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**PATENT OPPOSITIONS AS COMPETITIVE TOOLS: AN  
ANALYSIS OF THE MAJOR PLAYERS IN THE EUROPEAN  
MARKET OF WHITE GOODS**

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# **Patent Oppositions as Competitive Tools: An Analysis of the Major Players in the European Market of White Goods**

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## **Abstract**

This paper examines the role and determinants of patent oppositions between the main competitors in a given industry. Differently from previous studies, it is not concerned with high-tech firms but considers the major players in the European market of white goods. Thus, we are dealing with a medium-tech, scale intensive industry which, during the last two decades, has been characterised by a stagnating demand and decreasing unit values. As a result, the level of competition has increased, especially in terms of product quality and innovations. Among the consequences of that, the leading companies in Europe have not only intensified their patenting activities but also the usage of oppositions against the patents of direct competitors. By considering 961 patents granted by the EPO to the above companies over the period 2000-2005, the paper shows, among other things, that the probability of receiving an opposition from industry rivals does not depend on the patent quality or value. Accordingly, it contends that, at least in the industries of this kind, the extent and direction of patent oppositions are mainly associated with idiosyncratic corporate characteristics and strategies.

**Key words:** Strategic patenting; Patent oppositions; White good industry.

**JEL Codes:** O34 (Intellectual Property Rights), L68 (Industry studies - Appliances; Other Consumer Durables)



## **1. Introduction**

This paper examines the role and determinants of patent oppositions between the main competitors in a given industry. Differently from previous studies, it is not concerned with high-tech firms but considers the leading companies in the European market of white goods, i.e. refrigerators and freezers, cooking appliances, washing machines and dishwashers. Thus, we are dealing with a medium-tech, scale intensive industry which, during the last two decades, has been characterised by a stagnating demand and decreasing unit values. As a result, the level of competition has increased, especially in terms of product quality and innovations. Among the consequences of that, the major industry players in Europe have not only intensified their patenting activities but also the usage of oppositions against the patents of direct competitors. By considering 961 patents granted by the EPO to the top eleven companies in Europe, the paper shows, among other things, that the probability of receiving an opposition from industry rivals is not significantly affected by the patents' quality or value (approximated by the usual indicators). Accordingly, it contends that, at least in the industries of this kind, the extent and direction of patent oppositions mainly depend on idiosyncratic corporate characteristics and strategies: companies with high or increasing market shares but a limited patent portfolio are more exposed to rivals' challenges; however, the same occurs to the companies that are more akin to oppose the patents of competitors since, behaving in this way, they expose themselves to retaliations.

The paper is structured in the following sections. Section 2, after a survey of the literature concerned with patent litigation and oppositions, illustrates the motivations and additional contributions provided by this study. Section 3 describes the main features of the European market of white goods and identifies its major players in terms of market shares (nominal sales and units sold) and unit values recorded in 2005. Section 3 examines the patents granted by the EPO

to the above companies over the period 2000-2005 and concerned exclusively to white goods; the percentage of opposed patents turns out to be higher than that recorded in high-tech industries; then, a matrix of reciprocal oppositions is built with a view to identify the most aggressive and vulnerable companies in terms of patent challenges; finally, a Probit regression is run in order to test whether the patent quality plays any role in explaining the probability of receiving an opposition. Section 5 is devoted to the recent (2006-2010) behaviour of the examined companies in terms of patent applications to the EPO. Section 6 contains some concluding remarks.

## **2. Patent litigation and oppositions: a survey**

The last two decades have witnessed an explosion of patent applications and grants, both in the United States, Europe and Japan (i.e. the countries hosting the major patent offices of the world). The literature has offered several explanations of this phenomenon, but that attracting more consensus refers to the increasing recourse by companies to strategic patenting, that is for reasons other than that of achieving the exclusive right to commercialise or licence an invention<sup>1</sup>.

Firms may build a sort of patent "wall" around the original invention by patenting some of its potential developments and extensions. Since the obvious aim is that of blocking competitors, Arundel and Patel (2003) termed this strategy *offensive*. Instead, a *defensive* strategy occurs when firms apply for patents in order to avoid infringement suits as well as to increase their bargaining power with competitors and the scope for technological exchanges. While the purpose of the former strategy was that of restricting the competitors'

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<sup>1</sup> For two recent surveys of the various motives to patent see Blind et al. (2009) and Corbel and Le Bas (2011).

margins of manoeuvre, in this case the firms try to secure their freedom of operation (see also Cohen et al., 2002).

By examining the patenting activities in the US semiconductors industry, Hall and Ziedonis (2001) contended that companies were building up large patent portfolios mainly to enhance their contractual capability and, then, the access to external technologies. Thus, in presence of a mutual technological dependence among firms, a *defensive* strategic patenting is likely to prevail. Subsequent studies have shown that this is the case of many industries belonging to the ICT sector (computing, software, telecommunication equipment) which, in fact, are characterised by an extensive use of cross-licensing, information sharing and related negotiations (see, among others, Graham et al., 2003; Calderini and Scellato, 2004).

One of the consequences of the mounting recourse to strategic patenting has been an increase of the legal disputes on IPRs, both in terms of patent litigation (heard in front of a court) and patent oppositions (heard in front of a patent office, which is asked to re-examine its decision to grant a patent)<sup>2</sup>. Thus, as far as patents have been increasingly used as strategic weapons, also the legal challenges to the patents held by competitors have increased over time.

Although remarkable, the augment of patent litigation and oppositions does not mean that the propensity to legal disputes on patent right has raised too. In fact, during the 1990s, the shares of oppositions (or re-examinations) on patents granted by the EPO (or the USPTO) remained almost constant in the fields of pharmaceuticals and biotechnology while declining in semiconductors and software (Graham et al., 2003)<sup>3</sup>. Also looking at the patents challenged in front

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<sup>2</sup> The opposition procedure before the European Patent Office (EPO) allows any third party to file an opposition against the decision to grant a patent on the grounds that the prerequisites of patentability (novelty, inventiveness, and utility) were not fulfilled. A parallel procedure of re-examination is adopted by the United States Patent and Trademark Office (USPTO).

