

# Business models, intangibles and firm performance: evidence on corporate entrepreneurship from Italian manufacturing SMEs

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**Abstract** This paper examines the factors that affect firm performance in a sample of 376 small- and medium-sized Italian enterprises over the period 2000–2010. It looks in particular at changes in business models and investments in intangibles. We compared firms that continued to be managed through an existing business model with matched firms that changed their business model over the period. We found that a modification of the business model has a positive effect on the ability of the firm to perform well. There was also a positive complementary effect on performance of business model change and intangibles. These results are even more evident when business model changes were categorised by their degree of innovation, suggesting that business model innovation is core to firm performance and that intangibles are positive moderators. They play a crucial role in shaping the firm's competences, which favour the success of an innovative business model configuration.

**Keywords** Small and medium enterprises · Corporate entrepreneurship · Business model innovation · Italy · Intangibles · Firm performance

**JEL Classifications** L25 · L26 · L60

## 1 Introduction

In this paper, we define business model (BM) innovation as the action of modifying the firm's existing activity system and renewing its core business logic, to enact and exploit opportunities. This definition is consistent with the most recent literature on corporate entrepreneurship (CE), which considers BM innovation as a strategic entrepreneurship initiative (Schneider and Spieth 2013; George and Bock 2011). Business model innovation describes how the firm transforms itself with reference to where it was before and/or to the industry convention to pursue higher performance and competitive advantage (Morris et al. 2011; Kuratko and Audretsch 2013), allowing it to exploit and enact opportunities (George and Bock 2011).

Despite the acknowledged importance of this CE element, BM innovation studies are generally limited to the context of large, leading firms, usually in the high-tech and service sectors (Schneider and Spieth 2013). This has left BM innovation in small and medium enterprises (SMEs) largely unexplored, particularly in manufacturing sectors, despite their

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acknowledged worldwide economic relevance (Ayagari et al. 2007). Coherent with the idea that CE includes a set of interacting elements (Covin and Miles 1999), entrepreneurship scholars have recently stressed the importance of understanding how BM innovation interacts with other activities to affect firm performance (George and Bock 2011). In this paper, we submit that one of these activities is investment in intangible assets, defined here as expenditure on R&D and advertising (Delios and Beamish 2001; Dierickx and Cool 1989; Caves 1996). These types of investments can be seen as entrepreneurial strategies which allow a firm to create value by inventing new goods and services (R&D) and by commercialising them (advertising) (Ireland et al. 2001).

With this premise, we examined complementarity effects between BM change and intangibles. We studied the relationship between the extent of BM innovation and firm performance and how it is moderated by investment in intangibles. We aimed to offer a better understanding of *how* and *why* CE elements such as BM innovation and investment in intangibles can create value.

We used a longitudinal data set of Italian SMEs in the clothing sector which combined company financial information with survey data on firms' BM and intangibles over the period 2000–2010. Using a transactional event study, we evaluated the impact of changes in firms' BM (i.e. whether the firm changed its BM) and compared pre-change and post-change performance over a 3-year window before and after the event. The within-firm variations in accounting measures of performance allow controlling of time-invariant firm characteristics that might affect both performance and the decision to shift from one BM to another, but cannot be controlled in a cross-sectional setting.

We found that a modification of the BM had a positive effect on the ability of the firm to perform well. Intangibles also showed a positive impact on performance. The evidence of complementarity was confirmed: companies that linked a modification of their BM to an investment in intangible assets were found to be better performers than those that did not. To offer a more detailed view of this relationship, we classified BM changes according to their level of innovation and studied their relationship with firm performance, and how it was moderated by investments in intangibles. When classified in terms of innovation, BM changes emerged as an even more crucial determinant of firm

performance. Intangibles were confirmed as significant positive moderators of this relationship. In other words, the more innovative the BM change, the greater the effects on performance and the more robust the positive moderation role of intangibles.

This paper contributes to the CE literature in three ways. First, we offer empirical evidence for the idea that BM innovation is an important vehicle of CE (Morris et al. 2011). It allows firms to redesign their core BM(s) and differentiate themselves from competitors in ways valued by the market (Kuratko and Audretsch 2009; Covin and Miles 1999). Second, we go beyond the literature on BM innovation (e.g. Morris et al. 2011; Amit and Zott 2012) and investments in intangibles (e.g. Arrighetti et al. 2014; Villalonga 2004) as independent variables. Instead, we analyse their complementarity to explain firm performance. We therefore show the contingent nature of CE and address the challenge of moving towards a better understanding of the combination of circumstances that leads to successful outcomes of CE initiatives (Corbett et al. 2013: 818). Third, our finding that more innovative BM changes have greater effects on performance confirms that innovation is at the centre of the network of activities that is CE (Ireland and Webb 2007). The finding that this relationship is positively moderated by investments in intangibles offers empirical support to the idea that, while innovation is necessary, 'there is more to CE than innovation' (Covin and Miles, 1999: 49–50). This missing element is the adoption of strategies such as investment in intangibles, which energise the firm and allow the creation of bundled resources (such as R&D and advertising) for the exploitation of opportunities and the development of competitive advantage (Ireland et al. 2003).

The paper is structured as follows: Sect. 2 presents the theoretical background and develops the hypotheses; Sect. 3 provides the study context and sample structure; Sect. 4 presents the empirical model and results of the empirical analysis; and Sect. 5 discusses some implications and draws conclusions.

## 2 Hypotheses

Corporate entrepreneurship, and in particular its component, strategic entrepreneurship, involves opportunity- and advantage-seeking behaviours (Ireland et al. 2003). Business model innovations are

considered to be among the most important elements of strategic entrepreneurship initiatives (Ireland et al. 2003), and the CE literature emphasises an opportunity-driven mindset, where the company management seeks to achieve and maintain a competitive advantage (Ireland et al. 2001). However, while opportunities represent the possible set of services and goods that can be sold at any given point in time, opportunities *per se* are valueless. For firms to build a competitive advantage, they must successfully design and innovate BMs that exploit specific opportunities (Ireland et al. 2001; Eckhardt 2013). Hence, our understanding of BM innovation is central to the development of the literature in CE.

BM research is gathering speed, but receiving some sceptical reactions because many BM definitions are all-inclusive and make it very difficult to see what the BM is *not*, and how it differs from the company or the organisation in general (Arend 2013). To avoid the risk of carrying out research with little added value, it is essential to define the BM carefully and show how it is distinguished from other concepts (Zott and Amit 2013).

Although a unique definition of BM does not exist, a recent literature review concluded that BMs are a holistic way of describing how companies operate, seeking to explain value creation, value delivery to customers and value capture by the company (Zott et al. 2011). This conceptualisation is generally consistent with the mainstream literature on BM (Casadesus-Masanell and Ricart 2010; Chesbrough and Rosenbloom 2002; Teece 2010). As the focus of this study was on SMEs in the clothing sector, we defined SMEs' BM as 'the design of organisational structures to enact a commercial opportunity' (George and Bock 2011: 99). Instead of focusing on the BM *per se*, we analyse the strategic entrepreneurship decision to change and innovate a BM (Ireland et al. 2009). The details on how we operationalised BM innovation are presented in the Methods section.

Although particular BM changes are not innovative to the industry, they may be new for the business itself and involve behaviours that are simultaneously opportunity- and advantage-seeking (Ireland et al. 2003; Kuratko and Audretsch 2013), a typical element of CE. Additionally, there seems to be agreement in the literature that BMs facilitate a firm's success when they are dynamic. A recent literature review revealed 'an increasing consensus that business model

innovation is key to firm performance' (Zott et al. 2011: 1033). Studies have confirmed that novelty-centred BM design positively affects the performance of entrepreneurial firms (Zott and Amit 2007).

