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Post-Entry Product Introduction: Who Explores New Niches?

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ABSTRACT Where do innovative products come from? Why do some firms address new market niches and others do not? The literature has rarely blended the concept of innovativeness of a product at the market level with the coherence of the product portfolio at the firm level. In this paper, we examine whether the introduction of products that are highly innovative occurs in firms that are very differentiated, both in terms of target niches and in terms of technological competencies, or rather in firms that focus on specific market segments and that have a limited technological capability. The results show that the introduction of products that are new to the market generally occurs in firms that introduce many products in few market segments and are characterized by a set of specialized technological and market competencies. At least in this industry, the myth of the small specialized niche player does not hold. Implications have a positive relevance to assess firms' behaviour in a given market. From the welfare point of view, this paper helps disentangle monopolistic power generated by truly new products and simple versioning of the product.

KEY WORDS: product differentiation, innovation, ski industry, market niches

JEL Classification: L23, L25, 031

1. Introduction

Where do innovative products come from? Why do some firms address new market niches and others do not? The introduction of new product varieties is an important strategic decision for companies, which constantly face the challenge of competitors and need to evaluate costs and benefits deriving from broadening the scope of their product lines (Sorenson 2000; Sorenson et al. 2006). In particular, consumer goods industries are characterized by the constant introduction of new varieties of products, some of which are truly innovative and address new market niches, while others are introduced in dense market segments and represent incremental changes of existing products.

The incentives of introducing new product varieties lie in the possibility of gaining market share, either by offering goods in new market segments that are not covered by competitors and better fit consumers' preferences, or simply by increasing the range of the product portfolio and exploiting the market segmentation in a strategic way. These two strategies affect firms' organization of production and cost structure. Introducing new product varieties requires firms to engage in very costly and uncertain innovative efforts, but at the benefit of gaining market power in very specialized and (possibly) emerging market niches. On the contrary, the simple versioning of existing products allows firms to leverage strategically on product differentiation and possibly to exploit economies of scale and scope.

The literature has extensively discussed these two strategies, investigating both the factors affecting the development of product innovation and the consequent emergence of new niches and the determinants of industrial evolution—competition and legitimization, the role of new entrants vs. incumbents (among others Hannan and Freeman 1989; Klepper 1996; Klepper 2002; Klepper and Thompson 2006). Furthermore, scholars have looked more in depth at the dynamics of products' entry and exit (among others Stavins 1995; Greenstein and Wade 1998; de Figueiredo and Kyle 2006; de Figueiredo and Silverman 2007; Khessina and Carroll 2008; Guerzoni 2010), studying in particular the motivations behind the generation of variety within firms' product portfolios and their impact on firms' survival/performance (Sorenson 2000; Sorenson et al. 2006; Giarratana and Fosfuri 2007).

We depart from this literature, in two directions. First, we discuss the relationship between the degree of innovativeness of new products at the market level and the product portfolio composition at the firm level. In order to identify the potential benefits from a new product, the literature has looked at the coherence of broadening strategies, thus mostly focusing on firms' costs. By looking at the innovativeness of the product at the market level, we are able to assess the monopolistic power gained by the company on the market, i.e. we can assess the degree of market competition which the new product will face. Second, we account for firms' portfolio versioning/broadening strategies, by distinguishing between market-related and technology-related differentiation. The difference between market (service) and technical characteristics has been broadly used in innovation studies (see Gallouj and Weinstein 1997). However, the literature on firms' strategic behaviour has not fully disentangled these two dimensions of differentiation strategies. This issue is relevant, since the two dimensions differently impinge upon firms' competencies and cost structure. While market-related differentiation has more impact on marketing and commercial strategies, technology-related differentiation has more impact on the management of technical assets, eventually leading to the enhancement or disruption of the existing competencies.

Our empirical analysis looks at the ski manufacturing sector and relies upon an original product-level data-set of innovation including all new skis introduced by 42 manufacturers and sold in the European market between 1992 and 2007. We collected data on the key product characteristics of 4,202 models and investigated the relationship between the extent to which a product is new to the market and a series of variables accounting for firm-specific product strategies over time. In the data-set we explore in this paper, the market has been segmented into more than 100 sub-markets according to consumers' demographics and skiing style preferences. In the 10-year time span considered, more than 50% of the new products have been introduced in two sub-markets only, in which

clearly the largest mass of the distribution of consumers is located. However, we also observe firms which address smaller market niches and introduce new products that are very diverse from the market average.

In the next paragraph, we discuss the relevant literature. In the Section 3, we describe the data-set, while in Section 4 we empirically test the hypotheses and discuss the results. Conclusions follow in Section 5.

2. Firms' Product Strategies and the Generation of Variety

The generation of product variety constitutes an important strategic decision for firms, which need to choose whether to develop multiple products targeting different consumers/market niches, or focus on few products, exploiting economies of scale (Sorenson 2000). The literature uses the notion of variety in different ways (Lancaster 1990): it can be the degree of innovativeness, i.e. its originality from the competitors, or it can simply refer to the breadth of a firm's product portfolio. From the firm's perspective, there are incentives both for introducing new-to-the market products, and for adopting versioning strategies, marginally modifying the existing products and increasing the product portfolio by entering multiple market niches (that are already covered by competitors). Developing truly new products can generate relevant competitive advantages for firms, because the more a product differs from its competitors, the higher the gains in market power. However, firms also have incentives to increase the breadth of their product portfolio by entering niches that are already covered by competitors or to adopt versioning strategies by developing different releases of the product within the same niche and thereby have the core of the product line shielded by competitors (Giraud-Héraud, Hammoudi, and Mokrane 2003; Tabuchi 2012).¹ Combining these two perspectives, Sorenson (2000) argues that the advantages of breadth lie both in the better matching with (heterogeneous) consumers' preferences, and in the potential shield towards competitors (new market entrants and existing competitors).