<sup>3</sup> Recent data provided by the EPO annual reports show that, also over the 2000s, the average opposition rate is slightly declining.

of US courts, the average rate of litigation has not shown significant changes over time (Lanjouw and Schankerman, 2004)

Thus, rather than focusing on time variations, the attention of scholars has been mainly devoted to explain why the probability to incur in a patent litigation or opposition is significantly different among technological areas (and, then, industries), types of patent holders (small or large companies) and types of patents (less or more valuable).

With respect to patent litigation, Lanjouw and Schankerman (2004) show that in the US, over the period 1991-95, the share of litigated patents was, on average, equal to 2%. There were relevant differences across technological areas, but a clear distinction between more or less technology advanced industries did not emerge. The only interesting finding was that, among the areas showing a greater propensity to patent litigation, both computers and biotechnology were included. By considering German patents over the period 1978-93, Cremers (2004) finds an average litigation rate lower than 1% which was significantly higher in the mechanical area (a group composed of different technological fields and products) and lower in pharmaceuticals, chemicals and electronics. These findings, probably due to the different technological specialisation of German companies, are quite at odds with those emerged in the US. In any case, what the evidence suggests is that the probability of having a litigated patent cannot be easily associated with a particular technology or industry.

Looking at the features of patent holders, Lanjouw and Schankerman (2001) contend that in the US there are two types of patentees overexposed to the risk of patent litigation: small firms and independent inventors holding patents in new or technology-advanced industries. Similar results emerge in Lanjouw and Schankerman (2004) who, moreover, show that the probability of litigation is lower for companies with large patent portfolios, i.e. with a greater ability to prevent legal disputes by resorting either to cross-licensing or credible threats of retaliation. The evidence for German companies (Cremers, 2004) confirms the



negative impact exerted by the extent of patent portfolios while the results concerned with the size of patentees are mixed.

The above mentioned studies converge in showing that the probability of litigation is significantly associated with the patent quality or value. The latter can be approximated by different indicators, each having strengths and weaknesses (for a recent survey, see van Zeebroeck, 2011). Among them, the most diffused and effective quality measures are the number of citations received by a patent (forward citations) and the size of patent families (given by the number of countries in which patent protection is sought for the same invention). Other indicators, less diffused and/or effective in capturing the value of a patent, are the number of backward citations (references to previous patents), the number of claims (the specific property rights that the patent should protect) and the number of years for which the renewal fees are paid (and, then, the patent is in force).

Lanjouw and Schankerman (2001 and 2004) find that the probability of litigation raises significantly with the number of claims contained and the number of forward citations received by a patent. These results are confirmed by Cremers (2004) who, moreover, shows that also the number of backward citations and the extent of patent families exert positive effects.

The analysis of patent oppositions confirms only in part the above findings. This is not surprising, since filing an opposition to a patent office is not only inherently different than litigating a patent in a court but implies different costs. In fact, the exclusive aim of an opposition is that of challenging the validity of a patent (see footnote 2), while patent lawsuits, along with the same motive, are mainly undertaken to protect a patented invention from infringements<sup>4</sup>. However, from an economic viewpoint, the most important difference is that

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<sup>4</sup> In fact, among the different European jurisdictions, to challenge the validity of a patent in court is either not admitted (as in Germany) or admitted only for defensive purposes within a lawsuit for infringement.

patent lawsuits are much more expensive than oppositions. In Europe, the costs of an opposition range from €15,000 to €25,000 while those of litigation, according to the complexity of the case, are estimated to be between €0,000 and €500,000 (for an in-depth analysis see Mejer and van Pottelsberghe, 2009). As a consequence, the opposition rates are much higher than those of litigation (see below) also because most of the legal disputes concerned with patent rights can be solved by resorting to extrajudicial settlements<sup>5</sup>.

Before moving to the evidence, it should be stressed that while in the United States the attention of scholars has been mainly concentrated on patent litigation, in Europe the analyses have almost exclusively focused on the oppositions to the patents granted by the EPO<sup>6</sup>. The reason is that, in the European context, the presence of multiple national jurisdictions makes almost impossible to collect comprehensive information on patent litigation<sup>7</sup> and the only centralised procedure dealing with patent challenges is that of an EPO opposition.

A number of studies have examined the oppositions against EPO patent grants by looking at their extent, determinants and outcomes. In the following discussion, I will mainly refer to the findings of Graham et al. (2003), Haroff and Reitzig (2004), Calderini and Scellato (2004) and Cincera (2011).

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<sup>5</sup> Instead, once an opposition is filed, the parties have no longer the chance of reaching an agreement before the EPO. For an empirical analysis of settlements during patent litigation trials in Germany see Cremers (2009).

<sup>6</sup> Graham et al. (2003) perform a parallel analysis of EPO oppositions and USPTO re-examinations. The rate of re-examinations turns out to be much lower than that of oppositions (on average, 0.2% versus 8%). As a consequence, the USPTO re-examinations do not seem particularly effective in reducing the likelihood of further legal disputes. Being the latter aim socially desirable, some scholars contend that also in the US an opposition procedure similar to that of the EPO should be introduced (see Levin and Levin, 2003; Hall et al., 2003).

<sup>7</sup> Thus, it is not by chance that, to my knowledge, the only available study on patent litigation in Europe (Cremers, 2005) refers exclusively to Germany. Aside from the data issue, a system of multiple jurisdictions implies that a patent can be challenged in different States and the filing of multiple lawsuits is often necessary in order to effectively fight infringements. Moreover, for both kinds of litigation there is no certainty that the outcomes will be similar across national jurisdictions. Schettino and Sterlacchini (2009) show that the high cost and uncertainty of legal disputes reduce the propensity to patent of European small companies.

The overall share of opposed patents ranges from 6 to 8% of all the patents granted by the EPO, a share much higher than that of litigated patents (see above). The opposition rate for patents concerned with TLC and ICT is lower both with respect to the average and to that recorded in biotechnology and pharmaceuticals. For EPO patents concerned with TLC the share of oppositions was about 4% over the period 1980-2002 (Calderini and Scellato, 2004) while for biotechnology and pharmaceutical patents, examined between 1979 and 1996, it was 8.5% (Haroff and Reitzig, 2004).

