

Crass, Dirk

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ARTICLE



# Which firms use trademarks? Firm-level evidence from Germany on the role of distance, product quality and innovation

Dirk Crass

Economics of Innovation and Industrial Dynamics, Centre for European Economic Research (ZEW), Mannheim, Germany

## ABSTRACT

Trademarking firms are more productive, generate higher profits, and have a better survival rate. Trademarking firms are in one word more successful, which might motivate non-trademarking firms to adopt a trademark strategy. But this does not seem to be the case. The proportion of trademarking firms in the German business sector amounts to just 18%. This figure is quite low, given that nearly each firm has reputation to protect. But why does the vast majority of firms not have registered trademarks? Using a representative sample of German firms, the present paper links certain firm characteristics to a firm's propensity to register trademarks. The empirical results point to circumstances under which trademarks are significantly more often used: this is the case where a large distance between a firm and its customers exists, a firm's product quality is difficult to assess, a firm's products are characterised by a limited (but not strong) substitutability, and where a firm is engaged in R&D and introduces innovative products. Trademarks are considerably less frequently used if none of this is the case.

## KEYWORDS

Intellectual Property Rights; trademarks; reputation; innovation

## JEL

C25; D21; L14 O34

## 1. Introduction

Brands and trademarks have a ubiquitous presence throughout the economy and in our everyday life. This has its advantages. They enable us to identify and memorise products, to determine their origin, and to distinguish products of different providers from each other. The identifiability of a product is an essential requirement for customers to draw on previous experiences with a product while making purchasing decisions. The experiences with a product, even those of others, may prove useful to assess otherwise unobservable product characteristics. Positive experiences are likely to lead to repeated purchases, while disappointed customers are more likely to avoid the product. This constitutes an incentive for firms to build a reputation to deliver products and services of a reliable quality, leading to the quality guarantee, implicitly indicated by trademarks. In turn, producers are able to differentiate their products against those of competitors and to establish brand reputation, leading, at best, to brand loyalty.

A brand is of economic value only if the respective firm has the right to use this reputational asset exclusively. In Germany, as in most European countries, the protection of marks might arise due to use of a sign in trade (§4(2) German Trademark Law). Protection is awarded if the mark is used intensively in commerce and a significant proportion of the relevant public has knowledge of the mark. A formal registration does not take place; trademarks acquired by use are therefore not observable by the researcher. There are good reasons for firms not to rely solely on the protection acquired by use and to choose an official registration: A trademark is protected once it is registered<sup>1</sup>; knowledge of the relevant public is not necessary. The scope of protection includes the selected product as well as service classes and applies to the whole territory of Germany; protection is not limited to the region in which the relevant public has knowledge of the mark. Registration takes place at reasonable cost: the registration fee at the German trade mark office (DPMA) amounts to 290 Euro and at the European Union Intellectual Property Office (EUIPO) to 900 Euro, possibly augmented by attorneys fees.

The registration of a brand as a trademark or through a bundle of trademarks protects the reputation of a brand. The registration defines the firm's rights against counterfeiting and fraud. The owner of this right is given a legal monopoly over the protected word, sign, symbol or other graphical representation in connection with the attached commodity. It has the exclusive right to commercially use the protected trademark and is exclusively protected against infringement (Economides 1998; Baroncelli, Fink, and Javorcik 2004). The protection from misuse does not happen automatically; the trademarking firm has to proactively police for trademark violations and enforce its rights against infringement. Internationally well-known and thus valuable brands are particularly affected (Fink, Helmers, and Ponce 2018). Von Graevenitz (2007) emphasises that trademark owners need the 'reputation of being tough on imitators'.

Empirical studies show positive associations between the use of registered trademarks and firm success. A trademarking firm exhibits on average a higher productivity (Greenhalgh and Longland 2005; Greenhalgh and Rogers 2012; Crass and Peters 2014), is more profitable (Ailawadi, Neslin, and Lehmann 2003; Griffiths, Jensen, and Webster 2011; Crass, Czarnitzki, and Toole 2019), yields higher market valuation (Bosworth and Rogers 2001; Krasnikov, Mishra, and Orozco 2009; Sandner and Block 2011; Greenhalgh and Rogers 2012), and has a better propensity to survive in the market (Jensen, Webster, and Buddelmeyer 2008; Buddelmeyer, Jensen, and Webster 2010; Helmers and Rogers 2010). Schautschick and Greenhalgh (2016) provide a detailed overview.

The empirical studies provide evidence of a positive contribution of trademarking to firm performance. This implies that a non-trademarking firm could benefit from adopting a trademark strategy. Hall et al. (2014) expect trademarks to be 'the most widely used' intellectual property right that is "available to essentially any firm". Graham et al. (2013) state that 'almost every firm, regardless of size, market, or business strategy, has goodwill to protect'. From this perspective, perhaps not every firm but the vast majority of firms can be expected to register trademarks. But contrary to expectations, why does a vast majority of firms not register trademarks at all? In Germany, the majority of firms do not register trademarks and just 18% of the firms are trademarking firms.

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<sup>1</sup>The term *trademark* refers to the legal right that belongs to the wider family of intellectual property rights.

The group of trademarking firms seems to be special – or to be more precise, the group of firms registering trademarks. Flikkema, De Man, and Castaldi (2014) provide a compelling overview over the different motives for firms to register trademarks: increasing the distinctiveness of products, signalling important changes, appropriate the rents from innovation, build brand equity and hence customer loyalty, and gain a competitive advantage. For some firms trademarks are not indispensable. Athreye and Fassio (2020) study motives for innovators not to trademark such as the non-existing danger of infringement, the unsuitability of trademarks for specific innovations or just alternative distribution channels.

The empirical literature has stressed that larger firms use trademarks more frequently and that the proportion of trademarking firms is highest for manufacturing and especially for high-tech manufacturing firms (Greenhalgh et al. 2011; Millot 2011; Crass and Peters 2014). Dinlersoz et al. (2018) present a firm-trademark linked dataset that allows for the tracking of trademark filing activity over the life-cycle of a firm in the US. They find that first-time trademark filing is concentrated in young and relatively large firms and confirm empirical evidence that the likelihood of a trademark filing increases with firm size.

But are there any other reasons as to why relatively few firms register trademarks? Do certain firm characteristics make a company unsuitable for adopting a trademark strategy?

The purpose of this study is to describe relevant circumstances under which trademarks might be powerful instruments for a firm and to shed more light on firm and product characteristics that influence a firm's decision to trademark.

The empirical analysis relies on 5,335 firm-level observations from the 2011 survey of the Mannheim Innovation Panel (MIP). The 2011 survey provides information on each firm's trademark activity, its branding policy, as well as its competitive environment. The stratified random sample also allows for extrapolations to the total of German firms with at least five employees in the business sector. The data confirms large heterogeneity by size. While 73.9% of large firms with 1,000 employees and more, rely on trademarks, it turns out that the proportion of small firms with 5 to 49 employees is quite low at about 13.6%. As already mentioned, the extrapolated proportion of trademarking firms amounts to 17.8%.

The existing literature is extended in the following ways: Firstly, using a representative sample of German firms, the study provides extrapolated figures about the use of trademarks for the German business sector in total as well as for single industries. Secondly, it provides large-scale empirical evidence on the drivers of trademark decisions. Results show that firms use trademarks to overcome the distance to their customers, make product quality more assessable, differentiate their products against a limited (not large) number of competitors, and that especially R&D activities and product innovations induce the registration of trademarks.