In this context, an important strand of research focuses specifically on the analysis of new product development within multi-product firms (e.g. Sorenson 2000; de Figueiredo and Kyle 2006; Giarratana and Fosfuri 2007) and examines the impact of firms' product strategies on their survival and growth/performance. Existing studies discuss the relevance of supply-side and demand-side motivations behind differentiation strategies (among others de Figueiredo and Silverman 2007). These studies date back to Montgomery (1982), and Pitts and Hopkins (1982) and in line with the resource-based theory of the firm (Wernerfelt 1984; Rumelt 1984; Penrose 1959) look at the relationship between the competencies needed to enter a new niche and the extent to which new products/markets are related to the existing products/markets. This literature examines the extent to which a product is related, coherent or similar to the other products of the firm and develops various measures of relatedness, starting from the seminal paper by Hoskisson and Hitt (1990). Furthermore, the

¹ If each firm produces only one variety, such as in a pure Dixit–Stiglitz framework, the production of each new variety requires the entry of a new firm, which produces negative effects on the other firms' profits, by increasing the competition. If, on the contrary, firms are allowed to produce more than one variety (up to an extreme case, where only one monopolist produces all the possible varieties), they are able to internalize those negative effects and thus reach a more profitable equilibrium (Vassilakis 1993).

studies discuss the ways in which diversification may create competitive advantage.² From a demand-side perspective, the broader the product portfolio, the more the market segments a firm can reach. However, with the introduction of many new products, there might be risks of cannibalization—i.e. the firm faces competition from its own products. From a supply-side perspective, introducing many new products may allow firms to exploit economies of scope. However, it may also result in more complexity in management and production, therefore, increasing costs. The generation of very specialized products requires detailed information about consumer needs and the employment of *ad hoc* technologies and complementary assets (e.g. Teece 1986), while, at the same time, increasing the uncertainty of future profits.

As de Figueiredo and Silverman (2007) show, the consequence of this trade-off is that dominant firms tend to enter market segments in which they can leverage their technological capabilities, but that are sufficiently distant to avoid cannibalization. Giarratana and Fosfuri (2007) find that a firm's survival is explained by the adoption of either versioning strategies or portfolio-broadening strategies, as opposed to the pursuit of mixed strategies, and argue that this finding is in line with the traditional literature on organizational learning and resource partitioning.

We extend the existing analysis in two respects. First, the existing literature investigates the determinants of new product introduction, without explicitly discussing the degree of innovativeness of a new product *at the market level*. Scholars usually look at the competition within a specific market segment as a factor affecting the entry of a new product (i.e. as an independent variable), or investigate the introduction of products by firms outside their existing niches, but do not take into account the originality of the product itself. However, products may have very different degrees of innovativeness with respect to the existing products in the market, and the costs and benefits deriving from the production of a radically new product are very different from those deriving from the development of a marginally new product. The degree of product innovativeness at the market level is an extremely important factor that impacts firms' decision to enter a market niche. The extent to which a new product is technologically coherent with or divergent from a firm's product portfolio has an important effect on the production cost. However, the profitability of a new product depends also on the revenues, which in turn depends on the product innovativeness at the market level: *ceteris paribus*, a product addressing a niche with few competitors can generate higher margins.

We explore the relationship between the degree of innovativeness and the number of new products introduced in the market, in a way similar to Sorenson et al. (2006), and formulate the following research question:

RQ1: Is the introduction of a highly innovative product compatible with the simultaneous introduction of many new products?

Although the literature seems to point at a negative relationship, we do not have a priori expectations on the sign of the relationship. On the one hand, as suggested by Sorenson

² For instance, Markides and Williamson (1996) steer the attention towards the coherence of diversification which creates long-lasting competitive advantage. According to them, the creation of long-run strategic assets through relatedness requires the development of appropriate internal mechanisms for transferring competences and assets across business units in a more efficient way than can be achieved in the open market.

(2000), we could observe a tension between the breadth and focus on the new products, which might result in focused firms introducing a small number of products in small niches that are different from the rest of the market. On the other hand, larger firms which introduce many products have the opportunity to experiment more and might decide to place some of them in diverse niches.

Second, the simple count of new products is a rough measure to understand the complexity of firms' differentiation strategies. Our aim is to distinguish the effect of firms' market-related differentiation and technology-related differentiation on the degree of product innovativeness with respect to the market. In the words of Giarratana and Fosfuri (2007), firms can strategically adopt a versioning strategy, that is introducing *multiple releases in a single niche*, or broadening strategies, that is *covering multiple niches*. In the paper, we take into account this strategic choice, which captures the extent to which new products are within the same niche or cover multiple niches. Furthermore, we explore the role of technological capabilities, accounting for technology-related differentiation, which captures the extent to which a firm's products are coherent in terms of the technology used, following De Figueiredo and Silverman (2007). From this, we explore the second research question:

RQ2: Is the introduction of highly innovative products compatible with a differentiated portfolio both in terms of markets and in terms of technology?

Also in this case the literature does not provide a clear a priori expectation of the results. On the one hand, a differentiated portfolio might signal the presence of dynamic capabilities or an attitude of the firm towards innovation and, therefore, it can be associated with the introduction of highly innovative products. On the other hand, entering new markets is a risky call and requires ad hoc information, which usually only coherent and non-differentiated firms possess. In the following paragraph, we introduce the data-set and the empirical strategy to assess these two research questions.