As far as the outcomes of the opposition process are concerned, about 30% of the opposed patents is revoked, 35% amended (for instance, by changing or reducing the claims) while the remaining 34% is maintained (i.e. the opposition is rejected or closed). Contrary to what has been found for patent litigation, the probability of an EPO opposition is not significantly affected by firm size and inventor status (independent patent holders versus companies). Instead, similar results emerge for the extent of patent portfolio which reduces the chance of patentees to incur in an opposition. Finally, looking at the patents' quality or characteristics, the number of forward citations and claims, the extent of patent families and, to a lesser extent, the number of backward citations are found to significantly increase the probability of an opposition. In short, the most valuable patents (according to the above proxies) are more likely to be opposed. Also on the basis of these findings, it has become common to take the same occurrence of an opposition as an indicator of patent quality (cf. Haroff et al., 2002; Cremers, 2004; van Zeebroeck, 2011).

However, it should be stressed that a strong correlation between EPO oppositions and patent quality indicators arises when the analysis refers to all the EPO patents of a country (Belgium in Cincera, 2011) or those of some industries or technology areas (biotechnology, pharmaceutical, software and semiconductors in Graham et al., 2003; biotechnology and pharmaceutical in Haroff and Reitzig, 2004). In fact, taking into account only the major producers

of TLC equipment (such as Siemens, Motorola, Nokia, Alcatel, Ericsson, and others) Calderini and Scellato (2004) show that the quality of opposed patents is not different from that of the others.

This paper, in line with Calderini and Scellato's (which, to our knowledge, is unique in this respect), deals explicitly with the patent disputes of the main competitors in a given industry. Differently from previous studies, it is not concerned with a high-tech industry but examines the main European producers of "white goods", a label attached to large domestic appliances, including refrigerators and freezers, cooking appliances (ovens and cookers), washing machines and dishwashers<sup>8</sup>. Thus, we are dealing with a medium-tech, scale intensive industry which, as documented in the next section, has been characterised by an almost stagnating demand. These features make the white good industry quite opposite to the fast-growing, R&D-intensive industries of biotechnology, ICT and TLC, which have been extensively analysed in the literature concerned with strategic patenting.

Moreover, the focus on the major industry players allows one to identify not only the extent of patent oppositions and the patents that are more likely to be opposed but also "who is opposing the patents of whom". In other words, we also examine if some companies are more exposed than others to a patent opposition as well as whether some companies are more akin to oppose the patents of (specific) competitors. By taking into account company behaviour and characteristics, this paper enlarges the set of the possible determinants of patent oppositions with a view of improving our understanding of the role played by strategic patenting and technological competition.

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<sup>8</sup> They are usually distinguished from "brawn goods" (household appliances used outside the kitchen, such as TV and video recorders) as well as small domestic appliances (such as vacuum cleaners, mixers, coffee makers, etc.).

### **3. The European market of white goods and its major players**

During the last two decades the global demand of white goods has grown at a slow pace. The positive impulse has coming from the developing and emerging economies while OECD countries, and especially those of Western Europe, have recorded a sluggish if not declining demand. According to Nichols and Cam (2005), due the saturation of Western European markets, the European white goods industry has become more and more competitive as witnessed by the declining or flat unit prices. The major European players have reacted by extending their presence in Eastern Europe, Asia and the Middle East whose patterns of demand and unit values have been more favourable.

As a consequence, while in the past the leaders in the white goods industry have thrived on economies of scale, strong presence in regional (and sometimes national) markets, tight control of distribution channels and relatively simple innovations, in recent years they have been compelled to undertake radical changes in terms of competitive strategies. In the face of a stagnating demand and declining prices, companies have become more globalized (both in terms of production and commercialization), more oriented to exploit scope (rather than scale) economies, and invest in product differentiation, R&D and innovation (Segan-Horn et al.,1998; Nichols and Cam, 2005; Bonaglia et al., 2007). In fact, although both products and production processes are viewed as rather mature, in recent times, the emphasis on environment preservation and energy saving as well as the application of micro-electronic, connectivity and wireless technologies have given a remarkable impulse to product innovations.

In spite of the increasing globalization of the white goods industry, high degrees of market concentration are still observed at regional level (Europe, North America, etc.). Over the 2000s, no single producer owned more than 10% of the global market. The first four companies in the world commanded less than 27% of the market, while the cumulated shares of the top fours in North America and

Western Europe were, respectively, 44 and 55% (see CSIL, various years). In fact, contrary to smaller appliances whose trade is more intense and global, the market of white goods is still geographically segmented because of high transportation costs, persistent differences in terms of consumer preferences and standards, and, last but not least, brand loyalty (Bonaglia et al., 2007). Accordingly, and in line with the practice of industry experts and companies, the European market of white goods usually encompasses both Western and Eastern European countries (including Russia).

Table 1 – Leading companies in the European market of white goods: market shares and euro per unit sold in 2005\*

	Sales (million euro)	Percentage European sales	Units (million)	Percentage European units	Euro per unit
BSH	5500	15.07	14.0	13.33	393
Electrolux	5150	14.11	18.0	17.14	286
Indesit	2880	7.89	12.0	11.43	240
Whirlpool	2400	6.58	10.0	9.52	240
Arçelik	2300	6.30	8.0	7.62	288
Miele	1680	4.60	3.5	3.33	480
Fagor-Brandt	1420	3.89	7.0	6.67	203
Candy	850	2.33	4.5	4.29	189
Major players	22180	60.77	77.0	73.33	n.a.
Others <sup>°</sup>	14320	39.23	28.0	26.67	n.a.
Total <sup>°°</sup>	36500	100.00	105.0	100.00	n.a.

\* Estimates based on CSIL (2006 and 2008) *Profiles of 50 major appliance manufacturers worldwide*; n.a.= not applicable; ° = include the Digital Appliance Divisions of LG Electronics and Samsung.; °°= estimates of total sales and total units sold are also based on data provided by, respectively, Nichols and Cam (2005) and the Indesit Company (in a presentation diffused in 2006).