## **2. The role of trademarks**

### **2.1. The reputation of trademarks**

A trademark is a sign which is designed to distinguish the firm's product(s) from those of its competitors. It is intended to identify the origin of a product, but the information

content of the actual sign is quite restricted – unless it is charged with meaning. Economides (1998) highlights that a meaningful and thereby valuable trademark ‘will be created with its identification with the product.’ The identification can be accomplished in several ways. Borden (1944) argued that consumers associate the product with a trademark through recommendation, through use, or through advertisement. The association with a trademark makes former experiences with the product recognisable; own experiences, or even those of other people, can be assigned to the trademark to assess a product’s quality.

### **2.1.1. Distance to customers**

Trademarks are certainly not a recent invention. Moore and Reid (2008) emphasise that trademarks ‘have existed for as long as it has been possible to trace artefacts of human existence.’ But they underline, that trademarks have become ‘more complex through time’. Borden (1944) described the point at which trademarks, which served (just) as a guarantee of origin, reached the next level of complexity and became a valuable asset for a company: He stresses the relevance of a ‘close contact’ between ‘the maker and the buyer’. Their ‘close contact’, in an environment where everyone knows each other, provides a basis for a (often long-standing) personal relationship. The ‘maker’ is able to build a reputation in the course of the relationship and ‘the buyer’ in turn is enabled to assess the quality of the goods and services. The reputation of the ‘maker’ might not guarantee the best quality of the goods and services for ‘the buyer’ – but it limits the degree of uncertainty about the product. Borden (1944) dated the loss of a ‘close contact’ to the Middle Ages, where goods were traded over long distances. Trademarks took the place of the crucial personal relationship and became more and more ‘guides of quality to buyers’.

The times when people (‘the maker and the buyer’) knew each other, which Borden (1944) referred to as village economy, are gone; though not completely. Many firms offer their goods and services solely in the immediate vicinity of where the company is located. This is often true in the case of handicraft businesses, law firms, or restaurants. These firms are able to maintain long standing customer relationships – even in our highly specialised economy. The personal relationship is here of primary importance and trademarks play only a subordinate role.

Geographical proximity of ‘the maker and the buyer’ might not be the only way to establish a personal relationship. A firm might be able to maintain very close contacts with its customers for example through regular meetings and client visits. The larger the distance that separates a firm from its customers, the larger the costs to overcome the distance. The costs of labour and travel-related expenses limit the number of customers with which a ‘close contact’ is worthwhile. Overall, this leads to the expectation that trademarks are of minor importance for regional providers and firms with comparatively few customers.

### **2.1.2. Product quality and the role of trademarks**

Consumers do not often possess full knowledge of the quality characteristics of the products and services offered. Imperfectly informed customers are not able to price at the moment of the purchase unobservable quality features. Consumers would, consequently, not pay for unobservable and from their perspective at best uncertain quality features. For the maker of the product, however, these features are costly. It would not be profitable for a firm ‘to incur higher costs for unobservable quality improvements if these

could not be signalled to the prospective buyers to justify a higher sales price' (Baroncelli, Fink, and Javorcik 2004). Unobservable quality improvements would be crowded out from the market.

A trademark is an instrument designed to avoid this kind of market failure induced by information asymmetries. Akerlof (1970) refers already to trademarks as 'an institution which counteracts the effects of quality uncertainty'. A trademarked product is identifiable and recognisable so that customers are able to rely on former consumption experiences. After experiencing a product, they are better able to assess "how functional or effective the product is; how reliable it is; how long it lasts; how easy it is to use; how it tastes, sounds or smells; and what side effects it may have" (WIPO 2013, p.81). Especially the quality of services is difficult to assess without experiencing the service. The lack of any tangible attributes increases the uncertainty of consumers. A brand with its attached meaning acts here as a decision anchor (Castaldi and Giarratana 2018).

The information role of trademarks allows firms to build reputation for reliability and a certain consistent quality (Economides 1998; Landes and Posner 1987). The consistent quality is not to be confused with high quality. The reputation of the trademark of McDonalds illustrates the difference. While the worldwide operating fast food restaurants are not known for being gourmet restaurants, the trademark has the reputation to deliver a consistent quality everywhere in the world. A consumer can rely on her former culinary experience. She knows exactly what she will get and how the burger will taste. This leads to the expectation that trademarks are especially useful if the characteristics of a product are not directly observable.

### **2.1.3. Product substitutability**

Identical products from different companies can generally be easily substituted. The more the products differ, the less substitutable they become. Otherwise identical products become less substitutable, for instance, if they are not available at the same location. This is due to transport costs and delivery times. Switching from one supplier to another can also cause additional costs. Physical product differentiation as well as differences in services bundled with products corresponds to individual consumer preferences. These real or perceived differences can also reduce substitutability.

Branding and advertising are one of the most effective instruments to establish lasting customer loyalty. Consumers might perceive physically substitutable products as being less interchangeable. Brands are legally protected by trademarks and incorporate durable symbols, words, and signs that consumers are likely to remember and help to avoid confusion among customers. Srinivasan, Hsu, and Fournier (2011) called the unique and memorable aspects of a brand the symbol system that firms use as the public face of the brand. The symbol system enables customers to identify the goods and services they prefer – for whatever reasons. A strong regime of brand-identification trademarks positively affects consumers preferences (Krasnikov, Mishra, and Orozco 2009). Apart from the quality information, brands convey also an image of the product. Sáiz and Fernández (2009) point out that 'the intangible prestige of brands is often much more difficult to imitate than the technological information contained in patents.' Over time a trademark can develop qualities that exist above and beyond the objective product or service such as customer awareness, perception of desirable overall quality, and favourable associations (Keller and Lehmann 2006). The development of a trademark takes

time, but once a brand becomes familiar, people will select those products or services over an unknown brand (Aaker 1991).

The more this effect increases brand loyalty, the more effective the product differentiation strategy, which is likely to result in a weaker price competition. Especially firms with products that are easily substitutable would benefit from a high degree of product differentiation, since this could lead to a less elastic demand (Bagwell 2007).

## **2.2. The link between innovation and trademarks**

New trademarks are correlated with the introduction of new product innovations, which qualifies trademarks as proxies for innovation (Schmoch 2003; Mendonca, Pereira, and Godinho 2004; Jensen and Webster 2009; Gotsch and Hipp 2014; Flikkema, De Man, and Castaldi 2014). But what causes this correlation?

The first explanation is a timing argument: A new product might come with a new name, perhaps a new logo. As part of the preparations for the market introduction, the new signs are registered as a trademark. The immediate registration is not compelling, but advisable: the desired sign might be in conflict with already registered ones and later changes of the sign can become expensive. The sign belonging to the new product is immediately protected as registered trademark. The achieved protection acts against imitations of new products and services from competitors. At least for the knowledge-intensive business services industries, the protection against competitors is the primary reason for registering a new trademark (Gotsch and Hipp 2014).