3. Data and Descriptive Evidence

Modern downhill skiing appeared only in the nineteenth century in the Alps, when Sondre Norheim from Telemark (Norway) invented the Telemark ski, with the tip and tail broader than the waist, which remained the dominant design in the sector until the mid-1940s, when the modern ski became the dominant design and Telemark became a niche product. In 2006, there were about 50 million skiers worldwide and the market for skis was estimated to be about e400 million at the wholesale level. Europe is the main market (64% of total sales), followed by North America (23%) and Japan (10%). In the last two decades, the ski market has declined, from 6.5 million pairs sold per year in the late 1980s, to an estimated 4.1 million in 2006. This decline can be explained by the increasing success of snowboarding during the 1990s, by the emergence of renting skis as a popular habit across Europe (also due to the high number of beginners who need to experiment before purchasing the skis), and, partially, by the economic downturn in Japan.

Concentration in the sector is very high, with a few global players dominating the market, and small players focusing on national markets. Recent mergers and acquisitions have further increased market concentration and some producers are now part of large groups, controlling important ski brands. For instance, Amer Sports Inc. controls Atomic, Salomon, Dynamic and Volant (a small premium brand); K2 Inc. controls the K2 brand, Volkl

and Marker (a leading ski binding brand); Quiksilver Inc. controls Rossignol and Dynastar. The process of consolidation can also be explained by the strength of single brands at the national level (with Austrians inclined to purchase Austrian brands such as Fischer or Atomic, while the French tend to buy French brands such as Salomon or Rossignol). For instance, K2 is the leader in the US market, but has a low market share in Europe. The acquisition of Volkl in 2004 gave the company a strong position also in the European market. The C4 index and the Herfindhal–Hirschman (HH) index are, respectively, 90% and 0.22, indicating a high degree of concentration.

It is possible to identify three different kinds of firms in the market: global players, medium-size players and niche players. Global players compete on a global scale producing not only skis, but also other ski equipment, exploiting their strong brand reputation. The above-mentioned market leaders and Fisher all belong to this group and follow cost leadership strategies in the more generalist niches, exploiting economies of scale, but also targeting the high-end of the market with top-level products. These companies also compete to provide ski equipment to athletes in the skiing World Cup. This is a key element to build brand awareness, especially at the top end of the market where consumers are interested in high-performance ski equipment.

Medium-size players do not compete on a global scale, but are large enough to compete against global players at least at a national level and provide skis to the whole spectrum of consumers, from beginners to experts. Among others, Elan, Nordica, Stockli, and Maxel belong to this segment. Generally speaking, these companies rely less on advertising and communication strategies, as they have limited financial resources, and focus more on their core product (skis), rather than extending their brand to other ski-related products. Finally, niche players compete only in the top end of the market, providing tailor-made products. These companies produce fewer than 1,000 units every year and rely upon a craftsman-type production process, which makes their products extremely expensive. Companies such as Duel and Lacroix are part of this segment. It is important to notice that, even within this group of niche players, there are some differences in companies' strategies, with obvious consequences on prices: Lacroix for example provides highly customized and expensive skis, while Duel tends to offer more standardized and cheaper products.

All these firms are extremely active in introducing incremental or radical changes in their products. Quite interestingly, Elan and Kneissl, two medium-size players, were the first to develop carving skis—the current dominant design—in the early 1990s. Sometimes companies improve their products with very small changes over time (e.g. they modify the graphics), at other times innovations can be much more radical, such as changes in the available lengths, in the side cuts or in the materials. Traditionally the use of different materials has been a major source of innovation in the industry, since the ski core represents a crucial component, which affects product performance. Sometimes innovations are developed in order to rationalize the manufacturing process and thus reduce costs: the introduction of the “cap construction” technique by Elan and Salomon at the end of 1980s aimed at simplifying the production process; the use of cheap materials for the ski core (such as foam) helped reduce the cost of raw materials. Another aspect to be taken into account when introducing new products is the length of the ski. Consumers' purchasing choices depend on their weight and height, as well as on their skiing skills. In general, taller and heavier skiers buy longer skis; furthermore, *ceteris paribus*, more expert skiers with a

preference for speed also choose longer skis. This has important implications for variety generation: firms need to sell skis of different lengths, if they want to attract the full spectrum of potential consumers.

Our empirical analysis relies upon an original data-set of innovations including 5,109 new skis sold in the European market between 1992 and 2007.³ The source of data and information is *Sciare*, an Italian specialist ski magazine, whose buyers' guides provide detailed information on key product characteristics.⁴ Each year, companies sell new models in the market, while old skis are usually kept for rental. This means that for each year, our data-set includes an entirely new set of skis. We collected detailed information on the following variables: price, consumers' skiing skills (beginner, intermediate, expert and professional), consumers' skiing styles (e.g. special slalom, giant slalom, all-round and freestyle) and a set of the technical characteristics of the ski (core, edges and base materials, anti-vibration system, etc.).

Our sample includes 42 firms. On average, we record around 20 firms per year; however, important differences exist in the sample, since 11 firms produce at least one product per year (Fischer, Atomic, Rossignol, Salomon, Head, Dynastar, Blizzard, Völkl, Elan, Dynamic, K2), while nine appeared in the market for the first time in 2007 (Sporten, Bottero Ski, Morotto, Duel, Dyad, Nava Ski, AK, Hagan, Hart). Tyrolia, Authier, Pre, Lacroix and Morotto are present just at the beginning of our observation period and then exit the market.⁵ Furthermore, some firms enter and exit the market more than once—e.g. Kneissl, Volant and Lacroix. [Figure 1](#) shows the number of different new models introduced between 1992 and 2007, which represents the first, very rough measure of variety.