BM change can be related to the need to exploit new opportunities (Markides 2008) or adapt in parallel to the firm's lifecycle advancement (Andries and Debackere 2007). Business model change is also described as a vehicle for firm rejuvenation (Demil and Lecocq 2010; Ireland et al. 2001; Johnson et al. 2008; Sosna et al. 2010).

This supports the idea that BM change can be particularly beneficial in contexts where competition, risk and uncertainty are high, which is the situation in the clothing sector.

We therefore propose:

**Hypothesis 1** A firm's BM change positively affects its performance.

Corporate entrepreneurship literature suggests that, to be successful, both new and established firms need to be simultaneously strategic and entrepreneurial (Ireland et al. 2001). Specifically, strategic choices such as investments in R&D and advertising are the means by which entrepreneurial behaviours can be carried on and new products and services invented and commercialised (Erickson and Jacobson 1992). In recent years, increasing effort has been devoted to finding suitable measures of such investments through two major approaches: aggregate estimates derived from firms' expenditures on 'intangibles' (e.g. Corrado et al. 2005) and direct measures of stocks originally reported as intangible assets on companies' balance sheets (e.g. Marrocu et al. 2012). In both cases, empirical evidence acknowledges that intangible assets are key resources for firms' competitiveness (Arrighetti et al. 2014).

At the firm level, despite the different ways of measuring, the literature suggests that intangible assets account for a large part of corporate assets. For example, Hulten and Hao (2008) found that, in the case of US firms, R&D expenditure and other intangible assets such as advertising represent an important share of the total value of assets. Similar results have also been found in other countries such as the Netherlands (van Rooijen-Horsten et al. 2008), Italy (Bontempi and Mairesse 2008), the UK (Marrano et al. 2009) and Japan (e.g. Fukao et al. 2009). It must also be noted that both scholars and policymakers recognise

the growing role played by intangible assets on firms' investments (e.g. Hulten and Hao 2008; Marrocu et al. 2012; Bontempi and Mairesse 2008).

After having recognised intangible assets as an important part of entrepreneurial behaviour (e.g. Pitelis and Teece 2010), the focus of the debate has shifted to the effects of investments in intangible assets on firms' performance (Delios and Beamish 2001; Heiens et al. 2007; Marrocu et al. 2012). For instance, Bontempi and Mairesse (2008) found that, despite the great difficulties in measurement, firms' accounting data on intangible assets possess real informative content and unveil positive effects on firm performance; a few years later, this result was confirmed by Marrocu, Paci and Pontis (2012). A positive contribution of intangible assets to both firm- and industry-level productivity has also been found recently (e.g. Marrocu et al. 2012; O'Mahony and Vecchi 2009). These studies, which derive from different disciplines including economics, business and management, provide consistent findings and show how an entrepreneurial strategy, such as investing in R&D and advertising, can be important for firm success.

We therefore propose:

**Hypothesis 2** A firm's investments in intangible assets positively affect its performance.

It is generally recognised that BM can be both an enabler and a limitation on entrepreneurial growth and exploitation of resources and investments (Amit and Zott 2001; Mahadevan 2000; Morris et al. 2005). One could logically argue that BM change, as a way to create and appropriate value, involves designing a modified or new activity system and mainly relies on recombining the firm's existing resources (Zott and Amit 2013). It may, therefore, not necessarily require significant investments in intangible assets. However, Kuratko and Audretsch (2009) pointed out that BM changes, like all the other focal points of strategic entrepreneurship, represent the tools through which opportunities are realised. This is increasingly true for both large and small enterprises (Purcarea et al. 2013).

Even though CE initiatives are the result of important decisions taken after careful reflection, researchers often ignore CE's unique relationship to firm strategy, structure, and process (Dess et al. 1999) and the importance of strategic fit in the CE process as a condition of higher performance (Covin and Miles

1999). To date, we have tended to study firms that have successfully adopted CE approaches, such as BM change and investment in R&D and advertising, as if these CE elements were independent. An advancement of the CE field can be obtained in this case by considering that BM change and investment in intangibles are complementary, showing that CE elements are neither casual nor alienated from the rest of the organisation (Zahra and Wright 2011). Specifically, improved performance depends both on the BM's ability to keep pace with the changing dynamics of the market and eventually to exploit and enact opportunities and on the ability to increase the quantity sold and price charged to clients. Empirical results showed that R&D investments help develop technological know-how, while advertising is important to develop brand equity and differentiate (Mosakowski 1993), as an isolating mechanism and as an entry barrier (Lieberman and Montgomery 1988; Mitchell 1989). In terms of investment choices, empirical data indicate that investments in intangibles such as advertising and R&D are intertwined with a firm's BM dynamics (Casadesus-Masanell and Ricart 2011).

Business model changes can therefore yield low value unless accompanied by expenditure in R&D and advertising. A firm's investments in R&D and advertising can help it to learn and absorb new knowledge more efficiently, to develop a distinctive innovative capability (Kor and Mahoney 2005). This innovative capability is central to pursuing successful BM changes. In summary, firms that change their BM and also invest in R&D and advertising can further increase their performance by selling better products and/or by selling with a stronger brand. They can, therefore, obtain a higher markup, sell more of the same product or both.

Conversely, BM changes can be a way to allow investments in intangibles to have a positive effect on firm performance. A change in the firm's BM can capture value from innovation (Chesbrough and Rosenbloom 2002), and firms must adapt their BM to industry changes (Andries and Debackere 2007), because technological progress (achieved through R&D investments) and new customer preferences (captured through investments in advertising) represent an opportunity for BM changes (Casadesus-Masanell and Zhu 2013). Not only must the firm invest in R&D and advertising to develop its intellectual property and brand, but it must also generate and

implement the complementary BM changes needed to exploit the resources generated through those investments (Teece 2007).

BM change might serve as a vehicle to obtain access to novel information and technological knowledge, which are not available through the old BM and which can further be used in the firm's innovation process. However, the benefits achievable through BM change depend on firms' learning abilities, which will influence the quality of intangible investments themselves (De-Young 2005). Furthermore, firms' learning abilities may increase precisely through BM changes. In this study, we contend that BM changes and investments in intangibles are in fact complementary activities (Milgrom and Roberts 1990) for SMEs' performance.

We therefore hypothesise:

**Hypothesis 3** Business model change and investments in intangibles are complementary activities for firms' performance. That is, the performance gains from engaging in one activity increase if a firm also engages in the other.

In this paper, we also suggest that the effects of BM changes on performance vary according to the level of their entrepreneurial intensity, namely their degree of innovation and proactivity (Anderson et al. 2014).

Business model changes use two different approaches: an entrepreneurial approach or a more passive, adaptive one (Schneider and Spieth 2013). In the first case, BM changes present high levels of innovation and are generally done proactively by firms wanting to exploit emerging opportunities, experiment with new ways of doing business and trigger typical first- or early-mover actions (Dess et al. 1997; Lynn et al. 1996). Such *BM innovations* lead to the implementation of a fundamentally different BM in an existing business (Markides 2006) which changes the core business logic, the resources needed and the firm's position in the industry (Schneider and Spieth 2013). In the second case, *BM change* is carried out merely to adapt to the market structure and/or to respond to customers' existing, expressed needs (Schindehutte et al. 2008; Andries and Debackere 2007). In this case, the core business logic of the firm is refocused on certain activities that do not require any entrepreneurial effort in terms of innovativeness and pursuit of emerging opportunities.