Table 1 identifies the major companies (or groups) of the European white goods industry by reporting their market shares either in terms of sales and units sold in 2005. Although the table is mainly based on company data provided by the reports published by CSIL (2006 and 2008), in order to find the total amount of sales and units sold in Europe (Western and Eastern) I also resorted to other data sources. Moreover, for a few companies (such as Miele and, to a minor extent,

Arçelik), data are adjusted (under reasonable hypotheses) in order to isolate the sales exclusively concerned with the European market. As a consequence, the market shares reported in Table 1 and, especially, the unit values included in its last column should be taken as round estimates rather than precise figures. In any case, it should be stressed that the company ranking emerging from the table is consistent with the information provided by previous studies (cf. Nichols and Cam, 2005; Bonaglia et al., 2007).

The four major players in the European market of white goods are BSH (Bosch and Siemens Hausgeräte), Electrolux Europe, Indesit Company (formerly Merloni Elettrodomestici) and Whirlpool Europe. BSH is the leading company in terms of sales, while Electrolux prevails with respect to the units of domestic appliances sold. Obviously, this is due to different product prices, in line with the effective or perceived product quality. As the last column of Table 1 shows, the estimated unit value of BSH products is significantly higher than that of Electrolux's. Both for sales and output volumes Indesit and Whirlpool are, respectively, the third and fourth main player of the European market. However, especially in terms of sales, they are closely followed by the Turkish Arçelik which, considering its performance in previous years, results as the emerging European company (Bonaglia et al., 2007).

Miele attains the sixth position for sales and the last one for units sold. Again, such a big discrepancy is due to the fact that the German company, specialised in top quality ("premium" and professional) white goods, applies the highest unit prices among the observed companies (remarkably higher also with respect to those of BSH).

The Fagor-Brandt group is the result of the 2005 merger between two companies: Fagor (based in Spain) and Brandt (France). Together, they reach a good position only in terms of units sold. Finally, the last among the major European players is the Italian Candy which also records the lowest unit value.

The eight above mentioned companies account for 61% of total sales and 73% of total units sold in the European market of white goods. Such a high level of concentration is mainly due to an intense process of mergers and acquisitions that occurred in previous years. In consequence of that, each of the top European companies but Miele owns a considerable number of brands (see Box 1). This has allowed the largest producers of domestic appliances to enlarge their presence in foreign countries without losing the brand loyalty of consumers. However, as mentioned above, to face the problems of a stagnating demand and declining unit values, the white good companies have also had to pay more attention to product innovations, especially in the fields of efficiency (i.e. energy saving), reliability, multi-tasking, digital and programming facilities.

Box 1 – Main brands (aside from their own) of the top companies in the European market of white goods\*

*Arçelik*: BEKO, Altus, Blomberg, Arctic, Grunding, Leisure, Flavel, Arstil, Elektra Bregenz.

*BSH* (Bosh and Siemens): Pitsos, Balay, Profilo, Gaggenau, Neff, Continental.

*Candy*: Hoover, Rosières, Iberna, Otsein, Vyatka, Zerowatt.

*Electrolux*: Zanussi, AEG, Elektro-Helios, Tricity Bendix, Frigidaire, Kelvinator.

*Fagor-Brandt* (Elco-Brandt and Fagor): Aspes, Edesa, White-Westinghouse.

*Indesit*: Ariston, Hopoint, Cannon, Creda, Sholtès.

*Whirlpool*: Kitchenaid, Roper, Estate, Bauknecht, SMC, Brastemp.

\*=In a few cases, also the brands exclusively diffused in countries other than the European ones are included.  
Source: CSIL (2006 and 2008) *Profiles of 50 major appliance manufacturers*.

The emphasis on technological competition clearly emerges from the communication strategies of the leading companies of the industry: nowadays, it is extremely rare not to find the words “technology” and “innovation” in the company profiles diffused on the Internet. Some of them, in order to sustain



their claims of being “technology leaders”, offer to the public detailed information on their R&D and patenting activities. This is particularly the case of BSH and Miele.

According to the information provided in their web sites, in 2005 the annual R&D expenditures of BSH amounted to €184 million (2.5% of turnover) while Miele spent €150 million (about 7% of its turnover). From 2001 to 2005, the latter filed 112 patent applications to the EPO (and 69 to the USPTO) while BSH, in its 2008 annual report, claimed to file 350 patent applications per year, that is almost one patent per day. Looking at the EPO applications of the two companies (see Section 5), I found not only that the above information are true but that, in 2009 and 2010, both of them (though especially BSH) have remarkably increased their patenting activities. The claim of BSH and Miele to be innovation leaders of the white good industry is also supported by the fact that the average price of their products is much higher (though especially in the case of Miele) than that of their main European competitors (see Table 1). As shown in the next section, to play and sustain the role of technology leader has important implications also in terms of usage of patent oppositions.

As compared to BSH and Miele, the other major European players can be classified as technology followers. However, this does not mean that all of them ascribe the same importance to technological competition, at least in terms of patenting activities. For instance, according to Bonaglia et al. (2007) the emergence of Arçelik as one of the top European companies has been also due to its R&D efforts, mainly undertaken to develop its own technology and brand along with the acquisition of foreign ones. In terms of patenting activities, Arçelik was far behind its main competitors during the first half of the 2000s (see the next section). However, from 2006 to 2010 it has been the company characterised by the highest growth rate of EPO applications (see Section 5).

Before moving to the exam of patent grants and oppositions, it must be added that, along with the first eight European companies mentioned in this section,

our analysis also includes LG Electronics and Samsung or, to be precise, their respective “digital appliance divisions”. In 2005 the two South Korean companies (included in Table 1 under the label of “others”) recorded a low share of the European market of white goods: according to some estimates, their cumulative market share in terms of units sold was below 4%, with Samsung behind LG. However, in the subsequent years both companies have significantly increased their sales of domestic appliances in the European markets<sup>9</sup>. Thus, it was not by chance that, in our search for the patents granted by the EPO in the field of white goods, we found that those obtained by Samsung and LG over the period 2000-2005 were, respectively, greater and in line with the patent grants achieved by some of the main European players. Since similar findings did not emerge for other producers of domestic appliances, we decided to include only Samsung and LG in our study.