Once customers associate the trademark with the product, it becomes much more difficult for competitors to imitate the product. In this way, a trademark registration enhances a firm's ability to appropriate the economic returns of an innovation (Mendonca, Pereira, and Godinho 2004). In this respect, trademarks might be complementary or even substitutable to patents (Llerena and Millot 2013; Amara, Landry, and Traoré 2008). The resulting coincidence in time of trademark registration and market introduction qualifies trademark applications as proxy for innovations (Greenhalgh and Rogers 2012). The correlation between trademarks and product innovation may also be explained by the information argument. The introduction of a product innovation is per definition the introduction of a good or service that is 'new' for a firm's customers. Potential customers have no experience with the new product to judge the product quality against former purchases. Is the new product sold under a trademark, the reputation of the trademark might balance out a consumer's lack of experience with the new product. In this sense, trademarks have the potential to reduce uncertainty about the quality of product innovations. This might be especially relevant for product innovations to explain why innovative firms pursue more often a trademark strategy.

An alternative explanation for the correlation between trademarks and innovation reverses the direction of causality: The reputation for a brand encourages a firm to improve the quality of its products (Ramello 2006; Greenhalgh and Rogers 2012). In this case, trademarks might serve as a proxy for innovation.

This implies that innovative firms can be expected to use trademarks more frequently.



### 3. Empirical implementation

#### 3.1. Data sets

Firm-level data is obtained from the 2011 survey of the Mannheim Innovation Panel (MIP), which is a stratified random sample (stratified by sector, size and region) of German firms. The MIP is the German contribution to the European-wide harmonised Community Innovation Surveys (CIS). It is based on the concepts and definitions of the Oslo Manual (2005) for collecting data on innovation processes. It targets legally independent firms with at least five employees. The MIP sample is disproportionately drawn. Higher drawing probabilities are applied to larger size classes, cells from Eastern Germany and cells with a high variation of innovation activities. For a more detailed description of the dataset, the survey, and the methodology in general, see Peters and Rammer (2013) as well as Aschhoff et al. (2013) for the 2011 survey.

The MIP, started in 1993, is conducted annually. Though it is designed as a panel, the 2011 survey is the only wave which includes information on the distance between firms and customers, product quality, and product substitutability. The 2011 questionnaires had been returned by nearly 7,000 firms in manufacturing and services, which constituted a 20% response rate. The firms provide information on their innovation activities and general firm information such as sales, employment, exports, and other major control variables. Surveyed MIP firms have been linked with information on firm's trademark activity at the German Patent and Trademark Office (DPMA) and at the European Union Intellectual Property Office (EUIPO).<sup>2</sup>

#### 3.2. Trademarking firms

There are three options for a firm to obtain trademark protection in Germany through registration: Firms can choose between a registration of a national (German) trademark at the German Patent and Trademark Office (DPMA), the registration of a European Community Trademark at the European Union Intellectual Property Office (EUIPO), or the registration of an International Trademark at the Bureau of the World Intellectual Property Organisation (WIPO). A trademark registration at all three offices has the same protective effect for Germany; a Community trademark or an International Trademark completely replaces the need for a German Trademark – and vice versa (with respect to the territory of Germany). At all offices, the initial term of trademark protection is 10 years and can be indefinitely renewed for further 10-year periods. International Trademarks are not explicitly considered in the empirical analysis, which should not affect the results: An international registration must be based on a registration of the same mark in one of the member states of the Madrid Agreement for the International Registration of Marks. For the sample of German firms in question, an International Trademark is almost certainly based on a Community Trademark or a (national) German Trademark.

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<sup>2</sup>Firm-specific trademark information were collected by matching the name of the firms participating in the innovation survey with the names of applicants at the EUIPO and the DPMA using a special software developed at ZEW, and including an extensive manual double-check.



The aim of this paper is to explain the firm's trademarking status, regardless of the trademark office chosen. The binary dependent variable *trademarks* indicates whether a firm has at least one valid trademark in 2010. A trademark is considered as valid, if it has been registered at either trademark office and if its protection period has not expired. This is the case for 31% of the firms in the sample (Table 2).

The sample is, as already pointed out, disproportionally drawn. Firm responses and information from the trademark register are weighted to represent the total firm population covered by the Mannheim Innovation Panel (MIP). Disproportional sampling by sector, size class and region as well as differences in response rates are taken into account. Table 1 provides the extrapolated absolute number and the proportion of trademarking firms by sector and size classes.

A total of roughly 48,000 firms with more than five employees in the German business sector have at least one valid trademark in 2010. This corresponds to a proportion of 17.8% of the total firm population surveyed. This figure would probably be considerably smaller if the high number of very small firms with less than five employees were also included. The proportion of trademarking firms in the US, including also very small firms, amounts to roughly five percent (Dinlersoz et al. 2018).

**Table 1.** Absolute number and proportion of trademarking firms in Germany.

Sector	WZ 2008	Trademarking Firms	
		absolute	in %
Food/Beverage/Tobacco	10–12	1,793	10.1
Textile/Clothes/Leather	13–15	767	32.0
Wood/Paper	16–17	644	13.6
Chemicals/Pharmaceuticals	20–21	1,368	57.1
Rubber-/Plastics products	22	1,475	30.3
Glass/Clay/Stone	23	869	24.2
Metal	24–25	3,250	15.6
Electronics	26–27	2,750	36.2
Machinery	28	3,562	34.8
Motor vehicles	29–30	855	38.4
Furnit./Toys/Medick. instr./Repair	31–33	2,393	16.6
Energy/Mining/Petroleum	5–9, 19, 35	607	22.6
Water/Waste disposal/Recycling	36–39	322	7.2
Wholesale	46	7,483	19.6
Transportation/Postal services	49–53, 79	1,865	6.0
Media services	18, 58–60	2,191	26.5
IT/Telecommunication	61–63	4,996	37.9
Financial services	64–66	1,432	20.7
Technical/R&D services	71–72	2,205	13.6
Consultancy/Advertising	69, 70.2, 73	3,470	11.1
Corporate services	74, 78, 80–82	3,663	14.1
Research-intensive manufacturing	20–21, 26–30	8,535	38.0
Other manufacturing	5–19, 22–25, 31–39	12,512	15.7
Knowledge-intensive services	58–66, 69, 70.2, 73	13,902	19.4
Other services	46, 49–53, 74, 78–82	13,011	13.6
Size Class (# employees)		31,247	13.6
50–249		12,272	38.8
250–999		3,457	58.8
1000 and more		984	73.9
<b>Total</b>		<b>47,960</b>	<b>17.8</b>

Firms in Germany having at least 5 employees in German Classification of Economic Activities, 2008 edition (WZ 2008) 5–39, 46, 49–53, 58–66, 69–74 (not 70.1), 78–82. All figures are extrapolated to the total firm population in Germany.

Source: ZEW: Mannheim Innovation Panel, survey 2011.