The entrepreneurial approach to BM change (BM innovation) can arguably lead to improved firm

performance (Schneider and Spieth 2013). An entrepreneurial approach towards BM change allows the firm to change the rules of the game by, for example, addressing latent customer needs, increasing customer value and modelling existing market structures (Jaworski et al. 2000; Kumar and Scheer 2000; Schindehutte et al. 2008). On the other hand, there is also the risk that such first- or early-mover advantages will be difficult to obtain, for example, because innovations in the BM can fail or be excessively expensive, or because competitors take immediate advantage of the firm's entrepreneurial effort with follower stances (Lieberman and Montgomery 1988).

One way to minimise these risks while successfully introducing highly innovative BM changes is to accompany this entrepreneurial behaviour with investments in R&D and advertising. Investments in R&D lead to increased experimentation and innovative capability that can, when well-protected, create entry barriers that reduce risk of the appropriation of first and early movers' advantages by followers (Covin and Miles 1999). Investment in R&D can also reduce the risk of creating innovative BMs that do not work, since it offers the necessary concrete support to product and process innovation that is usually needed with very innovative BMs (Morris et al. 2011). Finally, by facilitating innovation, it contributes to the process that leads the firm to anticipate and even create new customers' needs (Zahra et al. 1999).

Similarly, investments in advertising support entry to new product/market domains (Barrett and Weinstein 1998) and help communicate with customers to tell them about the new value created thanks to the innovative BM (Garvin and Levesque 2006). Investment in intangibles also allows the firm to gain the resources and develop capabilities needed to support entrepreneurial behaviours such as BM innovations which aim to identify and exploit opportunities (Ireland et al. 2003).

For these reasons, we suggest that investments in R&D and advertising are a necessary condition to support and legitimize innovative changes in BMs and make them economically successful. Investment in R&D and advertising can therefore be seen as a positive moderator that allows an entrepreneurial firm which introduces an innovative BM to achieve significant value improvements for customers and high growth for itself (Schlegelmilch et al. 2003).

We therefore propose:



**Hypothesis 4** The positive effects of BM change on performance increase with the innovation intensity of such changes and are positively moderated by investments in intangibles.

### 3 Study context and data

We used a data set that collects information on BM for a sample of 376 Italian SMEs in the clothing industry. The data set, which contains disaggregated information at the firm level, was built by matching two complementary sources: (1) a cross-sectional survey data set, collected directly from the companies using questionnaire-based phone interviews, and (2) an accounting data set that consists of the company accounts of the interviewed firms from 2000 to 2010 (AIDA Bureau van Dijk).<sup>1</sup> Financial information includes data on intangibles.

The questionnaire was addressed to the ‘person in charge of major company decisions’. Analysis of the formal titles of the responding executives showed that 89 % were owners or CEO/presidents, 5 % were general managers, and 6 % were other senior executives. The companies were selected if they were active firms located in Italy, operating in the clothing industry (the 4-digit Ateco codes were 1411, 1413, 1414 and 1439)<sup>2</sup> and employing between 10 and 500 employees.<sup>3</sup> In total, 1,508 Italian companies matched

these criteria (ISTAT, Istituto Nazionale di Statistica, 2001). Of these, 56 % (844 firms) were considered appropriate for our analysis, because their financial information was available in the AIDA database. The remaining 664 firms were excluded because they were not obliged to file their financial data in the Public Registry. Phone interviews with all the companies were conducted between March and May 2012. A total of 408 firms answered the questionnaire: a subgroup of 32 companies was excluded from the analysis because of incomplete financial information, resulting in a final sample of 376 firms. Two-sided *t* tests on the difference of mean were performed for firm size (measured with total sales and employees) and intangibles (R&D and advertising capitalised expenditures on sales). The results indicated no response bias. The response rate was 44 % (24.9 % when calculated based on the total number of firms in the Italian clothing industry), in line with the average response rates reported in similar studies (Baruch and Holtom 2008).<sup>4</sup>

## 4 Empirical analysis

### 4.1 Empirical methodology

We followed several steps to test our hypotheses. The first modelling problem that we addressed was the evaluation of the causal effect of the BM change and intangibles on performance. We used a performance-based matching approach to contrast the effect of the BM change on performance for those firms that changed their BM and those that did not. Subsequently, we checked the role of complementarity between the change of BM and investment in intangibles. Finally, we related BM changes ranked by innovation intensity to measure the differential impact of the innovation variable on performance.

<sup>1</sup> The AIDA Bureau van Dijk database is an authoritative source of information on Italian companies. Information is drawn from official data recorded at the Italian Registry of Companies and from financial statements filed at the Italian Chambers of Commerce. Limited Liability Companies furnish data on a compulsory basis. The information provided includes company profiles and summary financial statements (balance sheet, profit and loss accounts and ratios). Each company's financial statement is updated annually. Additional information on the AIDA Bureau van Dijk database can be retrieved from <http://www.bvdinfo.com>.

<sup>2</sup> The ATECO classification is the Italian coding based on the NACE classification of manufacturers of wearing apparel. We included the segments that best describe the clothing industry. The description of each code is: 14.11 Manufacture of leather clothes, 14.13 Manufacture of other outerwear, 14.14 Manufacture of underwear and 14.39 Manufacture of other knitted and crocheted apparel.

<sup>3</sup> The industry structure consists mainly of small- and medium-sized firms located in districts. The industry is highly fragmented: the mean Herfindahl index for the four industry sectors is 0.004, whereas the manufacturing industry mean is 0.06.

<sup>4</sup> This database has both strengths and weaknesses. Among its strengths, as mentioned in the Introduction, it contains information that enriches the secondary data and allows for a deeper longitudinal analysis. Among its weaknesses, the balanced panel does not permit us to control for sample selection bias, as we ignored the exit and entry of firms (Cameron and Trivedi 2005). However, this should not be a major problem because we are interested in the influence of BM changes on performance. We recorded 94 BM changes in 376 firms during the 10 years under analysis.

## 4.2 The matching procedure

Very divergent firm-specific features underlying the adoption of a new BM might produce different strategic choices around the event (i.e. BM change), which could affect the post-adoption company performance. If BM change occurs when inadequate firm profitability forces the company to reorganise, the comparison of post-change performance between the companies may become an extremely difficult issue to deal with. This may be even worse in situations where sudden cost competition, such as that suffered by Italian SMEs in the clothing industry during the last decade, pushes incumbents to adjust their strategic approach rapidly without properly assessing the viability of alternatives.

Studying the impact of BM changes and investment in intangibles on firms' performance in a panel raises the concern that intangibles are not exogenous as an independent variable to changes in the outcomes that are being assessed. If they are not, then the coefficient on the estimated variables could be biased. For example, a firm might invest in intangibles only when its competitiveness begins to deteriorate (which would bias the estimate downward) or after a major restructuring, which also involves intangibles. In this case, the benefit from restructuring could be misattributed to larger investments in intangibles (which would bias the estimate upward).

To obviate this potential problem, we employed a performance-based matching procedure (Barber and Lyon 1996), to compare sample firms and control firms with similar pre-event economic structure to verify whether a different outcome in performance could be ascribed to a different investment strategy in intangibles. The matching procedure compared firms before the relevant event on the basis of business characteristics that might have been responsible for the decision to introduce a new BM.<sup>5</sup> Although this procedure does not fully eliminate the potential downward or upward bias in ordinary least squares estimates if intangibles are endogenous, it allows

<sup>5</sup> We relied on a single-variable matching procedure to isolate the specific drivers of the BM change, i.e. profitability or the position of the company in the value chain, instead of using a single score that captures all the information for selection from the (observable) pre-event firm characteristics, as in standard propensity score-matching models.

identification of the differential effect of intangibles, when compared with other forms of investment (Barber and Lyon 1996). As the outcome for firms that had not adopted a new BM was unobservable, we followed a consolidated micro-econometric literature to define the average effect for the outcome for treated and control firms (Heckman et al. 1997).