#### **4. Patent grants and (reciprocal) oppositions among the leading white good companies**

For the major players in the European market of white goods, including the digital appliance division of LG Electronics and Samsung, we collected comprehensive information, including the occurrence of an opposition, on the patents exclusively concerned with white goods (refrigerators and freezers, cooking appliances, washing machines and dishwashers) granted by the EPO from 2000 to 2005. We found the remarkable figure of 961 granted patents (about 160 per year).

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<sup>9</sup> According to company press releases, during the first six-months of 2010, Samsung’s share in the European market for refrigerators was 8.3%. On the other hand, although no figures are available for the whole European market, LG has particularly increased its sales of washing machines. For instance, in 2010, LG achieved a 7.3% share of the Italian market.

Table 2 – Patents granted by the EPO and oppositions received by the leading companies of the European white good market: 2000-2005

	Patents granted		Total patents opposed		Patents opposed by listed competitors	
	Number	Per unit sold*	Number	Percentage on granted	Number	Percentage on granted
Fagor <sup>o</sup>	19	7.0	1	5.26	0	0.00
Arçelik	23	2.9	1	4.35	1	4.35
LG	29	n.a.	2	6.90	2	6.90
Brandt <sup>o</sup>	30	7.0	2	6.67	0	0.00
Indesit	38	3.2	9	23.68	8	21.05
Samsung	54	n.a.	3	5.56	3	5.56
Candy	55	12.2	3	5.45	3	5.45
Miele	62	17.7	7	11.29	5	8.06
Whirlpool	113	11.3	6	5.26	6	5.26
Electrolux	174	9.7	22	12.64	19	10.92
BSH	364	26.0	38	10.44	27	7.42
Total	961	n.a.	94	9.78	74	7.70

\* = See Table 1. <sup>o</sup>= The number of patents per units sold refers to Fagor-Brandt. n.a. = not available or applicable.

For the eleven companies considered, Table 2 shows, in increasing order, the number of EPO patent grants and, then, the number and percentage of opposed patents, by also distinguishing those received by one of the major competitors. The overall opposition rate is 9.8%, a figure greater than that concerned with the overall population of EPO patents (between 6 and 8%; see Section 2), much higher than that arising for ICT and TLC patents (4%), and even above that found for biotechnology and pharmaceuticals (8.5%). The most important finding that must be stressed is that such a high presence of patent challenges is mainly due to the behaviour of the same top companies considered: 74 out of the 94 opposed patents (78.7%) are challenged by one of the competitors listed in Table 2. Moreover, the overwhelming majority of other opponents (that have challenged the remaining 20 patents) was not made of direct competitors in the final market of white goods, but companies producing control systems and apparatus for domestic appliances.

Moving to company performances, BSH indisputably emerges as the leading company (being the assignee of almost 38% of the whole set of observed patents) while Electrolux and Whirlpool rank second and third respectively, each owing less than half of the BSH patents. Together these three companies account for about 68% of all the patents considered. The patents granted to the other eight companies are by far lower and this can be partly justified by their relatively small size. Thus, in terms of patents per unit sold (see the second column of Table 2), BSH remains the leader, but, along with Whirlpool (and, probably, LG and Samsung) also Miele and Candy record a good performance. Electrolux and Fagor-Brand achieve an intermediate position while Indesit and Arçelik rank very low.

Looking at the opposition rate across companies, it emerges that almost 24% of the patents assigned to Indesit have been challenged (an opposition rate more than twice that observed on average) and this is almost entirely due to behaviour of direct competitors. Although with much lower rates, the other companies more exposed to patent oppositions are Electrolux, Miele and BSH. According to these figures, there is not evidence that the size of patent portfolios reduces the probability to incur in an opposition. Companies with a relatively undersized portfolio of patents (such as Fagor, Arçelik, LG, Brand and Indesit) record quite different opposition rates and the same happens to companies with intermediate (Samsung, Candy and Miele) and large patent portfolios (BSH, Electrolux, Whirlpool). In particular, the Indesit case might suggest that the likelihood of receiving an opposition is higher not necessarily for companies with small patent portfolios but for those that share with the above feature that of having a relevant market share (Indesit being the third major player in the European market; cf. Table 1). On the other hand, the fact that Electrolux, Miele, and BSH, in spite of having quite different patent portfolios and market shares, record similar opposition rates suggests that the probability to incur in a challenge could be affected by other factors, such as the propensity to challenge

the patents of competitors and the different quality (or value) of patents. Both factors are examined in the remain of this section.

Table 3 – Matrix of EPO oppositions between the leading white good companies in Europe

Opponent Patentee		A	B	C	D	E	F	G	H	I	J	Others	Total
Açelik	A	0	0	0	0	0	0	0	0	0	1	0	1
LG	B	0	0	0	0	0	0	0	2	0	0	0	2
Indesit	C	1	0	0	0	0	1	0	1	1	4	1	9
Fagor-Brandt	D	0	0	0	0	0	0	0	0	0	0	3	3
Samsung	E	0	0	0	0	0	0	0	1	0	2	0	3
Candy	F	0	0	0	0	0	0	0	0	0	3	0	3
Whirlpool	G	0	0	1	0	0	0	0	1	1	3	0	6
Miele	H	0	0	0	0	0	0	0	0	1	5	2	8
Electrolux	I	0	0	0	0	0	0	2	6	0	12	5	25
BSH	J	0	0	2	1	0	0	1	17	11	0	14	46
Total		1	0	3	1	0	1	3	28	14	30	23	104

A quite strong indication that patent oppositions are used strategically as competitive tools emerges from the analysis of the matrix of reciprocal oppositions. Table 3 shows that 81 out of the 104 oppositions (due to the occurrence of multiple opponents, the number is higher than that reported in Table 2) were filed by the main white goods producers in Europe. Moreover, it should be reminded that most of the “other” opponents were not direct competitors of the ten leading companies listed in the first column<sup>10</sup>.