**Table 2.** Descriptive statistics of main variables (not weighted).

	(1)		(2)		(3)	
	Full Sample		TM-Firms		Difference	
	Mean	SE	Mean	SE	Diff	SE
<b>Trademark Activity</b>						
Trademarks (D)	0.31	(0.01)	1.00	(0.01)	1.00	(0.00)
<b>Personal Distance</b>						
Few Customers (D)	0.15	(0.00)	0.10	(0.00)	−0.07***	(0.01)
Many Customers (D)	0.45	(0.01)	0.51	(0.01)	0.09***	(0.01)
<b>Geographical Distance</b>						
Regional Market (D)	0.63	(0.01)	0.52	(0.01)	−0.16***	(0.01)
National Market (D)	0.71	(0.01)	0.88	(0.01)	0.24***	(0.01)
International Market (D)	0.47	(0.01)	0.71	(0.01)	0.35***	(0.01)
<b>Product Quality</b>						
Quality Assessable (D)	0.22	(0.01)	0.21	(0.01)	−0.02	(0.01)
<b>Substitutability</b>						
Products Substitutable (D)	0.21	(0.01)	0.16	(0.01)	−0.07***	(0.01)
Few Competitors (D)	0.42	(0.01)	0.47	(0.01)	0.07***	(0.01)
Many Competitors (D)	0.19	(0.01)	0.12	(0.01)	−0.10***	(0.01)
<b>Innovation</b>						
Continuous R&D (D)	0.22	(0.01)	0.40	(0.01)	0.27***	(0.01)
EPO Patent (D)	0.12	(0.00)	0.30	(0.00)	0.26***	(0.01)
Process Innovation (D)	0.32	(0.01)	0.44	(0.01)	0.16***	(0.01)
Product Innovation (D)	0.44	(0.01)	0.65	(0.01)	0.30***	(0.01)
<b>Basic Characteristics</b>						
Firm Size (# of employees)	203.15	(21.07)	457.59	(21.07)	370.40***	(29.27)
Group (D)	0.29	(0.01)	0.44	(0.01)	0.22***	(0.01)
East Germany (D)	0.32	(0.01)	0.23	(0.01)	−0.13***	(0.01)
Firm Age (in years)	32.96	(0.50)	37.50	(0.50)	6.61***	(1.05)

The first column provides mean and standard error of the main variables for the full sample, the second column for the subsample of trademarking firms, and the third column provides the difference between trademarking and non-trademarking firms. D indicates a dummy variable.

Source: ZEW: Mannheim Innovation Panel, survey 2011.

Trademarks are used by firms in all sectors. The proportion of trademarking firms differs considerably between the various sectors, ranging from 6% to 57%; less between manufacturing (20.6%) and service industries (16.1%). Sectors with high absolute numbers of trademarking firms are wholesale, IT and telecommunication, corporate services, machinery, consultancy and advertising, and metal. The highest share of trademarking firms can be found in the chemicals and pharmaceutical sector (57.1% of all firms), followed by motor vehicles (38.4%), IT and telecommunication (37.9%), electronics (36.2%), and machinery (34.8%). The lowest share of trademarking firms can be seen in transportation and postal services (6%), water, waste disposal, and recycling (7.2%), and food, beverage, and tobacco (10.1%). The largest proportion of firms using trademarks is research-intensive manufacturing (38%). The proportion of trademarking firms is much smaller in knowledge-intensive services (19.4%), other manufacturing (15.7%), and other services (13.6%). The extrapolated figures also suggest that there is a link between *firm size* (measured by the number of employees in 2010) and a firm's tendency to trademark. The larger a firm the more likely its tendency to register trademarks. A break down by size classes illustrates this relationship: The proportion of trademarking firms is quite low for small firms (less than 50 employees) making up 13.6% of the total figure. The proportion rises already to 38.8% for medium-sized firms (50–249 employees) and to 58.8% for large firms (250–999 employees). The proportion of trademarking firms increases up to 73.9% for very large firms (1000 and more employees).

### 3.3. Explanatory variables

Based on the expectations developed above, four broad categories of explanatory variables are of special interest in the empirical analyses: distance to customers, product quality, product substitutability, and a firm's innovation activity. They will be explained in the following subsections together with basic firm characteristics which are used as control variables in the regression. Table 2 provides the sample mean and standard errors for the full sample in Column (1) and for the subsample of trademarking firms in Column (2). The difference between trademarking and non-trademarking firms shows Column (3). More detailed descriptive statistics are provided in Table 5 in the Appendix.

#### 3.3.1. Distance between firm and customer

The distance between the firm and its customers is captured through two different dimensions: the geographical distance and the personal distance.

The geographical distance is measured through the geographic markets in which a firm is active. Three dummy variables account for a firm's activity in the local market (the firm sells goods or services within a radius of 50 km), the national market (Germany), and/or the international market. A firm is able to serve all or only some geographical markets. The local market allows, from the geographical perspective, the closest contact between a firm and its customers and is served by 63% of the sample firms. As a logical corollary, this means, that the local market is not relevant for the remaining 37% and that those firms have to deal more often with geographical distance. The same is true for 71% that serve the national market, and nearly half of the firms (47%) that serve the international market. Firms could use trademarks to deal with geographical distance. Table 2 supports this view: trademarking firms are more frequently active at the national or international level and less at the regional market.

The second distance dimension, the personal distance, captures the ability of a firm to build a personal relationship between its staff members and its customers. It is reasonable to assume that the more customers a firm has, the less able it is to establish a close relationship with all of its customers. The number of customers would be a good measure of the personal distance but is, unfortunately, not available from the survey and often unknown to the firm as well. The survey, instead, provides information on the share of turnover with the three most important customers. This measure is able to proxy the number of customers quite well: A firm that reports a share of turnover of 100 percent for its three most important customers, has not more than three customers. The lower the reported share, the larger in general the number of customers. Based on this survey information, the two binary variables, *few customers* and *many customers* account for personal distance. A close contact seems to be reachable for 15% of the sample firms with only few customers, while 45% are characterised as having many customers, associated with larger personal distance. Again, firms might deal with personal distance by using trademarks. The descriptive statistics (Table 2) are in line with this argument since the proportion of trademarking firms is larger with many customers and smaller with few customers.

### 3.3.2. *Substitutability of products and services*

Firms might be more likely to pursue a product differentiation strategy if operating in product markets in which product-substitutability is high. Whether or not a firm operates in a market in which *products are substitutable* is direct information from the questionnaire and is based on the assessment of the firms. Product substitutability applies fully for 21% of the sample firms but only for 16% of the trademarking firms.

The number of (main) competitors serves additionally as a measure of product substitutability and is again direct information from the survey. A firm with no or just few competitors sells goods and services which are, due to the lack of alternative suppliers, less easily substituted. The larger the number of competitors, the higher the number of potential providers, indicating that barriers to entry are low and that the firm is rather in polypolistic competition. Consequently, the degree of substitutability is relatively high. A small number of competitors (up to five, '*few competitors*') is considered as less substitutable products and a large number (more than 50 competitors, '*many competitors*') as easily substitutable products. Any number of competitors in between these two serves as the reference category. It turns out from the descriptive statistics that trademarking firms are less often faced by many competitors (12% in contrast to 22% of non-trademarking firms) and operate more often in a competition environment with few competitors (47% in contrast to 40%).

### 3.3.3. *Product quality*

An important aspect of product quality is the customer's assessability of quality prior to the purchase. The firms were asked to assess, on a four-point Likert scale (ranging from 'applies not' to 'applies fully') whether it is difficult for customers to assess the quality in a firm's product market. The binary variable *quality assessable* equals one, if customers have no difficulties to assess the product quality. Overall, that is the case for 22% of the firms. The proportion of suppliers with assessable quality is not smaller for trademarking firms (see Table 2).