The similarity in the initial conditions between the treated firms and control firms was based on two main indicators, firm's profitability and firm's value added per capita. These two indicators summarised the pressure, driven by internal and external factors, to adopt a change in strategic profile. The use of profitability as a matching condition allowed us to cluster firms who had similar ex-ante performance incentives to change the strategy (internal factor). Similarly, the use of value added per employee as a matching condition allowed comparison of firms that compete in similar segments of the competitive arena and so faced similar external pressures from a common pool of competitors (external factor). The procedure matched each sample firm to a comparison firm in the database with a similar pre-event performance. The comparison firm was selected from among those firms whose initial matching parameters were within  $\pm 20$  and  $\pm 15$  % of the sample firm's average for profitability and value added per employee, respectively. The matching procedure enabled us to identify two different samples of 198 and 194 companies that had not changed their BM over the observed period, which were used as a matched control group for the two samples comprising 91 and 87 firms that had changed their BM.<sup>6</sup>

## 4.3 The impact on performance of BM changes and intangibles

We considered an indicator of whether a firm had adopted a new BM,  $BM_{it} \in \{0, 1\}$ , and invested in intangibles,  $Int_{it} \in \{0, 1\}$ , in the relevant year. Defining  $BM_{it} \in \{0, 1\}$  and  $Int_{it} \in \{0, 1\}$  as vectors of dummy variables that are equal to 1 for the adopting firm and 0 for non-adopters, we obtained the following firm performance model:

<sup>6</sup> Only firms with a full record of data were considered. In the first case, three, and in the second case, seven BM changes were not analysed because we were not able to find a matched company within our sample.

$$\pi_{i,t} = \alpha_0 + \beta_1 \text{BM}_{i,t-1} + \beta_2 \text{Int}_{i,t-1} + \beta_3 \text{BM}_{i,t-1} * \text{Int}_{i,t-1} + \beta_4 \bar{\pi}_{i,t-1} + \text{controls}_{i,t-1} + u_{i,t} \quad (1)$$

where the coefficients  $\beta_1$  and  $\beta_2$  can be interpreted as the average change in the firm's performance attributable to the firm introducing a new BM (lagged) or investing in intangibles (lagged).<sup>7</sup> Our dependent variable  $\pi_{i,t}$  is a measure of firm's performance at time  $t$  [measured as sales growth, return on sales (ROS) and total factor productivity (TFP)]. We estimated a fixed-effect model [Eq. (1)] to control for the time-invariant observable and unobservable characteristics of the firm, which influence the performance, but cannot be controlled for in a cross-sectional setting (Angrist and Pischke 2008; Hausman 1978). The variable  $\bar{\pi}_{i,t}$  indicates the average performance of the group of firms in the same location (province) and size class of firm  $i$  and was computed as the average of all the companies in the AIDA Bureau van Dijk database with available financial accounts. A full set of controls, including time dummies, was also introduced to capture other non-observable firm and economy-wide characteristics. We then tested for the complementarity effect of BM and intangibles, followed by further testing for the relationship between the extent of innovation of BM change and performance by considering the moderation effects of intangibles.

#### 4.4 Variables

##### 4.4.1 Dependent variables

Firm performance at time  $t$  was measured as sales growth, ROS and TFP.<sup>8</sup> Although several measures of firm's performance exist, profitability, sales growth and TFP are arguably three of the measures most relevant to this study (e.g. Zahra et al. 2000, 2009). Previous studies based on similar contexts had adopted ROS and sales growth (e.g. Chiao et al. 2006; Greve 2003; Yiu and Lau 2008) to measure firm performance.

<sup>7</sup> We used 1-year lagged independent variables to avoid reverse causality.

<sup>8</sup> Sales growth is calculated as  $(\text{Sales}_t - \text{Sales}_{t-1})/\text{Sales}_{t-1}$ , and ROS is calculated as  $\text{Net Income (Before interest and tax)}/\text{sales}$ . Finally, we used a simplified definition of TFP as  $\log(\text{value added}) - 0.40 \times \log(\text{capital}) - 0.60 \times \log(\text{employees})$ , where the factor weights are the cost shares estimated in the sample (Bloom et al. 2011).

Previous research has also indicated that strategic entrepreneurship investments, such as those in R&D and advertising and others, positively affect TFP (Urata and Kawai 2002; Balasubramanian and Lieberman 2010).

##### 4.4.2 BM changes and innovation

Data on BM were obtained by asking the interviewees the following questions: 'Please indicate (1) the item that best describes the actual BM of your company among the following (see list in Table 1) and (2) the year in which the model was introduced (no year if the model has not been changed since 2000)'. It was assumed that those in charge of decision-making could determine this change with reasonable accuracy. The proposed empirical taxonomy of BM (Table 1) had been adapted from that suggested by Camuffo et al. (2008) and Pozzana (2011), who built and validated it by means of multiple correspondence analysis and cluster analysis in a sample of almost 30,000 small Italian textile–apparel firms (Italian Ministry of the Economy annual industry revenue survey—*Studi di Settore*).<sup>9</sup> Table 1 shows a detailed description of the taxonomy that was used in our survey.

From our survey data, a variable BM that measures changes in BM was derived. This variable was a dummy variable set to 1 if the company had made a simple change to its BM over the observed period and zero otherwise. In the second step of our BM definition, we sought a more detailed view of BM changes by coding them according to their level of

<sup>9</sup> This taxonomy has been built and validated by means of cluster analyses and other multivariate analysis on the most comprehensive databases on SMEs in the clothing sector managed by the Italian Ministry of Economy (Annual Industry Revenue Survey on Companies in the Textile and Clothing Sector—*Studi di Settore*). The definition of each BM is based on a grid of variables that captures the most relevant dimensions of BM in the industry. It refers to choices, activities, resources and capabilities, which provide a unique identification of the company's organisation structure: the positions attained and maintained by the firm within the industry; the markets in which it competes (e.g. role within the vertical contracting structure of the industry, degree of internationalisation, customers' portfolio, etc.); the activities it performs to attain and maintain these positions (scale of operations, nature and scope of activities, etc.); the resources and capabilities that enable it to perform these activities (technologies, people, etc.) and the relationships among these elements (for details, see Camuffo et al. 2008 and Pozzana 2011).



**Table 1** Description of business models in the clothing sector

Business model	Distinctive feature				
	Product quality	Cost efficiency	Innovation (design and new materials)	Brand	Export
1 Craft labs with direct selling onsite: Hand crafters and small manufacturers who sell their products in the laboratory. No export and no brand name	*				
2 Phase specialists: Producers specialising in one or more phases of the production process; focus on the cost effectiveness of one or more productive phases, no brand name		*			
3 Process specialists: Producers specialising in the entire production process. Focus on the cost effectiveness of the entire production process, no brand name		*			
4 Low-quality producers for mass retailers: Producers of low-quality products distributed/sold by distribution chains or mass retailers; no brand name		*			
5 Medium–high-quality producers for mass retailers: Producers of medium–high-quality products distributed/sold by distribution chains or mass retailers; no brand name	*	*			
6 Brand owners, innovation-oriented producers: Producers who distribute under their own brand name, with significant interest in market innovation (e.g. design) and technical innovation (e.g. new materials)			*	*	
7 Brand owners, export-oriented producers: Producers who distribute under their own brand name and are mainly interested in foreign markets				*	*
8 Brand owners, mass retailer-oriented producers: Producers who sell products to distribution chains or mass retailers under the producer's brand name (not included in previous categories)		*		*	
9 Converters: Companies who create a network of subcontractors to manage the production process from the early stages of idea generation—developed internally or proposed by a client—to the finished product along the whole of the production chain; no brand name		*			
10 Only prototyping: Firms that design and make the prototype of the product, and help in the selection of reliable suppliers without direct involvement in the manufacturing process	*	*			

\* Distinctive features are present in the BM represented in the various lines

*innovation*. We used this information in the empirical analysis to test Hypothesis 4 (the impact on firm performance of the innovation intensity of the BM change and the role of intangibles). To rank the BM changes by innovation, we used the following classification:

- (1) Change with *low* level of BM innovation/adaptation: this change is carried out by firms refocusing their core business logic by restricting it to the production/design of samples commissioned by other companies (in Table 2, firms transitioning to BM 10). These other
- (2) Change with *medium* level of BM innovation. The change is carried out by firms enlarging the scope of their competence set by including activities connected to the management of the firm's brand name in international markets (in Table 2, firms transitioning to BM7). With this BM change, these producers proactively commercialise their products in new, international market domains and create their new own brand.

