market opportunities, food quality and safety, and the optimization of production processes in the agrifood industry, respectively. These fields of innovation are found to provide a sustainable alternative to the current agrifood scenario nowadays, in terms of both environmental and socio-economic impacts, leading to a wider territorial development in Marche Region. Clusters represent a new strategy with a deep local dimension, aimed at exploiting the advantages of proximity in order to promote the economic growth and the competitiveness of SMEs. Such innovative hubs have the potential to become a targeted tool for the implementation and development of the regional policy for innovation and to foster local development strategies, besides facilitating the coordination of bottom-up and top-down initiatives aiming at the innovation process. It is worth highlighting that this process is quite difficult for SMEs and farms which are notoriously reluctant to share their innovative ideas and to internally promote the innovation path. It follows that the horizontal and vertical cooperation among companies, policy and universities and research institutions may be the only viable approach to improve the innovation performance of firms (Zeng *et al.*, 2010).

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