The total number of new models introduced into the market has substantially increased over time, from 296 models in 1992 to 552 models in 2007, with a peak of 600 models in 2006 (see [Table 1](#)). It is interesting to note that this variable was quite stable until 1999, had a peak in 2002 (with 510 models) and then decreased substantially until 2006. On average, firms produce 17 new models per year, but there are remarkable differences over time and across firms. In particular, if we compute the average number of new models by firm—also taking into account the time of entry/exit in the market—Fischer, Atomic, Rossignol, Salomon, Head, Dynastar, Blizzard, Völkl, Nordica and Sporten produce on average 20 or more new models per year. However, while the first eight firms have always been active in the market, Nordica only started producing skis in 2001 and Sporten entered the market for the first time in 2007 with 20 different skis. On the other hand, firms such as DKB, Olin, Pre and Lacroix have developed fewer than six new models per year.

As mentioned before, demand heterogeneity is one of the main sources of variety. If we segment the market according to consumers' skiing styles, we can investigate the firms' patterns of specialization more in depth. To this aim, we group ski models into 11

³ Because of some missing data, we perform the analysis on a set of 4,202 skis. In some cases, companies' websites have been used to complement the information available in the magazine.

⁴ The magazine reports all new products introduced in Europe, which accounts for more than 80 per cent of major resorts and for the majority of number of lifts worldwide (Vanat 2014).

⁵ We refer to "entry" and "exit" in terms of new product development. Note that a firm that "exits" the market in our terminology can still be present in the market with old models of skis.

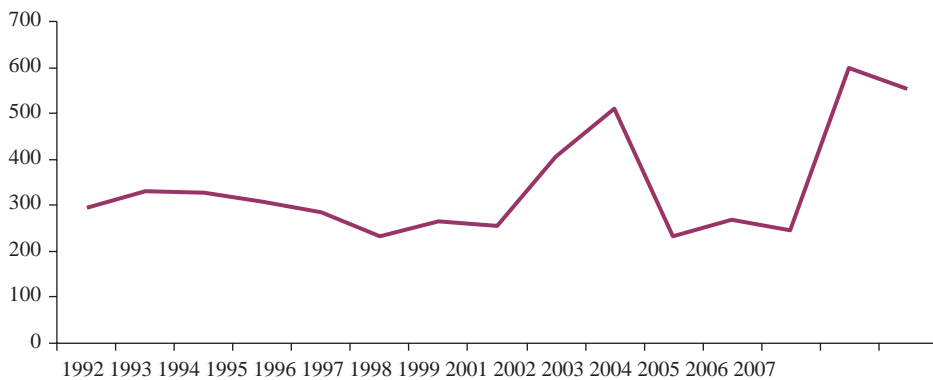


Figure 1. Number of models per year

overlapping market categories, which are highly heterogeneous in terms of target consumers and, relatedly, of technical characteristics (structure and materials). When observing market segmentation at the level of different styles of consumers, some interesting differences emerge across firms (see Table 2).

First, the market leaders (firms with more than 300 new skis *and* more than 20 new skis per year) produce in all ski categories (the only exceptions being Salomon and Head with zero products in the *alpine* category) and often they are among the top five producers in terms of number of models produced within a specific segment over total number of models in that segment.⁶ Second, the market leaders produce more than half of the total models in many categories, but their share of production is lower for *top* and *alpine* skis (around 35 per cent) and for *freeride* skis (47 per cent), which are often produced by the niche players. If we examine in more detail the firms' strategies, we note that large firms tend to target all the most important niches in a similar way. On the contrary, smaller manufacturers tend to focus on very few niches: for example, companies such as AK, DKB, Dyad Hart and Olin produce new models either in small niches such as *alpine*, or in top quality niches such as *racing*. All DKB and Hart skis are in this niche, and 75 per cent of Dyad skis are in the *freeride* niche, but these firms produce nothing in the *junior* or *easy carve* niches.

The analysis of the niches at a company level has important implications in terms of variety. The market leaders produce a very high number of new products and are present in many different niches, while firms that target a small number of niches also tend to produce a small number of products. Hence, the data in Table 2 might suggest the existence of a positive relationship between the development of a high number of new products and the degree of market-related differentiation at the firm level. However, this descriptive evidence does not provide any reference to the actual degree of innovativeness of the new products. In other words, a firm could be extremely prolific in terms of introduction of new products, by simply inventing around its existing products, offering very small value in terms of innovative content, exploiting the brand and the established market channels. On the contrary, other

⁶ The *alpine* and *freeride* submarkets constitute important exceptions, since the top producers are, respectively, Ski Trab and Scott USA.

Table 1. Industrial dynamics in the ski manufacturing sector, 1993 – 2007

	1993	1993	1994	1995	1996	1997	1998	1999	2001	2002	2003	2004	2005	2006	2007	TOT
Pre-existing companies	20	18	20	20	19	15	16	18	15	17	15	15	17	18	19	
New entries	0	2	0	1	1	0	1	1	3	3	0	0	1	5	4	22
Old entries ^a	0	0	1	0	0	0	4	0	0	0	0	4	0	1	1	11
Exits	0	2	0	1	2	5	0	1	3	2	5	0	0	0	4	25
Old exits ^a	0	0	0	0	0	0	0	1	1	0	0	0	2	0	1	5

^a Firms that have entered/exited the market not for the first time.