**Table 2** Change in BM in the sample firms—transition matrix between 2000 and 2010

BM in 2000	BM in 2010										Firms	
	1	2	3	4	5	6	7	8	9	10		
Craft labs with direct onsite selling	(1)	17	1				1	2			1	22
Phase specialists	(2)		50	1			6	21				78
Process specialists	(3)			44			25	11			5	85
Low-quality specialists for mass retailers	(4)				6			1			3	10
Medium–high-quality prod.for mass retail	(5)					10	7	1				18
Brandowners, innovation-oriented prod	(6)						65				3	68
Brandowners, export-oriented producers	(7)						2	35	1			38
Brandowners, mass retailer-oriented prod	(8)			1			1	7	25			34
Converters	(9)							1		9	3	13
Only prototyping	(10)	1									9	10
Firms		18	51	46	6	10	107	79	26	9	24	376

- (3) Change with *high* level of BM innovation. The change is carried out by firms refocusing their core business logic on highly innovative and high-quality products, both for design and materials (in Table 2, firms transitioning to BM6). With this BM change, most of them have also created their new own brand, allowing them to proactively commercialise their innovations in new product/market domains.<sup>10</sup>

#### 4.4.3 Intangible assets

The continuous measure of intangible assets (reported in the tables as *R&D + Adv/Sales*) denoted the ratio of R&D and advertising on sales at time *t* and has been used for the descriptive statistics. The AIDA Bureau van Dijk data set provides yearly information on ‘Intangible assets’, which includes several items, such as Start-Up and Expansion costs, Licences, and

<sup>10</sup> To check the consistency between our subjective classification of BM innovation and the objective evidence emerging from company information, we estimated an ordered logit model using the three types of BM changes (low, medium and high) as a dependent variable and a set of independent variables normally used in the literature as indicators of entrepreneurial behaviours. These 1-year lagged proxy variables were as follows: introduction of a new product (indicator of innovation), retained earnings (indicator of proactivity) and leverage (indicator of risk taking) (Miller and Le Breton-Miller 2011). Estimated results show that the intensity of the innovation inherent in the BM change is positively and highly correlated with these entrepreneurship proxies. Results are omitted for the sake of brevity, but are available from the authors upon request.

Goodwill, which are not the focus of this study and have therefore been excluded from our analysis. The annual value of expenses in R&D and advertising was computed by differentiating the stock values in the balance sheets of each year and applying to gross flows a 4-year amortisation rule. This allowed us to work with R&D and advertising values that referred to the annual value of expenses (i.e. flows) (e.g. Delios and Beamish 2001).

The dichotomous measurement of intangibles (reported in the tables as *intangibles*) has been used in our estimates and equals 0 when no investment in intangibles was made and 1 otherwise.

#### 4.4.4 Controls

We included the following firm-level controls: market share, leverage, firm age, value added per capita and outsourced services on sales ratio. In addition, controls for the year effects were also added. The market share variable is firm’s sales as a percentage of total industry sales (e.g. Berry 2006). The variable ‘leverage’ denotes the ratio of bank debt over sales. We used this ratio because it captures the financial constraints that make it difficult for firms to finance growth of sales better than the standard ‘debt/equity ratio’ (Coltorti 2006). Firm age, calculated as the number of years since the establishment of the firm, was included to account for the role of the organisation lifecycle and as a proxy for the level of experience, learning ability and managerial competencies that an organisation has accumulated over time (Zott and Amit 2008). Value added per

employee indicates the firm’s position in the value chain (Pelham 2000) and controls for the presence of companies that base their competitiveness on high value-added activities (i.e. design, brand-name manufacturing, marketing and retailing) (Humphrey and Schmitz 2002). We also controlled for the extent of vertical integration by using the share of outsourced services on sale (e.g. Poppo and Zenger 1998; Novak and Stern 2008). Finally, *controls* also included year and region fixed effects, and  $u_{i,t}$  indicated a normally distributed error term.

4.5 Summary statistics

Table 3 provides the descriptive statistics for the variables in 2010 as well as their correlations for the period 2000–2010. The correlations among the independent variables suggested that multicollinearity was unlikely to be a problem.

As shown in Table 4, during the 2000–2010 decade, the sample firms underwent some significant changes in their competitive position. Leverage showed a significant increase, and R&D and advertising investments considerably increased in the entire examined period, moving from 0.23 % in 2000 to 0.48 % in 2009; in 2010 only, they showed a small decrease. At the same time, the number of firms that changed their BM also increased, especially during the first part of the decade. Out of a total of 94 BM changes that occurred in the decade, 66 (about 70 %) happened during the period from 2001 to 2004. Finally, the shift of most companies towards the high-end segment of the market, characterised by a high value added per capita, became evident during the decade (Table 4). This was linked to strategic changes in many firms aimed at acquiring a position in the market with a renewed competitive structure.

The intensification of the competitive pressure after 2000 forced most of the companies to change their strategic orientation by ‘flying to quality’ and abandoning previous highly specialised market positions in the industry value chain (Camuffo et al. 2008).<sup>11</sup> This

<sup>11</sup> As our sample does not include firm entry and exit, the reported evidence is likely to underestimate the actual change that occurred in the industry structure. Indeed, the evidence of a massive flight to quality would have been even more robust if we had considered the very large number of low-quality/low-cost producers who left the market after the introduction of the Euro.

**Table 3** Descriptive statistics and correlations<sup>a</sup>

	Mean	SD	Firms	1	2	3	4	5	6	7	8	9	10
1. Sales growth	0.107	0.356	356	1.0000									
2. ROS	0.023	0.092	355	0.0758	1.0000								
3. TFP	-0.017	0.387	354	-0.0265	0.3861	1.0000							
4. R&D + Adv on Sales	0.003	0.013	351	0.0184	-0.1555	-0.0937	1.0000						
5. Market share	0.004	0.001	364	0.0079	0.1089	0.0127	0.0710	1.0000					
6. Leverage	0.260	0.249	362	0.1940	-0.0726	-0.3738	0.2135	0.0081	1.0000				
7. Firm age	23.6	14.3	364	-0.0878	-0.1996	-0.2565	0.3626	0.0062	0.0912	1.0000			
8. BM change	0.535	0.271	348	0.3874	0.3006	0.2331	0.1283	0.0888	-0.0921	-0.0971	1.0000		
9. Value added per capita <sup>b</sup>	0.461	0.459	344	0.0444	0.2852	0.4418	-0.0305	0.3685	-0.2059	-0.0891	0.1584	1.0000	
10. Outsourced services/sales	0.377	0.150	344	0.0065	-0.0853	-0.3219	-0.1769	0.0973	0.0747	0.0435	-0.1070	-0.1975	1.0000

<sup>a</sup> Descriptive statistics (mean and SD) were calculated for 2010; correlations were calculated over the period 2000–2010. The table indicates the average values of correlations over the 10-year period