The reciprocal oppositions among Miele, Electrolux and BSH (see the cells emphasised in green) account for 64% of the total patent challenges undertaken by the main European players. Although Whirlpool does not emerge as a strong opponent, if we add also this company to the above group (light blue cells) the same percentage increases up to 73%. Finally, by adding either the oppositions

<sup>10</sup> Fagor and Brand are merged because the only opposition they filed against Indesit occurred after their 2005 merge. In effect, the opponent’s name reported in the EPO document concerned with the legal history of the Indesit patent is Fagor-Brand.

received and done by Indesit with respect to the above companies, we reach about 84% of the total oppositions filed by the main competitors. Reminding that, in 2005, these five companies accounted for 48 % of total sales and 56% of the units of white goods sold in Europe (cf. Table 1), our findings clearly indicate that patent oppositions are particularly concentrated within the group of the main industry players.

These results are at odds with the evidence provided by Calderini and Scellato (2004) for the major companies in the industry of TLC equipment. In fact, as they point out on page 4 of their paper, “considering the major patentees in the TLC patent classes the matrix of reciprocal opposition cases is nearly empty”, suggesting that these companies have restrained themselves from using patent challenges as strategic weapons in order to avoid retaliations and, then, leave open the door to cross-licensing.

Why, in the case of white good companies, the matrix of reciprocal oppositions is rather full?

A plausible explanation is that the resort to patent challenges by dominant players is less intense in industries characterised by better demand prospects and higher technological opportunities, such as those of ICT and TLC. Instead, in industries facing an almost stagnating demand and lower technological opportunities the competition, also in terms of product innovations, becomes more fierce. Thus, as in the case of the white good industry, the companies must sustain their market shares and/or their reputation as innovation leaders with all means, patent challenges included.

Obviously, an extensive use of patent oppositions is not equally diffused among companies. Thus, the probability of receiving an opposition is also associated with the company propensity to challenge the patents of competitors, which clearly exposes the former to retaliations. In this regard, it is worth noticing that the number of reciprocal oppositions between BSH and Electrolux group is almost identical (12 and 11). In the same vein, it is interesting to compare the

cases of Miele and Whirlpool. Miele results as the second most aggressive company, having opposed a number of patents not far from that of the patent leader BSH (28 versus 30). Miele's challenges were mainly targeted on BSH (17 out of 26) and the latter company fought back by opposing 5 of the 62 patents assigned to Miele, which received other 3 oppositions for a total of 8. Whirlpool, on the contrary, acted as opponent only 3 times and, in spite of owing 114 patents, received 6 oppositions only.

Having stressed the strategic role of patent oppositions, it remains to be seen if some patents are more likely to be opposed than others. In order to test whether the probability of an opposition was significantly associated with patent quality or value, I performed two Probit regressions for the EPO patents under examination: one for the overall probability of an opposition and another for the probability of being opposed by the one of the main competitors. Among the explanatory variables, I employed, in line with previous studies (see Section 2), the number of backward and forward citations, the number of claims, and the extent of patent families (i.e. the number of countries in which patent protection is sought)<sup>11</sup>. Moreover, together with patents' heterogeneity, the regressions account for that of patentees by means of company dummies.

Table 4 shows that when the overall probability of opposition is taken into account the only patent quality indicator that exerts a positive and significant effect is the number of forward citations. So, contrary to previous studies, we do not find that patent families and claims increase the likelihood of an opposition; instead, the non significant impact of backward citations is not new in the empirical literature (see Section 2). The only company dummy that turns out to be significant, although at a 10% level of confidence, is that for Indesit, which means that, even after controlling for their relative quality, the patents of this

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<sup>11</sup> All the measures of patent quality were taken from the OECD/EPO patent citation database by using, as a search key, the application number of the 961 EPO patents considered in this study.

company were more likely to be opposed. As a tentative explanation for this result, we have already emphasised that Indesit was the third company in terms of European market shares but its patent portfolio was extremely undersized when compared with that of the other top companies.

Table 4 – Probit regressions for the occurrence of a patent opposition

	Total oppositions		Competitors' oppositions	
	Coefficient	Standard error	Coefficient	Standard error
Constant	-1.8090	0.4896 ***	-1.7276	0.4939 ***
Backward citations	-0.0323	0.00297	-0.0264	0.0315
Forward citations	0.0664	0.0310 **	0.0351	0.3401
Patent family size	0.0122	0.0184	0.0052	0.0197
Claims	0.0068	0.0095	0.0042	0.0102
Fagor-Brandt	0.2302	0.5464	omitted <sup>o</sup>	
BSH	0.4925	0.4697	0.2939	0.4730
Candy	0.1742	0.5511	0.1541	0.5534
Electrolux	0.5814	0.4834	0.4961	0.4868
Indesit	0.9069	0.5264 *	0.8669	0.5307
LG	0.2010	0.5898	0.2369	0.5886
Miele	0.5412	0.5146	0.3400	0.5262
Samsung	0.0617	0.5462	0.0994	0.5473
Whirlpool	0.1334	0.5046	0.1218	0.5064
Number of observations	961		912	
Log-likelihood	-296.72		-250.31	

\*\*\*= significant at 0.01; \*\*=significant at 0.05; \*= significant at 0.10.

<sup>o</sup>= no oppositions received from competitors

Moving to the probability to receive an opposition from a direct competitor, the regression results show that none of the measures of patent quality and company dummies exerts a significant effect. Thus, in this case, there is no evidence that



the occurrence of an opposition is associated with the characteristics of both patents and patentees.

By comparing the results of the two Probit regressions it emerges that patent quality (captured by forward citations) plays a significant role only when also the patent challenges of "other" opponents are taken into account. The latter, as already said, do not compete in the final market of white goods and, as such, are more likely to oppose valuable patents only. Instead, the major players of the European market pay less attention to patent quality and use patent oppositions mainly as competitive weapons. As a consequence, the patents of some companies can be more exposed to challenges not because of their value but for other strategic motives.