Table 2. Skis by company and style of consumers

Company						Special					
	Race	Giant slalom	Junior Lady	All-round		slalom	Carve	Top	Alpine	Easy	Free-ride
AK	2	4	0	0	0	2	2	0	0	0	0
Atomic	101	43	43	48	187	43	87	3	3	31	33
Authier	0	6	8	8	21	7	3	1	2	0	0
Blade	6	8	0	0	2	4	4	0	0	0	4
Blizzard	117	65	38	35	125	49	83	1	3	21	48
Bottero Ski	2	4	0	4	6	2	2	2	0	0	0
DKB	4	4	0	0	0	0	4	0	0	0	0
Duel	4	2	0	2	2	4	2	0	0	0	2
Dyad	6	0	0	2	2	0	0	0	0	0	6
Dynamic	99	25	35	25	106	28	75	2	3	45	23
Dynastar	117	39	32	53	133	32	72	7	8	38	43
Elan	113	40	23	33	111	28	94	4	1	40	37
Fischer	128	59	29	39	190	43	138	1	5	53	11
Hagan	0	2	0	2	3	1	0	0	0	0	0
Hart	6	0	0	0	0	0	4	0	0	0	4
Head	101	34	31	52	162	38	90	1	0	30	32
K2	85	40	15	50	99	37	72	3	3	13	29
Kästle	39	25	40	21	66	24	31	1	7	7	9
Kneissl	50	26	10	33	81	18	41	2	5	8	23
Lacroix	3	4	0	7	17	4	2	0	0	0	1
Longoni	7	1	0	0	4	3	11	0	0	5	0
Maxel	10	10	0	8	22	6	7	0	0	0	3
Morotto	0	2	2	2	4	0	0	1	3	0	0
Nava Ski	2	2	0	2	2	2	0	0	0	0	2
Nordica	66	18	0	23	62	17	54	0	0	22	24
Olin	2	2	0	0	5	1	1	0	0	0	0
Pre	0	3	0	6	8	2	2	1	0	0	0
Prime	12	6	4	0	2	0	14	0	0	7	3
Quechua	13	3	0	6	9	3	10	0	0	5	3
Rossignol	126	37	37	44	146	35	96	2	2	50	41
Salomon	119	37	8	56	171	29	93	4	0	37	38
Scott USA	81	4	1	7	30	12	38	0	0	4	62
Ski Trab	18	25	24	14	35	15	4	4	10	0	0
Spalding	10	16	20	10	37	12	4	2	3	2	0
Sport	6	6	0	2	2	10	6	0	0	0	0
Specialist											
Sporten	2	4	0	6	12	4	2	0	0	0	0
Stöckli	78	20	6	15	47	17	61	0	0	12	47
Tecno Pro	16	0	0	12	29	3	15	0	0	10	3
Tua Ski	37	8	10	13	62	8	29	2	9	17	13
Tyrolia	9	11	15	13	48	11	3	0	0	3	0
Volant	13	3	2	28	45	4	15	1	0	0	10
Vökl	115	48	21	37	116	41	87	1	4	38	36
Total	1,725	696	454	718	2,211	599	1,358	46	71	498	590

firms concentrate on a small number of niches, but generate truly new products. In order to further investigate this issue, the next section presents our empirical analysis, explaining the variables used to test our hypotheses, the specification of the models and the results.

4. Empirical Analysis

In order to empirically investigate the relationship between the degree of product innovativeness and firms' product strategies, we make an innovative use of the characteristic approach first developed by Lancaster (1966). This approach considers a product as a bundle of characteristics and the total utility of the product deriving from the accumulation of the utility of each individual characteristic. Saviotti and Metcalfe (1984) further improved this concept by making a distinction between service characteristics and technical characteristics, where the former provide a utility during the consumption, while the latter identify the internal (technical) structure, which allows an artefact to produce services. The characteristic approach has been widely used to perform hedonic price analysis (Griliches 1971; Rosen 1974) to assess market competitors, and to track technological trajectories (Frenken, Saviotti, and Trommetter 1999; Fontana, Nuvolari, and Saviotti 2009). Here we use this approach to (a) identify the extent to which a product is new to the market and (b) identify market-related and technology-related strategies of portfolio broadening at the firm level. First, as explicitly pointed out by d'Aspremont, Gabszewicz, and Thisse (1979) and Sorenson (2000), the mechanism underlying the Hotelling strategic effect relies on the consumers' preferences. Therefore, we make use of the service characteristics to measure the degree of innovativeness of the product with respect to the market. Second, in order to identify firms' product strategies, we use both the service and the technical characteristics, investigating their effects separately.

Specifically, to capture the degree of product innovativeness, i.e. to what extent a new ski differs from others in the market, we measure, for each product, its distance from other products in the market in a multidimensional characteristic space. To do so, we exploit the information on the skis' service characteristics and build an indicator of variety with respect to the target niche for each ski. We proceed in the following way. We first identify five different service characteristics for each ski, which refer to the target niche: *gender/age*, *carve*, *top*, *type of race*, *style*. Each characteristic can take different "values". In particular, *top* and *carve* are either present (1) or not (0); *gender/age* can be "lady" (1), "junior" (2) or "other" (0); *style* identifies different styles of skiing (e.g. freeride, easy); *type of race* identifies different types of race (e.g. giant slalom, special slalom) and can take three different values, as shown in Table 3.⁷

Thus, each ski can be represented as a vector of 5 service characteristics and there are 108 different possible value combinations in the market. Each possible combination of service characteristics constitutes a niche. This is because each combination of service characteristics defines a specific style of skiing of consumers: for example, a woman participating in downhill giant slalom's races will have different preferences from a teen-ager

⁷ Note that this categorization of service characteristics entails a smaller number of categories compared to the one previously discussed at the firm level (see Table 2). This is because some categories are mutually exclusive at the product level (e.g. a ski is either for special slalom races or for giant slalom races) and, therefore, it is possible to merge some of the categories into a single market segment.

Table 3. Service characteristics

Style	Gender/age	Top	Carve	Type of race	Value
Freeride	Lady	Yes	Yes	Giant slalom	1
Alpine	Junior			Special slalom	2
Race					3
Allround					4
Easy					5
Other	Other	No	No	Other	0

performing freestyle skiing, who needs fatter skis to float on top of the powder.⁸ Figure 2 shows the distribution of new skis in the different market segments. This frequency distribution is very skewed: in many niches there is no entry of any new products, while most of the observations are focused on few products.