### 3.3.4. *Innovative activity of firms*

Innovative firms are supposed to benefit particularly from the use of trademarks. A firm's technological capability and its innovative capability are used to identify innovative firms. Two dummy variables serve as indicators for a firm's technological capability: continuous internal R&D activities and at least one patent application at the European Patent Office (EPO). *Continuous R&D* is again direct information from the survey. Descriptive statistics reveal large differences between trademarking and non-trademarking firms: 40% of the trademarking firms conduct R&D continuously but just 13% of non-trademarking firms. The results for an *EPO patent* are similar: 30% of the trademarking and just 4% of the non-trademarking firms have a patent application at the EPO. Research oriented firms seem to be also trademarkoriented ones.

The innovative capability of a firm is captured by the current level of innovative activity, proxied by a set of dummy variables indicating *product innovation* and *process innovation* during the period 2008 to 2010. Again, trademarking firms are more often innovative: 44% introduced a process innovation (in contrast to 28% of non-trademarking firms) and 65% a product innovation (in contrast to 35% of non-trademarking firms). The current level of innovation seems to proxy the general

innovativeness of a firm quite well, since innovation is shown to be persistent within firms (Peters 2009).

### 3.3.5. Basic firm characteristics

The group of basic firm characteristics includes besides firm size also *firm age* (measured in years), the type of ownership, the region of a firm's location, and its sector affiliation. The type of ownership distinguishes between unaffiliated firms (reference group) and those that belong to a *group*. The region distinguishes between firms located in West- (reference group) and *East* Germany and the sector affiliation between 21 aggregated sector groupings.

## 4. Empirical findings

### 4.1. The propensity to trademark

The dependent variable indicates whether a firm uses trademarks. Due to the binary character of the dependent variable, a probit model for the econometric analysis is used. The cross-sectional data allows no interpretation of the results as causal effects; the results should thus be taken as associations rather than as causal relationships. The main estimation results of gradually enriched probit models are presented in Table 3.<sup>3</sup> Each of the four columns contains two sub-columns, where the first provides the coefficients and standard errors from the regression and the second sub-column provides the more informative average marginal effects. Column (1) presents the estimates for a specification which only accounts for basic firm characteristics. The specification is gradually enriched by including components of personal and geographical distance, product quality, and product substitutability in Column (2). Alternatively, model (3) accounts for basic firm characteristics and innovation activity. The complete set of explanatory variables is used for estimation in Column (4).

A randomly drawn sample firm uses at least one trademark with a propensity of 31.3%. The regression results provide some more differentiated insights into the propensity to trademark in Column (1), solely based on basic firm characteristics. Firms are characterised by size, group status, location, firm age, and sector affiliation. As the results show, the size of a firm has a highly significant impact: the larger the firm, the higher the propensity to trademark. A one unit increase of *firm size* (the logarithm of the number of employees) increases the probability of using trademarks by 9.1 percentage points. The estimated marginal effect is lowered to 6.2 percentage points, after controlling for all additional variables in Column (4).

This indicates that firm size is positively correlated to these variables and captures them partly.

The single number of 6.2 percentage points represents the average marginal effect of firm size – but the effect might vary across the range from small to large firms. Williams (2012) recommends to choose ranges of values for one or more independent variables (in this case firm size) and to calculate marginal effects for this range of representative values. Figure 1 provides average adjusted predictions (AAPs) and average marginal effects

<sup>3</sup>The results of a weighted estimation are provided in Table 7 in the Appendix. The results differ only slightly.

Table 3. Firm characteristics and the propensity to trademark.

	(1)		(2)		(3)		(4)	
	$\beta$ /SE	ME	$\beta$ /SE	ME	$\beta$ /SE	ME	$\beta$ /SE	ME
<b>Basic Characteristics</b>								
Firm Size	0.316*** (0.016)	0.091***	0.282*** (0.016)	0.076***	0.263*** (0.016)	0.070***	0.243*** (0.017)	0.062***
Group	0.120** (0.048)	0.035**	0.074 (0.049)	0.020	0.065 (0.050)	0.018	0.036 (0.051)	0.009
East Germany	-0.248*** (0.044)	-0.070***	-0.195*** (0.046)	-0.053***	-0.223*** (0.045)	-0.059***	-0.180*** (0.047)	-0.046***
Firm Age	-0.001 (0.024)	-0.000	0.009 (0.025)	0.002	0.013 (0.025)	0.004	0.013 (0.026)	0.003
<b>Personal Distance</b>								
Few Customers			-0.153** (0.065)	-0.040**			-0.159** (0.066)	-0.039**
Many Customers			0.147*** (0.045)	0.040***			0.146*** (0.046)	0.038***
<b>Geographical Distance</b>								
Regional Market			-0.204*** (0.043)	-0.056***			-0.177*** (0.044)	-0.046***
National Market			0.418*** (0.059)	0.111***			0.401*** (0.059)	0.101***
International Market			0.450*** (0.048)	0.127***			0.353*** (0.049)	0.094***
<b>Product Quality</b>								
Quality Assessable			-0.139*** (0.050)	-0.037***			-0.138*** (0.051)	-0.035***
<b>Substitutability</b>								
Products Substitutable			-0.080 (0.053)	-0.022			-0.036 (0.054)	-0.009
Few Competitors			0.140*** (0.045)	0.039***			0.093** (0.046)	0.024**
Many Competitors			-0.206*** (0.060)	-0.053***			-0.173*** (0.060)	-0.043***
<b>Innovator</b>								
Continuous R&D					0.242*** (0.061)	0.068***	0.208*** (0.062)	0.056***

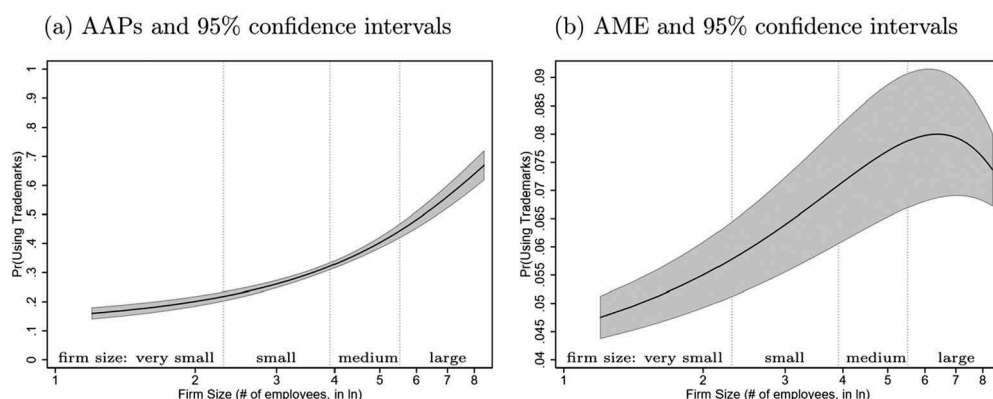
(Continued)

Table 3. (Continued).