Two additional findings are worth to be mentioned. The first refers to the outcomes of the opposition processes. In this connection, the results arising from our set of white good patents are consistent with those emerging from previous studies: about 33% of the opposed patents were revoked, 34% amended and 33% maintained. Accordingly, one can say that in the majority of cases the opposition strategy was successful, at least in reducing the extent of property rights assigned to patentees. It should be added that, because both the patentees and the opponents can appeal against the first decision of the EPO, the average length of the opposition procedures is not negligible (around 3 years). In any case, as mentioned in Section 2, the overall costs for the involved companies are likely to be incomparably lower than those required for a patent litigation. Thus, as far as patent oppositions reduce the scope for further legal disputes<sup>12</sup>, the fact that some companies make an extensive usage of them is not necessarily evil from a social point of view. The second interesting finding concerns the opponents' nationality. From 2000 to 2005 the oppositions filed by Miele and

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<sup>12</sup> Although, according to Graham et al. (2003), there is no clear evidence that this is the case. Cremers (2009), for instance, finds that a prior opposition reduces the probability of a settlement during patent litigation trials in Germany.

BSH were, respectively, 28 and 30. To them, one should add the 14 oppositions ascribed to the Electrolux group since they were actually filed by its German affiliate AEG-Hausgeräte: this is probably not by chance, considering that AEG is located in Nürnberg, that is about 150 Km far from the EPO headquarter of Munich in which the opposition proceedings are held. Finally, we found that 20 out of the 23 oppositions undertaken by other opponents were filed by eight German firms<sup>13</sup>. Summing up, in 92 out of 104 opposition cases (88%) the opponent was a German company.

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<sup>13</sup> Namely (and in decreasing order of number of oppositions): Diehl AKO Stiftung; Aweco Appliance System; Stiebel Eltron; Vaillant; Schott Glas; Rational Aktiengesellschaft; Schutzrechtsverwertung; E.G.O. Elektro-Gerätebau.

## 5. Recent changes in the propensity to patent

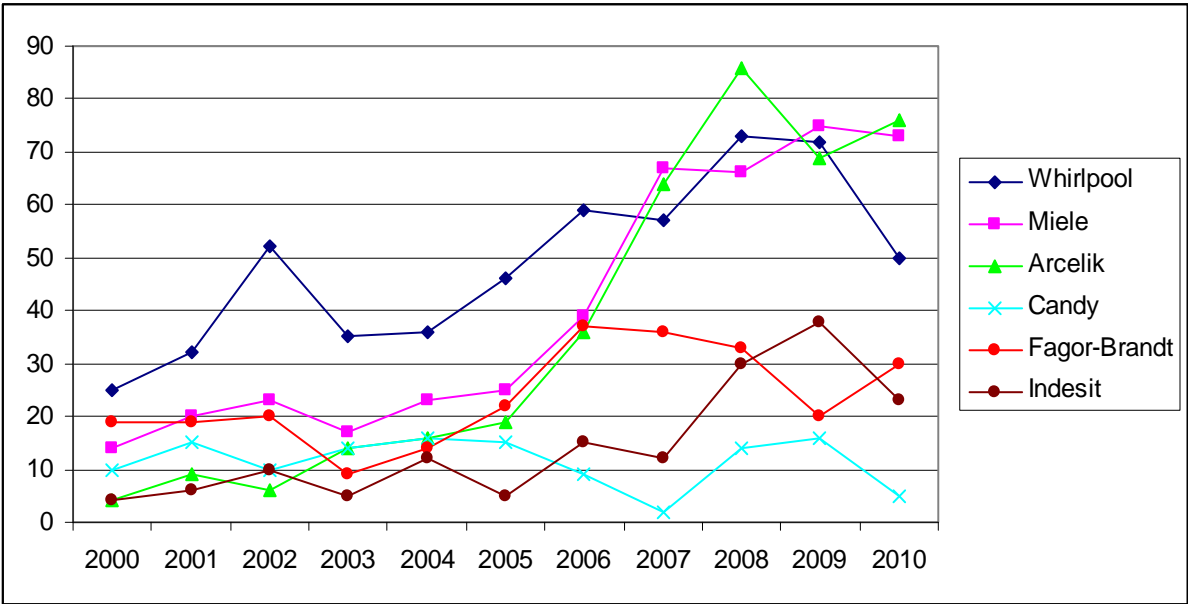
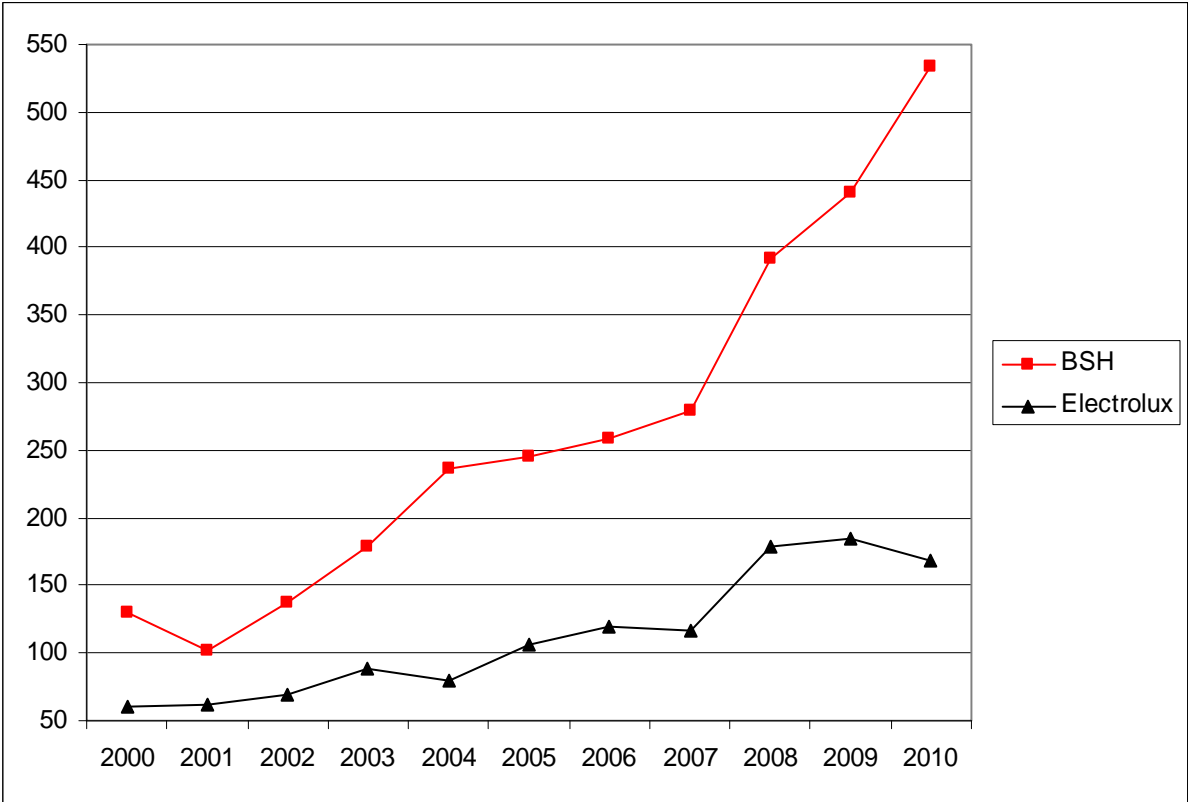
Before concluding, this section briefly examines the recent behaviour of the firms considered in the present study in terms of EPO applications. The aim of this additional analysis is to see if there has been an intensification of patenting activities and, looking at individual companies, whether there have been remarkable changes in the second half of the 2000s. Unfortunately, at this stage, we weren't able to distinguish the patent applications concerned with white goods filed by LG Electronics and Samsung, so that the two South Korean companies are neglected.