Starting from this, we calculate the index $INNOVATIVENESS$. $INNOVATIVENESS$ identifies the degree of originality of each ski in relation to the other products in the overall market by year. In order to build this indicator, we first calculate the number of skis that are identical to the ski under consideration along all the five characteristics ($SIMIL_5$), i.e. how many skis are in the same niche when we consider all the five service characteristics. We do the same considering the number of other skis that are identical along four characteristics ($SIMIL_4$), along three characteristics ($SIMIL_3$), along two characteristics ($SIMIL_2$), along one characteristic ($SIMIL_1$) and along no characteristic ($SIMIL_0$). Then we create the variable $INNOVATIVENESS_j = \frac{1}{4} \left(1 - \frac{P_{j,40}^5}{P_{j,40}^5} \right) \cdot SIMIL_j$ and standardize it (i.e. we transform the data into z-scores). This variable indicates the degree of innovativeness of each new ski with respect to other new skis in the market: the higher the $INNOVATIVENESS$, the higher its contribution to product variety in the market, i.e. the higher the degree of product originality. Figure 3 shows the trend in innovativeness over time.

4.1. Explanatory Variables

We test our dependent variable $INNOVATIVENESS$ as a function of three variables: the breadth of a firm's product portfolio, i.e. the share of its new products over the total number of new products introduced in the market, the degree of market differentiation of a firm's product portfolio and the degree of technical differentiation of a firm's product portfolio.

First, in order to investigate the relationship between the degree of innovativeness and the breadth of the product portfolio (our research question Q1), we introduce a variable related to the number of new products developed over time by each firm. To this aim, we build the variable $BREADTH$, which is the share of new skis produced by a firm each year⁹ and we also check for a possible nonlinear effect, by introducing the square term $BREADTH^2$, since breadth

⁸ If we consider fewer dimensions instead of considering all five service characteristics, the number of sub-markets decreases and the average size grows.

⁹ This variable can also be interpreted as a proxy for firm size.

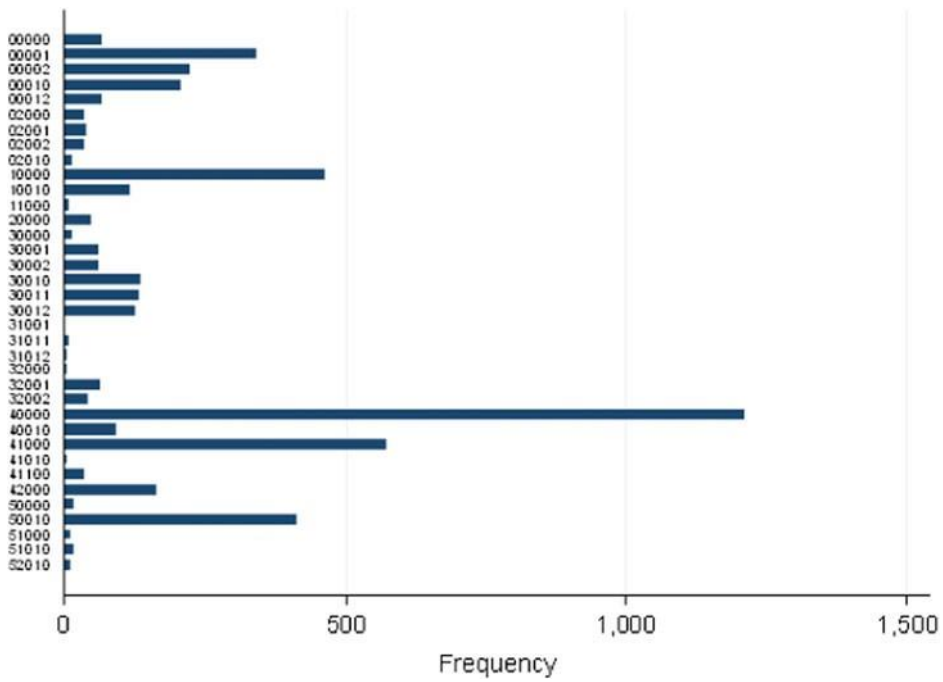


Figure 2. Distribution of new products in niches

is probably related to market size and there is strong evidence that size has a nonlinear relationship with any measure of innovative performance (Acs and Audretsch 1987).

Second, in order to investigate the second research question, we build two different measures trying to capture the extent to which the portfolio-broadening strategy results in a