	(1)		(2)		(3)		(4)	
	Trademarks(D)		Trademarks(D)		Trademarks(D)		Trademarks(D)	
	$\beta$ /SE	ME	$\beta$ /SE	ME	$\beta$ /SE	ME	$\beta$ /SE	ME
EPO Patent					0.866*** (0.067)	0.275***	0.800*** (0.069)	0.240***
Process Innovation					-0.019 (0.046)	-0.005	-0.042 (0.047)	-0.011
Product Innovation					0.292*** (0.051)	0.081***	0.203*** (0.052)	0.053***
W_Industry	0.000		0.000		0.000		0.000	
McFadden's R2	0.181		0.228		0.231		0.263	
McFadden's Adj R2	0.172		0.215		0.219		0.247	
Correctly Classified (%)	71.230		73.170		75.092		75.275	
Correctly Classified 1 (%)	72.063		76.096		70.836		74.342	
Correctly Classified 0 (%)	70.850		71.836		77.032		75.699	
Observations	5464		5464		5464		5464	

Source: ZEW: Mannheim Innovation Panel, survey 2011.





**Figure 1.** Firm size: a) Average adjusted predictions (AAPs), b) Average marginal effects (AMEs).

(AMEs) for a plausible range of firm size. The AAPs in Figure 1a illustrate the relevance of firm size after controlling for all other variables: a firm with 10 employees, which is at the border of being classified as very small to small (in logarithm at 2.3, the first dotted line), has a 22.3% predicted probability of using trademarks. A firm with 50 employees, which is on the border of being medium sized, has a 32.4% predicted probability and one with 250 employees on the border of being large, has a predicted probability of 44.1% to use trademarks. The average marginal effects (AMEs) are presented in Figure 1b for exactly the same range of firm size. The graph shows that an increase in firm size leads to an increase of the marginal effect of trademarking up to a firm size of 600 employees (about 6.4 in logarithm). This is the case for slightly less than 95% of all firms in the sample. An additional increase in firm size above 600 employees produces smaller but still positive increases in the likelihood to register trademarks.

A firm is, apart from its size, also characterised by its group status, its location in East or West Germany, and its sector affiliation. After controlling for all additional variables in Column (4), the propensity to register trademarks is reduced by 4.6 percentage points for a firm located in *East Germany*. Neither the fact that a firm is part of a *group* nor the *age* of a firm have a significant effect.

## 4.2. Distance, product quality and substitutability matter

Results for the first set of additional firm characteristics are given in Column (2). The results provide evidence that both dimensions of distance between a firm and its customers are significantly correlated to the use of trademarks: Trademarks are on average 4.0 percentage points less likely used in the case of short *personal distance* (few customers), while long personal distance (many customers) induce a 4.0 percentage points increase in the propensity to trademark. Furthermore, firms propensity to use trademarks is about 5.6 percentage points smaller in the case of a short *geographical distance* (regional market) and significantly higher in the case of a long distance; 11.1 percentage points larger for firms that serve the national market and 12.7 percentage points for those that serve the international market. The marginal effects are just slightly smaller after controlling for the full set of variables in Column (4).



**Figure 2.** Distance to customers matters, adjusted predictions at representative values (APRs).

Notes: Long distance is defined as serving the national and international market as well as having many customers. Short distance firms serve just the regional market and have few customers.

To illustrate the relevance of distance in more detail, [Figure 2](#) shows adjusted predictions for the same range of firm size as above, but distinguished by distance to customers. Short distance is defined as having a limited personal distance (few customers) and as having a limited geographical distance (being active just at the local market). Long distance firms are those with many customers, which are also active at the national and international market. [Figure 2](#) tellingly reveals along the firm size distribution that the probability of trademarking is significantly larger for firms with a long distance, compared to those with a short distance to their customers – even after controlling for all other variables. A firm with a long distance to customers and 250 employees (in logarithm at 5.5, the third dotted line) has a three times higher predicted probability of trademarking (63% compared to 19.4%) than an equally sized firm with short distance to its customers. A small firm with 10 employees (in logarithm at 2.3, the first dotted line) and a long distance has actually a six times higher predicted propensity to trademark.

This implies that trademarks are frequently used as an instrument to overcome distance, which is otherwise preventing a close relationship to customers. A short distance on the other hand limits the need for trademarks, since it enables firms to establish a close relationship with its customers.

Trademarks are also less often needed, if the quality of a firm's products is easy to assess: Firms in a product market in which products are of *assessable quality* have a 3.4 percentage points lower probability of using trademarks. This confirms that a trademark is a useful instrument to signal those product quality features that are otherwise not obvious.

The number of competitors is used to proxy product substitutability. A low number of competitors (*few competitors*), is correlated with a 3.9 percentage points larger probability to use trademarks. A large number of competitors (*many competitors*) is correlated with a 5.3 percentage points lower propensity to trademark. This indicates that trademarks are used to differentiate a firm's product especially in the case of a small number of main competitors, when a firm operates in an oligopolistic market. Figure 3 compares adjusted predictions for firms with few and many competitors. The largest differences arise for small to medium sized firms with about 50 employees. The overlapping areas of the confidence intervals reveal that the difference is not significant for large firms.

The results can also be interpreted as indication for the competition-reducing effect of brands. The presence of strong brands might establish barriers to entry for potential competitors. Market entry is prevented because of the high fixed costs for a firm that enters the market and has to establish competitive brands.

#### 4.3. Innovation matters

Innovative firms have a larger probability of using trademarks. Firm's conducting *continuous R&D* have a 6.8 percentage points higher propensity to trademark, whereas those with a *patent* application at the European Patent Office (EPO) have on average a 27.4 percentage points higher one. Both indicators capture a firm's technological capability and point to research intensive firms. The innovative capability captures the ability of a firm to introduce new products and processes into the market. Firms with product innovations have an 8.1 percentage points larger probability of using trademarks, while process innovations have no significant influence. The highly significant