<sup>b</sup> Hundred thousand per employee

**Table 4** Descriptive statistics for the period 2000–2010<sup>a</sup>

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2001–2010
Sales growth <sup>b</sup>	–	3.41	1.17	1.33	9.11	12.31	9.07	0.55	–9.04	10.76	3.87
ROS <sup>b</sup>	4.53	4.18	3.85	3.50	3.73	4.30	4.27	3.56	1.39	2.35	3.59
TFP <sup>b</sup>	8.03	4.62	6.16	3.88	1.86	5.56	7.36	0.31	–9.42	–1.69	2.93
RD + adv/sales <sup>b</sup>	0.23	0.35	0.38	0.38	0.38	0.35	0.36	0.40	0.48	0.41	0.37
Market share <sup>b</sup>	0.24	0.21	0.21	0.18	0.17	0.16	0.16	0.16	0.16	0.33	0.19
Leverage <sup>b</sup>	14.2	12.7	14.9	23.0	22.2	21.9	22.7	24.6	25.4	26.0	20.6
Firm age	14.6	15.6	16.6	17.6	18.6	19.6	20.6	21.6	22.6	23.6	19.6
BM change <sup>c</sup>	15	22	16	13	6	2	9	8	1	2	94
Value added per capita <sup>d</sup>	0.47	.45	.46	.46	.47	.48	.51	.51	.42	.46	.47
Outsourced services/sales <sup>b</sup>	0.35	0.34	0.35	0.35	0.35	0.34	0.35	0.42	0.37	0.38	0.36

<sup>a</sup> Mean values. Data were computed from a sample of 328 firms with a full record of data for the period 2001–2010

<sup>b</sup> Percentage values

<sup>c</sup> Number of firms that changed their business model, by year

<sup>d</sup> Hundred thousand per employee

shift is evident in Table 2, which shows the BM transition matrix from 2000 to 2010. Most of the firms that left the phase and process specialist BM moved to become part of the group of brand owners, both innovation- and export-oriented, and to the group of firms specialising in prototyping. A significant group of mass retailer-oriented companies also switched to an export-oriented approach to better exploit their capabilities in brand management in foreign markets.

#### 4.6 Analysis

Table 5 presents the mean values of sales growth, ROS and TFP of the 3-year window before and after each BM change. Extreme performance observations have been excluded by removing the largest and smallest 5 % values of each distribution. The table shows the comparison of firms that changed their BM with those that did not (control groups). Control group 1 included control firms (i.e. firms that had not changed their BM) matched on value added. Control group 2 comprised control firms (i.e. firms that had not changed their BM) matched on profitability.

With regard to the group of treated firms, i.e. firms that had changed their BM, Table 8 shows a sharp and significant increase in the post-event performance, as measured by sales growth and ROS: sales growth increased from 5.7 to 14.3 % in the pre-/post-event

comparison, with a statistically highly significant difference ( $p < 0.001$ ), and from 3.4 to 3.7 % in the case of ROS ( $p < 0.001$ ). Conversely, no significant effect was detected for TFP.

When compared with the matched control groups, the differences were significant only in the post-event performance. The treated firms (i.e. firms that had changed their BM) presented a pre-event mean sales growth rate of 5.7 %, which was not statistically different from the pre-event values of the control groups 1 and 2 (4.2 and 4.1 %, respectively). Conversely, the post-event sales growth rate for the treated firms was far higher and statistically different from those computed for control groups 1 and 2 (14.3 vs. 4.6 %;  $p < 0.001$  and 4.5 %;  $p < 0.001$ ). A similar result was observed in the case of profitability (ROS). Finally, the TFP did not show a pre- and post-event change as relevant as in the case of the previous two performance measures, i.e. growth of sales and ROS, and also, the difference between the treated and control groups in the post-event performance tended to weaken.

Table 6 summarises all the estimated relationships for Eq. (1) using three dependent variables for the period 2000–2010 and two different matched samples. Overall, the results suggested that the post-event performance dynamics of the firms that modified their BM were significantly different from those of the firms

**Table 5** Mean changes in the performance of treated and control firms in 3 years before and after the BM change

Subsample of firms	Mean sales growth rate				ROS				TFP			
	Before		After		Before		After		Before		After	
		<i>t</i> test after/before [ <i>p</i> ( <i>T</i> < <i>t</i> )]		<i>t</i> test after/before [ <i>p</i> ( <i>T</i> < <i>t</i> )]		<i>t</i> test after/before [ <i>p</i> ( <i>T</i> < <i>t</i> )]		<i>t</i> test after/before [ <i>p</i> ( <i>T</i> < <i>t</i> )]		<i>t</i> test after/before [ <i>p</i> ( <i>T</i> < <i>t</i> )]		<i>t</i> test after/before [ <i>p</i> ( <i>T</i> < <i>t</i> )]
Firms changing BM	0.057	0.143	3.802	[0.001]	0.034	0.037	2.440	[0.003]	0.049	0.048	0.199	[0.886]
Control group 1	0.042	0.046	0.291	[0.771]	0.032	0.030	0.308	[0.764]	0.047	0.044	0.274	[0.653]
Control group 2	0.041	0.045	0.333	[0.704]	0.034	0.031	0.084	[0.953]	0.047	0.045	0.221	[0.891]
<i>t</i> test versus control group 1	-1.3672	-4.316			-0.255	-4.583			-0.980	-1.222		
[ <i>p</i> ( <i>TI</i> < <i> t </i> )]	[0.174]	[0.000]			[0.862]	[0.000]			[0.223]	[0.024]		
<i>t</i> test versus control group 2	-0.215	-5.701			-0.215	-5.701			-0.523	-1.014		
[ <i>p</i> ( <i>TI</i> < <i> t </i> )]	[0.829]	[0.000]			[0.829]	[0.000]			[0.663]	[0.098]		

Number of observations 344

that had an equivalent probability of changing but did not. Moreover, these dynamics differed markedly across the indicators of firms' performance.

The most obvious results were perhaps the increase in sales growth displayed in the period after the BM change occurred (e.g.  $\beta = 0.032$ ;  $p < 0.01$  for panel A and  $\beta = 0.028$ ;  $p < 0.01$  for panel B, when sales growth was the dependent variable) and the positive impact of intangibles on TFP (e.g.  $\beta = 0.421$ ;  $p < 0.05$  for panel A).

With regard to the former, the evidence supported Hypothesis 1, indicating a performance-improving effect of the BM change on sales. These were probably more reactive to changes in the strategic approach of the firm than ROS and TFP, which were likely to adjust less quickly to changes in the firm's strategy. The relationship in Table 6 between the change in the BM, or CE initiative, and sales growth, which represents the revenue side of firm activity, confirms that discovering an area for competitive advantage calls for much more commitment and entrepreneurial ability than does eliminating inefficiencies.

With regard to the latter, the results offered empirical support to Hypothesis 2, according to which investments in intangibles positively affect firm performance. The contribution of intangibles, especially to TFP, confirmed the growing empirical evidence of a positive relation between intangibles and productivity (Marrocu et al. 2012; Arrighetti et al. 2014; Bontempi and Mairesse 2008). This result could probably be explained by relevant investments in intangibles that support the 'fly to quality' strategy followed by restructuring companies in the last decade.

Before addressing the complementarity test, we noticed that the interaction variables given in Table 6 provide preliminary evidence indicating that BM and intangibles are a joint determinant of the firm's performance, at least in the case of sales growth and productivity (e.g.  $\beta = 0.312$ ;  $p < 0.01$  for panel B when TFP is the dependent variable). Also, as the estimated results are coherent across the two matched samples (Panel A: value added per capita; Panel B: profitability), in the following analysis on complementarity we only present the results from the larger sample for brevity (Panel A: matching on value added per capita).