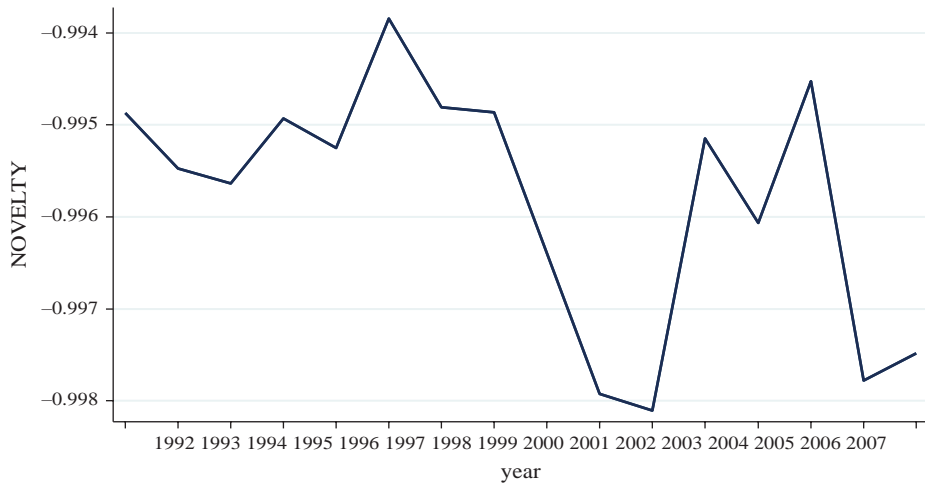


Figure 3. Degree of innovativeness over time

simple versioning of existing products: MKTDIFF and TECHDIFF. MKTDIFF is a variable representing the within-firm strength of the portfolio-broadening strategy in terms of niches. We have mentioned before that the market can be segmented by looking at service characteristics and that some firms produce skis for all niches, while others focus on specific skis. We can consider the range of niches served by each firm as an indicator of within-firm market-related portfolio-broadening strategies. Therefore, we first build a dummy variable for each niche, which takes the value 1 if a specific ski is developed for that niche and 0 otherwise. We then calculate, at the firm level, the average normalized (HH) index of niches per year, which indicates the degree of concentration related to the range of niches served by each firm. We take $MKTDIFF = 1 - \frac{1}{2} HH_{MARKETS}$ show as an indicator of the firm's portfolio differentiation in the niches. This variable ranges from 0 to 1 and takes value 0 only when a firm introduces products in one market only.

The second measure of the portfolio-broadening strategy, techdiff, is built upon three groups of technology-related variables—the core structure of the ski, the edges and the base (see Corrocher and Guerzoni 2009, for a detailed description of the variables). Each variable accounts for the presence of a specific feature in the core structure of the ski (e.g. presence of a torsion block), in the edges (e.g. presence of diamonds), in the base (e.g. presence of graphite). Since each variable is a dummy variable, we computed the variable structure for each ski as the sum of each characteristic. Then we calculate, at the firm level, the average normalized HH index per year in the $STRUCTURE$, which indicates the degree of similarity of the technical characteristics across the skis produced by each firm. Since we are interested in the degree of differentiation, we compute the variable $TECHDIFF = 1 - \frac{1}{2} HH_{STRUCTURE}$ where $HH_{STRUCTURE}$ is the HH of $STRUCTURE$.

Finally, we include some control variables, in particular the price of each product, to control for the perceived product quality, firm dummy variables and a time trend. The independent variables of the econometric model are presented in Table 4. Table 5 shows the correlation matrix.

4.2. Results

Table 6 presents the results. We first run an Ordinary Least Squares (OLS) regression, whose results are reported as Model 1 in the table. However, if we investigate the trend of INNOVATIVENESS, we observe that its distribution is far from being normal, which signals serious problems of heteroskedasticity. For this reason, we check the robustness of our results with alternative specifications. In particular, we run three quantile regressions.

Table 4. The explanatory variables—summary statistics

Variable	Description	Min	Max	Mean	Obs.
TECHDIFF	$(1 - \frac{1}{2} HH_{STRUCTURE})$	0.4015	0.987	0.7994	4,813
SERVDIFF	$(1 - \frac{1}{2} HH_{MARKETS})$	0.8271	0.9983	0.9528	4,574
BREADTH	Variable indicating the share of new products	0.003	0.05	0.09	4,394
log PRICE	Log of the product price	3.93	7.117	5.953	4,394
TREND	Time trend	1993	2007	2001	4,813

Table 5. Correlation matrix

	INNOV.	SERVDIFF	TECHDIFF	BREADTH	PRICE	TIME TREND
INNOV.	1	20.311	20.037	0.014	20.099	20.378
SERVDIFF	20.311	1	20.014	0.03	0.168	0.471
TECHDIFF	20.037	20.014	1	20.005	20.034	0.003
BREADTH	0.014	0.03	20.005	1	0.043	0.036
PRICE	20.099	0.168	20.034	0.043	1	0.394
TIME TREND	20.378	0.471	0.003	0.036	0.394	1

In Model 2 we estimate the coefficients by minimizing the absolute distance from the median, instead of the absolute distance from the mean. Because the heteroskedasticity is partly due to the existence of heavy outliers and the median is less sensitive to them, this model is more robust than a standard OLS. In Models 3 and 4, we estimate the quantile regressions for the 25th and the 75th quantile. Almost all coefficients remain stable and significant across the different specifications, but in Models 2 and 3, the adjusted R^2 improves. In all models we also control for firm-specific dummy variables.

Table 6 provides some empirical answers to the research questions. Results suggest that innovative products come from firms which introduce various products each year. The negative coefficient of the squared term suggests that the marginal effect is decreasing with the increase in the number of products and it could eventually become negative. However, in the interval of values observed in the sample, the relationship is always positive.

The second result of our analysis concerns the relationship between the degree of INNOVATIVENESS and the strength of market-related and technology-related portfolio-broadening strategies. The development of new-to-the-market products does not seem to be compatible with portfolio-broadening strategies, either at the level of technical characteristics (production structure) or at the level of service characteristics (target niches). Both TECHDIFF and SERVDIFF have a negative and significant impact on INNOVATIVENESS. Since TECHDIFF and SERVDIFF are measures of portfolio-broadening strategies in terms of technical and service characteristics at the firm level, i.e. across a single firm's products, this result means that firms with strong portfolio-broadening strategies tend to develop products with low levels of innovativeness with respect to the market. Furthermore, note that the coefficient of SERVDIFF is higher than the coefficient of TECHDIFF. This result suggests that the source of conflict between producing radically new-to-the-market products and pursuing strong portfolio-broadening strategies lies in the difficulties of segmenting the market and satisfying different consumer preferences, more than in the development of *ad-hoc* production structures.