Table 5 - Number of EPO applications per year of the major companies of the European white good market

	2000-05	2006-10	Percentage change
BSH	172	381	121.92
Electrolux	78	154	97.34
Whirlpool	38	62	65.13
Miele	20	64	214.75
Fagor-Brandt	17	31	81.75
Candy	13	9	-31.00
Arçelik	11	66	484.12
Indesit	7	24	237.14
Total	356	790	121.91

Comparing the periods 2000-2005 and 2006-2010, Table 5 shows that the patent applications per year of the eight companies under examination have increased from 356 to 790, i.e. more than doubled. By recording the same rate of change that arises on average, BSH confirms its strong leadership. Looking at punctual annual data, the company moved from 130 EPO applications in 2000 to 534 in 2010 (see Figure 1).

Figure 1 – EPO applications of the major companies of the European white good market



Only three companies have increased their patenting activities more than BSH. The most impressive change of gear has been made by Arçelik which moved from 11 to 66 applications per year and, in the last part of the decade, became the third company in terms of EPO applications. Also Indesit has remarkably increased its patenting activities, but not enough for reaching a position close to Arçelik and Miele's and consistent with its role of leading company, especially in terms of units of white goods sold.

Moving from 25 to 64 patent applications per year, Miele has intensified its struggle (with BSH) for being the industry innovation leader. In fact, we should not forget that the relatively low number of applications is justified by the lower size of Miele (due to its specialisation in the top quality segment of the white good market).

Instead, although in terms of absolute figures Electrolux maintains the second position, the gap with respect to BSH has remarkably widened. By recording a below-average increase of patent applications, also Fagor-Brand and, especially, Whirlpool are losing ground. Finally, the only company that has reduced patent applications is Candy<sup>14</sup>.

## **6. Concluding remarks**

A consolidated body of evidence indicates that, in each industry or technological area, the overwhelming majority of patent applications and grants are held by the largest companies which resort to them mainly for strategic reasons. As for patents, the leading companies can make use of patent oppositions as competitive weapons, both for defensive and offensive purposes. However, differently from patenting, challenging the patents of industry rivals

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<sup>14</sup> During the last years, Candy has reduced its market shares and, at present, the company is involved in a severe process of restructuring.

exposes opponents to future retaliations and strongly exacerbates the competitive struggle. In industries characterised by an increasing demand fostered by new technological opportunities, firms can find convenient to avoid an intensive use of patent oppositions (and litigation), and recur to them only in presence of high valuable patents. Instead, when the economic prospects of an industry are not so brilliant, the degree of competition is already fierce and patent oppositions may become like any other competitive tools that the largest companies employ in order to keep their market shares. This paper contends that this is the case of the white good industry in Europe.

By examining 961 patents that, over the period 2000-2005, were granted by the EPO to the eleven major players in the European market of white goods, I have shown that the share of opposed patents was higher than that recorded in pharmaceuticals and biotechnology and much higher than that of ICT and TLC industries. A matrix of reciprocal oppositions among the largest competitors was built with a view to identify the companies that were more akin to challenge the patents granted to direct competitors and those that were more exposed to patent oppositions. In some cases (namely, BSH and Electrolux) they coincided, suggesting that a process of retaliation occurred. However, I also highlighted the case of Miele as the most aggressive company in terms of patent oppositions, and that of Indesit as the company more exposed to the oppositions filed by industry rivals. Finally, by running a Probit regression, I found that the probability of a patent to be opposed by one of the major competitors was not significantly affected by its quality (approximated by forward and backward citations, claims and family size). The last piece of evidence concurs in suggesting that, among the major players in the European market of large domestic appliances, patent oppositions, rather than focussed on the most valuable patents, have been mainly used as competitive weapons.

Due to the difficulties of collecting consistent data at firm and product level, our analysis of patent oppositions before the EPO was concerned with the period

2000-2005 only, so that we don't know whether there have been significant changes in recent years. With respect to the economic prospects of the industry the situation has remained the same. In fact, aside from the current economic depression, the demand of white goods has been stagnant as in the first half of the 2000s and this has further increased the competitive pressure on the main producers. Looking at the increasing number of EPO patents that the leading companies have applied for over the period 2006-2010 (cf. Section 5), our guess is that the extent of patent oppositions between the major white good producers has raised as well. Our expectation is that the technology leaders of the industry (BSH and Miele) have not diminished the usage of patent oppositions while it is likely that some changes have occurred in terms of the targeted companies: probably, those struggling to become top players in the European market (like Arçelik, LG Electronics and Samsung) have been the targets of more patent challenges. As a consequence, it is possible that also the latter have started to fight back in terms of patent oppositions. In any case, although in the second half of the 2000s some players might have changed positions in the playing field, there are good reasons to believe that the game has remained almost the same as in the first part of the decade.

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