Table 7 presents the detailed results of the estimations on complementarity. In line with prior results, both BM and intangibles presented a positive and significant impact on sales growth and productivity, respectively,



**Table 6** Impact of BM change and intangibles on firms' performance<sup>a</sup>

	Panel (A) <sup>b</sup>			Panel (B) <sup>c</sup>		
	Sales growth	ROS	TFP	Sales growth	ROS	TFP
BM	0.032*** [0.008]	0.031*** [0.009]	0.137** [0.074]	-0.308 [0.614]	0.028*** [0.003]	0.134 [0.181]
Intangibles	0.010* [0.008]	0.010 [0.024]	-0.024 [0.089]	0.422** [0.201]	-0.008 [0.049]	0.391*** [0.097]
BM × intangibles		0.010*** [0.007]	0.099 [0.141]	0.386* [0.184]	0.017** [0.009]	0.312*** [0.040]
Mean	0.006* [0.003]	0.005** [0.001]	0.087* [0.036]	0.052* [0.019]	0.011 [0.016]	0.076* [0.026]
Controls <sup>d</sup>	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,734	1,734	1,734	1,734	1,686	1,686
Firms	289	289	289	281	281	281
R <sup>2</sup>	0.201	0.244	0.199	0.155	0.269	0.159

<sup>a</sup> Standard errors in [] \*  $p < 0.10$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

<sup>b</sup> Matched sample estimates: firms matched based on *value added per capita* (2000–2001 average)

<sup>c</sup> Matched sample estimates: firms matched based on initial *profitability* (2000–2001 average)

<sup>d</sup> All the regressions include firm age, value added per capita, outsourced services on sales ratio, leverage, market share and year and region fixed effects

**Table 7** Results of complementarity test of the effects of BM change and intangibles on firms' performance<sup>a</sup>

Panel (A <sup>b</sup> )	Sales		ROS		TFP	
	Fixed effect	Fixed effect with predicted dummies	Fixed effect	Fixed effect with predicted dummies	Fixed effect	Fixed effect with predicted dummies
BM	0.031** [0.014]		0.135* [0.092]		-0.311 [0.564]	
Intangibles	0.011* [0.006]		-0.007 [0.010]		0.440** [0.301]	
$D_{i,1,t-1}$ [BM + intangibles]		0.162*** [0.030]		0.466 [0.507]		0.312*** [0.084]
$D_{i,2,t-1}$ [only BM]		0.080* [0.052]		0.402 [0.368]		-0.204 [0.389]
$D_{i,3,t-1}$ [only intangibles]		0.011 [0.093]		0.027* [0.018]		0.409** [0.158]
Controls <sup>c</sup>		Yes	Yes	Yes	Yes	Yes
Observations	1,588	1,588	1,588	1,588	1,588	1,588
Firms	289	289	289	289	289	289
R <sup>2</sup>	0.187	0.219	0.224	0.194	0.116	0.132
Complementarity <i>F</i> test	9.22***	11.23***	4.62	2.55	5.66**	8.64**

<sup>a</sup> Standard errors in [] \*  $p < 0.10$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$

<sup>b</sup> Firms are matched on value added per capita (2000–2001 average)

<sup>c</sup> All the regressions include firm age, value added per capita, outsourced services on sales ratio, leverage, market share and year and region fixed effects

confirming Hypotheses 1 and 2. To estimate complementarity, we regressed the dependent variables on the mutually exclusive combinations of BM changes and intangibles, together with the control variables included in Eq. (1) (Milgrom and Roberts 1990). The lagged dummy variables given in Table 7 distinguish three cases: firms that changed their BM and invested in intangibles ( $D_{i,1,t-1}$ ), firms that only changed their BM ( $D_{i,2,t-1}$ ) and firms that only invested in intangibles ( $D_{i,3,t-1}$ ). The baseline was a firm that neither changed the BM nor invested in intangibles ( $D_{i,4,t-1}$ ). For each dependent variable (sales growth, ROS and TFP), Table 7 reports the estimated results for the basic fixed-effect model and models with predicted dummies for complementarity. To estimate predicted dummies we have run a probit regression for the probability of adopting different combination of BM introduction and investment in intangibles on a vector of observable explanatory variables. The vector includes: firm size, firm age, capital intensity, patents, capital expenditure in plants and other fixed assets (Hall et al. 2013). We also include the 1-year lagged values of investment in intangibles to control for the possible persistence in the investment activity of the company (Arrighetti et al. 2014).

Consistent with complementarity, the coefficient of variable  $D_{i,1,t-1}$ , i.e. firms that both changed their BM and invested in intangibles, was positive and highly significant in the case of sales growth (e.g.  $\beta = 0.162$ ;  $p < 0.01$ ) and TFP (e.g.  $\beta = 0.312$ ;  $p < 0.01$ ). Moreover, the results of the  $F$  test revealed significant differences between the estimated parameters, indicating that the returns from an investment in intangibles increased if the firm had changed its BM, and vice versa. The coefficients for variables indicating only the change in BM ( $D_{i,2,t-1}$ ) and only investment in intangibles ( $D_{i,3,t-1}$ ) were mostly not significant, suggesting that the combination of both the activities is necessary to explain the firm's performance, rather than either variable individually. Finally, all complementarity tests given in Table 7 were significant when the growth of sales and productivity were used as dependent variables. Conversely, no evidence of a significant complementary effect on firms' performance was detected in the case of profitability (ROS). Thus, Hypothesis 3, addressing the complementarity of BM changes and investments in intangibles, was confirmed when performance was measured based on growth of sales and TFP, but not when performance was measured with ROS.

#### 4.7 BM change: Adaptation or innovation?

The evidence presented so far shows that BM changes can have an impact on firm performance and that this impact can be reinforced by the complementary role of intangibles that generate any missing competitive assets or resources required for the adoption of a new BM.

To offer a more detailed view on this relationship, and to test Hypothesis 4, we used the variables *BM change\_1* (low level of BM innovation), *BM change\_2* (medium level of BM innovation) and *BM change\_3* (high level of BM innovation), as coded in Sect. 4.4, to assess the different levels of BM innovation. Table 8 shows the results of the estimate of the model linking BM changes ranked by innovation intensity to performance variables and also includes an interaction variable between BM innovation and intangibles. Table 8 supports Hypothesis 4, according to which the positive effects of BM change on performance increase with the innovation intensity of such changes and are positively supported/moderated by investments in intangibles.

The evidence of a positive impact of BM change on performance is particularly clear for very innovative type 3 BM changes (e.g.  $\beta = 0.124$ ;  $p < 0.01$  and  $\beta = 0.0213$ ;  $p < 0.05$  in the case of sales growth and ROS, respectively). The interaction variable is particularly significant in these types of BM innovations and, in general, increases with the innovation intensity of the BM change, especially for sales growth and TFP ( $\beta = 0.0310$ ;  $p < 0.01$ ,  $\beta = 0.008$ ;  $p < 0.05$  and  $\beta = 2.958$ ;  $p < 0.05$  in the case of sales growth, ROS and TFP when the interaction is between *BM change\_3* and intangibles). These results confirm that investment in intangible assets is crucial to generate additional competencies and resources within the firm and to reduce the risks of failure associated with adopting very innovative BMs.

## 5 Discussion and conclusions

This study focused on how CE elements affect SMEs' performance in a traditional sector such as the clothing industry. Although the CE literature theoretically acknowledges the importance of elements such as BM innovation (e.g. Morris et al. 2005, 2011) and investments in intangibles (e.g. Zahra 1996; Miller and Le Breton-Miller 2011), the interaction between these two elements has never been explored empirically.