In all the models, we control for the effect of price, which always shows a positive and significant coefficient. This is not surprising, as it is exactly the prediction of the Hotelling strategic effect: firms developing new products that are very similar to others already existing in the market cannot exploit the price differentials. However, here, we do not introduce this variable to test a trivial hypothesis, but rather to control for quality. In this sense, our results can be interpreted as providing evidence of the positive relationship between product innovativeness and quality. We also control for the effect of

Table 6. Regression results

	Dependent variable: INNOVATIVENESS			
	Model 1 (OLS)	Model 2 (0.50 quantile)	Model 3 (0.25 quantile)	Model 4 (0.75 quantile)
SERVDIFF	20.00369*** (0.00037)	20.00438*** (0.00024)	20.00299*** (0.00017)	20.00365*** (0.00032)
TECHDIFF	20.00306*** (0.0011)	20.00426*** (0.00064)	20.00104** (0.00046)	20.00228*** (0.00084)
BREADTH	0.0455*** (0.014)	0.0316*** (0.0082)	0.0207*** (0.0060)	0.0387***
BREADTH ²	20.334*** (0.10)	20.250*** (0.062)	20.238*** (0.045)	20.211** (0.083)
logPRICE	0.000300*** (0.000071)	0.000504*** (0.000049)	0.000255*** (0.000032)	0.000636*** (0.000070)
TIME TREND	20.000146*** (0.0000066)	20.000139*** (0.0000058)	20.000119*** (3.63e 2 06)	20.000167*** (0.0000078)
CONSTANT	20.991*** (0.0012)	20.991*** (0.00095)	20.994*** (0.00057)	20.993*** (0.0011)
FIRM DUMMY VARIABLES	Yes	Yes	Yes	Yes
Adj R ²	0.20			
Pseudo R ²		0.22	0.25	0.15
Observations	4,202	4,202	4,202	4,202

Notes: Standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

time in our analysis by using the variable $TREND$, which is a time index. The coefficient of $TREND$ is significant and negative in all the specifications, which has interesting implications for our analysis of variety. The descriptive evidence on the sector shows that several new models are introduced in the market every year. However, our empirical investigation suggests that the variety is increasingly due to the proliferation of similar products rather than to truly radical innovations, which means that companies are trying to leverage differentiation strategies to exploit advantages of price discrimination rather than producing something which is really new and could increase consumers' benefits.

Generally speaking, the results highlight that the ski manufacturing sector has a composite structure. First, we have multi-product firms that introduce many new products each year. Some of them are present in various segments and they are not the most innovative. Others tend, on the contrary, to introduce many new products, but they focus on one or very few niches only. The latter firms are most likely to attempt the introduction of products in innovative market niches.

Finally, we have very small fringe players who are active in very few specialized niches (e.g. Hart) and are not the most innovative ones. Therefore, the traditional partition of the industry into generalists vs. specialists is not occurring in this case, since the structural organization of the sector is much more complex and determined, among others, by the strong heterogeneity of consumers' characteristics and preferences.

5. Conclusions

The aim of this paper has been to examine the role of variety in a consumer goods sector (the ski manufacturing industry) and its relevance in firms' strategies. In particular, it has investigated the relationship between the emergence of products for new market niches and firms' portfolio-broadening strategies. While the existing literature usually looks at the determinants of new product entry or investigates the incentives of different types of firms to introduce innovations and the effect of different product strategies on firms' performance, this paper claims that new products may have very different degrees of innovativeness with respect to the market and that the production of new-to-the-market products entails very different costs and benefits for firms compared to the introduction of marginally modified versions of the existing products. Therefore, it studies the degree of product innovativeness as a function of the breadth of product portfolio and of firms' portfolio-broadening strategies in terms of technical characteristics and target niches, suggesting possible trade-offs between developing radically innovative products and adopting strong portfolio-broadening strategies.

We have collected data on products and firms in the ski manufacturing industry, which represents an interesting case, since it is a mature industry where niches can be easily identified, but where, nevertheless, there is a good deal of differentiation across firms and products. As a further contribution, the paper has also made a novel use of the characteristics approach, which is here employed to distinguish two types of variety—the degree of innovativeness of a product vis-a-vis the market, and the degree of technical and market-related differentiation within the firm.

We show that, controlling for quality, highly innovative products are rarely introduced by firms that adopt strong portfolio-broadening strategies both in terms of target markets and in terms of technical characteristics. Furthermore, we find that over time the overall degree of innovativeness of products decreases, suggesting that firms are progressively searching for

variety by developing different versions of the same products instead of introducing radically new products.

These results complement the observation by Giarratana and Fosfuri (2007) that firms might adopt “versioning strategies”, “broadening strategies” or mixed strategies by coupling the former two. Our evidence suggests that, when firms adopt versioning strategies, they might enter multiple niches, but these niches are not necessarily new to the market. The firms entering niches that are new to the market possess a focused product portfolio in terms of service characteristics and technical characteristics.

These findings signal that the introduction of novelty requires a deeply specialized knowledge of the new niche, which can be acquired only at the expense of the scope. It is particularly interesting to emphasize that product and technical differentiation have the same effect on product innovativeness, meaning that specialization involves both aspects. Further research could explore these results in more depth, looking at the profitability of different differentiation strategies and investigating other sectors to further validate these results.

There are relevant implications of our results both at the firm level and at the industry level. At the firm level, our results suggest that firms with a large product portfolio might produce highly innovative products, meaning that in some cases we observe the co-existence of strategies aiming at developing truly new products and strategies aiming at increasing the breadth of the product portfolio by introducing products that are only marginally different from the existing products. However, there is a trade-off between generating products with a high degree of innovativeness compared to the market competitors and pursuing aggressive strategies of portfolio broadening. At the industry level, we can state that although large (dominant) firms develop more innovations over time than smaller (fringe) market players, they do not necessarily introduce the most radical innovations. Indeed, among dominant firms, only those with a focused portfolio, in terms of both market segments and technological competencies, are likely to introduce highly innovative products.

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