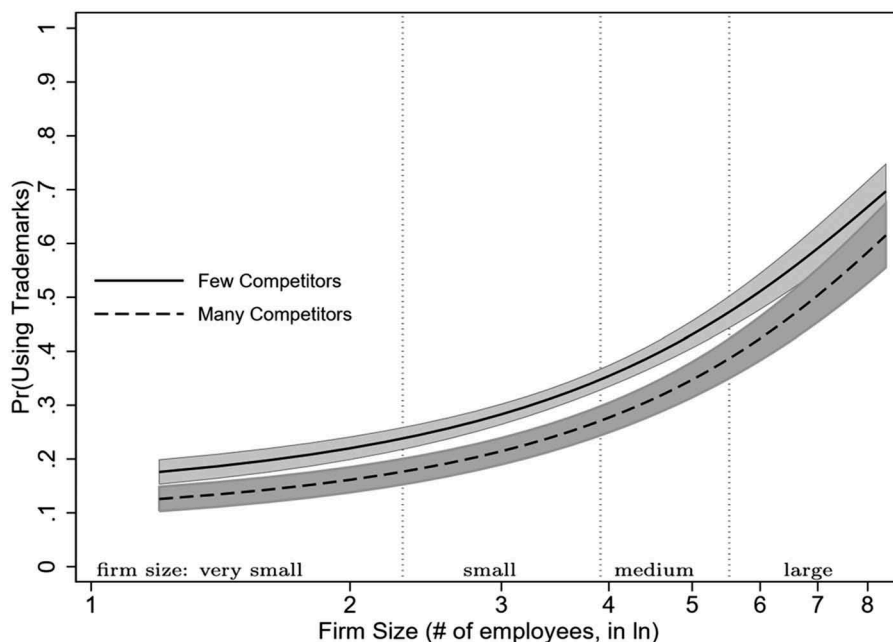


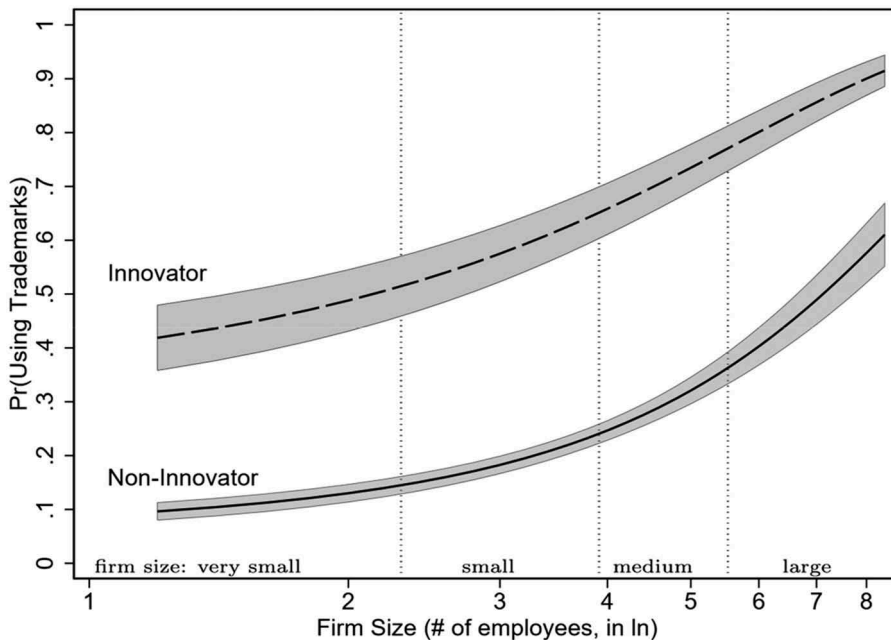
Figure 3. Substitutability matters, average adjusted predictions (AAPs).

correlation of a firm's innovation activities and its use of trademarks confirms related studies (Mendonca, Pereira, and Godinho 2004; Greenhalgh and Rogers 2012). Whether innovation activities lead to trademark registrations or the reverse, namely that a firm's brands lead to innovation activities is not clear.

Adjusted predictions are also chosen to illustrate the difference between innovative and non-innovative firms in Figure 4. Innovative firms are defined as firms that undertake R&D continuously, having a patent application at the EPO, and having introduced a product innovation. Non-innovative firms conduct no R&D, and have neither a patent registered nor a product innovation introduced. The introduction of process innovations has no significant effect and is therefore not taken into account. The probability of using trademarks differs significantly for the whole range of size classes. An innovative firm with 250 employees (on the border of being between medium and large sized) is more than twice as likely to trademark. After controlling for all other variables, the propensity to trademark is 77.0% for an innovative firm, compared to 36.4% for a non-innovative firm. The probability of trademarking of a small innovative firm with 10 employees (in logarithm at 2.3, the first dotted line) is more than three times greater (51.5% instead of 14.6%), compared to a non-innovative firm of the same size.

## 5. Conclusion

This paper provides empirical evidence of the proportion of firms that have registered trademarks in 2010 and analyses the role of several firm characteristics that are related to



**Figure 4.** Innovation matters, average adjusted predictions (AAPs).

*Notes:* An innovator is defined as follows: she conducts R&D continuously, has an EPO patent application, and introduced a product innovation. The opposite is true for the definition of non-innovators.

a firm's decision to register trademarks. The empirical analysis relies on a large sample of about 5,400 German firms from many different industries in the business sector. The extrapolated proportion of 18% of firms with at least one registered and still valid trademark is representative for all firms with more than five employees in the corresponding sectors.

The empirical analysis investigates to what extent firm and product characteristics matter for the firm's decision to use trademarks. The results cannot be taken as indicating causality because of potential endogeneity. But the results provide evidence that the decision of a firm to register trademarks is related to several firm characteristics: the distance between a firm and its customers, the assessability of product quality, the degree of substitutability, and innovative activities of a firm. Firms with a low level of personal as well as geographical *distance* use trademarks less often, while firms with longer distances use trademarks more frequently. This result suggests that trademarks are an appropriate instrument to overcome distance and are not needed in circumstances under which a firm and its customers are able to maintain a close relationship. The quality features of products offered are sometimes obvious, but more often not straightforward *assessable* at the time of the purchase. The results show that firms with products, whose quality is difficult to assess, use significantly more often trademarks. This might be interpreted as meaning that trademarks can help to solve the problem of asymmetric information: The reputation of a trademark helps to assess those products. Previous experiences with the product or even with similar products of the same brand, can be transferred to the current purchase decision. The results further indicate that trademarks are also more frequently used, if a firm's products are characterised by a limited (but not strong) *substitutability*. Pursuing a trademark strategy seems to be more promising, if a firm has to distinguish its products amongst few competitors. In fact, strong brands are typically found in oligopolistic markets such as smartphones, cars, telecommunications, soft drinks or credit cards. In the case of many competitors and thus easy substitutability, trademarks are significantly less used. Another important finding is that a firm that conducts continuous R&D is engaged in patenting and the introduction of innovative products has a significantly higher propensity to register trademarks. This confirms that product innovations and the registration of trademarks are correlated.

In the end to conclude, what are the circumstances under which trademarks are important for a firm? Overall, the results show that firms are more likely to register trademarks and pursue a trademarking strategy, provided that the distance to their customers is far, the product quality is not assessable, the number of competitors is small, or firms undertake R&D activities and introduce product innovations.

Some limitations need to be acknowledged. This study focuses on the investigation of firms with and without trademarks. The trademark data have been reduced to this key information and further interesting aspects were suppressed. This is to be mentioned as limitation, since trademark data allow more than the generation of an indicator variable. One can (i) count the registered trademarks and create trademark stocks (Krasnikov, Mishra, and Orozco 2009; Sandner and Block 2011), (ii) use the flow of trademark applications over time (Crass, Czarnitzki, and Toole 2019), (iii) differentiate between service, manufacturing and mixed trademarks (Schmoch and Gauch 2009), (iv) or analyse the portfolio of each firm to distinguish between corporate brands, umbrella brands, family brands, and individual product brands (Keller and Lehmann 2006).

Future research could build upon this study and try to validate the findings while investigating alternative representations of firms' trademark use.

Another limitation is the lack of information about the motives of firms for using trademarks (Flikkema, De Man, and Castaldi 2014; Castaldi 2018). Future research should complement the firm characteristics described with the motives to trademark. It could be examined whether the success of a trademark strategy relies on the described firm characteristics.

The results confirm the link between a firm's innovation and its trademark activity. Trademark data are an appropriate innovation indicator (Mendonca, Pereira, and Godinho 2004). This is especially relevant for innovation statistics in the services sector, where traditional innovation indicators like R&D expenses and patent applications are less frequently used (Schmoch and Gauch 2009). Trademark data fill this gap at least partially. The results presented show that a considerable number of firms do not use trademarks because of firm characteristics like a close contact to their customers. A certain amount of innovative firms which meet these characteristics will not appear in innovation statistics based on trademarks. Innovation indicators relying on trademark statistics might underestimate innovation.

The empirical evidence is unambiguous: Trademarking firms are more successful. The findings of this study suggest that many firms do not adopt a trademark strategy and have rational reasons for doing so. The characteristics of these firms or of their products and services do not match the problem that trademarks solve. The use of trademarks would not make this group of firms more successful. Policy-makers should keep this in mind if they want to encourage firms to adopt a trademark strategy.