**Table 8** Impact of BM innovation and intangibles on firms' performance<sup>a</sup>

Panel (A <sup>b</sup> )	Sales growth	ROS	TFP	Sales growth	ROS	TFP
BM change_1	0.034 [0.027]	-0.004 [-0.005]	1.272 [1.069]	0.022 [0.031]	-0.003 [-0.077]	1.081 [2.366]
BM change_2	0.099* [0.051]	0.001 [0.002]	2.503** [1.124]	0.0836* [0.043]	0.002 [0.018]	2.227* [1.061]
BM change_3	0.171*** [0.046]	0.018* [0.010]	2.215** [1.016]	0.124*** [0.032]	0.0213** [0.016]	1.364 [0.112]
Intangibles				0.0042* [0.002]	-0.001 [-0.001]	0.758** [0.321]
BM change_1* intangibles				0.002 [0.001]	0.006** [0.002]	1.641* [0.875]
BM change_2* intangibles				0.004* [0.003]	0.000 [0.003]	1.641* [0.875]
BM change_3* intangibles				0.0310*** [0.005]	0.008** [0.003]	2.958** [1.308]
Constant				-0.099*** [-0.029]	-0.014*** [-0.010]	2.346 [2.385]
Observations	1,314	1,314	1,318	1,297	1,254	1,228
Chi <sup>2</sup>	84.16	30.21	28.19	93.05	41.36	22.70
p value	0.002	0.006	0.021	0.000	0.000	0.019
R <sup>2</sup>	0.180	0.133	0.080	0.221	0.184	0.106

<sup>a</sup> Standard errors in [] \*  $p < 0.10$ ; \*\*  $p < 0.05$ ; \*\*\*  $p < 0.01$ . b. Firms are matched on value added per capita (2000–2001 average)

<sup>b</sup> All the regressions include firm age, value added per capita, outsourced services on sales ratio, leverage, market share, year and region fixed effects

Indeed, previous studies have mainly examined both BMs and investments in intangibles as if their effects on performance are isolated and independent. However, in this study, we suggest that investments in intangibles and BM changes are complementary and accompany each other to affect firms' performance.

Our results indicate that both BM change and investment in intangibles are effective supporters of firms' performance, supporting Hypotheses 1 and 2. Business model changes seemed to be more effective in sustaining sales growth, whereas intangibles were noted to have a relatively greater impact in the case of TFP. We found empirical support for our third hypothesis: consistent with the presence of complementarity, we showed that the positive effect of BM changes on firm performance is higher for firms that also invest in intangibles, and vice versa. Finally, we also found support for the fourth hypothesis according to which the positive effects of BM change on performance increase with the innovation intensity of such changes and are positively moderated by investments in intangibles. This suggests that the intensity of BM innovation is an even better predictor of firm performance than pure BM change and that this positive effect increases with higher investment in intangibles. A possible explanation of this evidence is that highly innovative BM changes are more risky and require larger investment in competence-building activities such as intangibles than is needed for a simple BM adaptation to existing industry norms.

These results have some implications. First, they confirm the existing literature on the positive effects of BM changes on firms' performance, at least when sales growth and ROS are used (e.g. Zott et al. 2011; Markides 2008; Andries and Debackere 2007). Second, they confirm the previous empirical results on the positive effects of investments in intangible assets on firms' performance (e.g. Arrighetti et al. 2014; Marrocu et al. 2012; Bontempi and Mairesse 2008) and indicate that these effects are more evident on TFP. Third, they stress the importance of better understanding of *how* BM and intangibles affect firms' performance: the evidence of the complementarity effects and the response to different performance variables is the first step in this direction. The evidence that more innovative BM changes provide stronger effects on performance clarifies the significance of BM innovation. This study stimulates the debate aimed at disentangling single components of CE, showing that it is not something

cryptic and segregated from other organisational activities, but is composed of strictly related elements.

We extend the CE literature by emphasising the importance of CE initiatives such as BM change, BM innovation and investments in intangibles for corporate success. We do so by offering empirical evidence on the link between BM change, BM innovation and investments in intangibles as ways of exploiting opportunities and increasing firm success (George and Bock 2011). The findings offer empirical support to the idea that, to be successful, companies must acquire resources alongside the implementation of changes in their BM (Hamel 1999) and that BM changes, innovations especially, can be more successful when a firm is able to leverage its intangible assets (Venkatraman and Henderson 1998). This is in line with the most recent literature that stresses the importance of analysing CE phenomena by considering CE initiatives in combination and based on circumstances and firm characteristics that may lead to successful outcomes for the firm (Corbett et al. 2013). Future research should take into consideration and include these types of contingencies when studying firms' structure and activities (e.g. Zott and Amit 2007; Kor and Mahoney 2005) to gain deeper insights.

Managers and entrepreneurs should be made aware of the fact that the 'winning' BM does not exist and that changing BM is not necessarily a winning strategy if this is not accompanied by innovation and by complementary activities that help the firm to differentiate itself in the market. Specifically, the practical recommendation that can be derived from this research is the importance for SMEs of considering BM change as a complementary element of investment in intangibles. Our results confirm the idea that, in the analysed companies, BM changes can yield higher value when accompanied by expenditure in R&D and advertising and that more innovative BM change provides a stronger positive effect on firm performance. This emphasises the utility of simultaneous investment in intangibles. Our hope is that with these results we have contributed to the ongoing debate on the logic of CE and on the forms of CE that produce the best results.

The results, according to which BM changes are beneficial for sales growth and ROS while investments in intangibles improve TFP, should be useful to both researchers and practitioners. For the former, the results confirm that, when studying firms' performance, it may be appropriate to run analyses with



different measures of performance to obtain a more fine-grained view. For the latter, the findings indicate that a single ‘successful’ BM does not exist and that strategic decisions have to be made by taking into consideration tasks and objectives (sales increase, return on sales or TFP).

This study also has limitations that offer opportunities for further research. We contrasted the performance of firms that have changed their BM with those that have not. The assumption that we made about this latter group was critical for the reliability of the empirical analysis. If this control group (i.e. no BM changes) was composed of firms that had already changed their BM before the start of the study (i.e. during the 1990s), then we would have only estimated the impact of latecomers in the adoption of a more efficient BM. Conversely, if the group included firms that chose not to change their BM during the 1990s, then we would have correctly estimated the impact of the new organisational structure on the ability of the company to successfully cope with increased competition. The dynamics of firms’ entry/exit in the sector during the last few decades show that most of the sectorial restructuring occurred from the year 2000 onwards. During the 1990s, the sector benefitted from the favourable economic conditions created by a currency devaluation in 1992, which relaxed the external competitive framework for these companies and allowed them to maintain the same business strategy and organisational structure. We are therefore confident that our empirical model is not affected by this type of selection bias, which could significantly alter the empirical estimates.

The sample used in this study is specifically related to a traditional sector in the Italian context, and differences may occur in other contexts; it is therefore not possible to generalise our results. Further research that examines other industries would be a useful extension. Our measure of BM changes is an empirical proxy and could benefit from more accurate measures of the economic event, including its temporal evolution. Another limitation is that unfortunately our data set did not allow us to measure R&D and advertising separately. Although it is recognised that advertising and R&D investments are correlated and produce similar effects on firms’ performance (Lee and Mahmood 2009), further research focusing on them as separate contributors to firms’ performance might produce new insights. To conclude, this is a first attempt to extend our knowledge on CE in SMEs by

showing its contingent nature and by moving towards a better understanding of how strategic entrepreneurship initiatives can lead to successful outcomes of the CE initiative. We hope our work contributes to stimulate further research on this fascinating topic of research.

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