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## Appendix

### Definition of Variables

**Table 4.** Variable Definitions.

Variable	Definition
Trademarks	Dummy variable taking value 1, if firm has at least one registered trademark in 2010.
Firm Size	Log of the number of employees (in 2010).
Group	Dummy variable taking value 1, if firm reports to be part of an enterprise group in 2010.
East	Dummy variable taking value 1, if firm is located in East Germany (the former territory of the GDR and West-Berlin).
Firm Age	Log of the number of years (in 2010) since the enterprise was founded.
Few Customers	Dummy variable taking value 1, if a firms' reported share of sales in 2010 with the largest 3 customers is among the highest 15 percent of all sample firms.
Many Customers	Dummy variable taking value 1, if a firms' reported share of sales in 2010 with the largest 3 customers is below the median value of all sample firms.
Regional Market	Dummy variable taking value 1, if firm reports to be active on the regional market, defined as the area within a radius of 50 km.
National Market	Dummy variable taking value 1, if firm reports to be active on the national market (Germany).
International Market	Dummy variable taking value 1, if firm reports to be active on the international market.
Quality Assessable	Dummy variable taking value 1, if firm reports that its market is characterised by the fact that customers have no difficulties to assess the quality of products.
Products Substitutable	Dummy variable taking value 1, if firm states it applies fully that it operates in a market in which products are substitutable.
Few Competitors	Dummy variable taking value 1, if firm reports to have up to 5 competitors on its main product market in 2010.
Many Competitors	Dummy variable taking value 1, if firm reports to have more than 50 competitors on its main product market in 2010.
Continuous R&D	Dummy variable taking value 1, if firm reports to have continuous R&D activities during 2008–2010.
EPO Patent	Dummy variable taking value 1, if firm has at least one patent application.
Process Innovation	Dummy variable taking value 1, if firm introduced a process innovation during 2008–2010.
Product Innovation	Dummy variable taking value 1, if firm introduced a product innovation during 2008–2010.

**Table 5.** Descriptive Statistics of Main Variables.

	Mean	SD	Min	Max
<b>Basic Characteristics</b>				
Firm Size	3.58	1.62	-0.13	10.22
Group (D)	0.29	0.45	0.00	1.00
East Germany (D)	0.32	0.47	0.00	1.00
Firm Age	3.11	0.86	0.00	6.52
<b>Sector Affiliation</b>				
Food/Beverage/Tobacco	0.04	0.20	0.00	1.00
Textile/Clothes/Leather	0.03	0.17	0.00	1.00
Wood/Paper	0.03	0.17	0.00	1.00
Chemicals/Pharmaceuticals	0.04	0.18	0.00	1.00
Rubber-/Plastics products	0.03	0.17	0.00	1.00
Glass/Clay/Stone	0.02	0.15	0.00	1.00
Metal	0.07	0.25	0.00	1.00
Machinery	0.07	0.26	0.00	1.00
Electronics	0.07	0.26	0.00	1.00
Motor vehicles	0.03	0.16	0.00	1.00
Furnit./Toys/Medick. instr./Repair	0.03	0.18	0.00	1.00
Water/Waste disposal/Recycling	0.05	0.22	0.00	1.00
Energy/Mining/Petroleum	0.04	0.19	0.00	1.00
Wholesale	0.04	0.19	0.00	1.00
Transportation/Postal services	0.07	0.25	0.00	1.00
Media services	0.04	0.20	0.00	1.00
IT/Telecommunication	0.05	0.22	0.00	1.00
Financial services	0.03	0.17	0.00	1.00
Consultancy/Advertising	0.05	0.22	0.00	1.00
Technical/R&D services	0.07	0.26	0.00	1.00
Corporate services	0.06	0.23	0.00	1.00
<b>Personal Distance</b>	0.15	0.36	0.00	1.00
Few Customers (D)				
Many Customers (D)	0.45	0.50	0.00	1.00
<b>Geographical Distance</b>	0.63	0.48	0.00	1.00
Regional Market (D)				
National Market (D)	0.71	0.45	0.00	1.00
International Market (D)	0.47	0.50	0.00	1.00
<b>Product Quality</b>	0.22	0.42	0.00	1.00
Quality Assessable (D)				
<b>Substitutability</b>	0.21	0.41	0.00	1.00
Products Substitutable (D)				
Few Competitors (D)	0.42	0.49	0.00	1.00
Many Competitors (D)	0.19	0.39	0.00	1.00
<b>Innovation</b>	0.22	0.41	0.00	1.00
Continuous R&D (D)				
EPO Patent (D)	0.12	0.33	0.00	1.00
Process Innovation (D)	0.32	0.47	0.00	1.00
Product Innovation (D)	0.44	0.50	0.00	1.00

Source: ZEW: Mannheim Innovation Panel, survey 2011.

**Correlation Matrix****Table 6.** Correlation Matrix.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
(1) Trademarks (D)	1.00																
(2) Firm Size (# of employees)	0.16***	1.00															
(3) Group (D)	0.24***	0.20***	1.00														
(4) East Germany (D)	-0.13***	-0.07***	-0.09***	1.00													
(5) Firm Age (in years)	0.09***	0.09***	0.05***	-0.23***	1.00												
(6) Few Customers (D)	-0.08***	-0.03*	0.04*	0.05***	-0.09***	1.00											
(7) Many Customers (D)	0.08***	0.08***	0.03*	-0.08***	0.15***	-0.31***	1.00										
(8) Regional Market (D)	-0.15***	0.00	-0.10***	0.06**	0.07***	-0.06***	0.11***	1.00									
(9) National Market (D)	0.25***	0.06***	0.12***	-0.01	-0.06**	-0.05***	-0.12***	-0.37***	1.00								
(10) International Market (D)	0.32***	0.08***	0.19***	-0.11***	0.02	-0.08***	-0.05***	-0.20***	0.46***	1.00							
(11) Quality Assessable (D)	-0.02	0.01	0.06***	0.00	0.02	0.08***	-0.02	-0.01	-0.04***	0.00	1.00						
(12) Few Competitors (D)	0.05***	0.00	0.04***	0.01	0.02	0.08***	-0.01	0.03*	-0.08***	0.03**	0.09***	1.00					
(13) Many Competitors (D)	-0.11***	-0.03*	-0.08***	0.02	-0.03**	0.01	-0.03*	-0.01	-0.01	-0.12***	-0.01	-0.45***	1.00				
(14) Continuous R&D (D)	0.31***	0.15***	0.19***	-0.02	-0.02*	-0.02	-0.02	-0.13***	0.24***	0.35***	-0.02	0.06***	-0.12***	1.00			
(15) EPO Patent (D)	0.37***	0.14***	0.24***	-0.10***	0.07***	-0.02	0.01	-0.12***	0.19***	0.31***	0.02	0.09***	-0.09***	0.37***	1.00		
(16) Process Innovation (D)	0.17***	0.14***	0.18***	-0.05***	0.02	-0.04**	0.01	-0.06**	0.17***	0.20***	-0.02	0.03**	-0.08***	0.33***	0.16***	1.00	
(17) Product Innovation (D)	0.27***	0.11***	0.15***	-0.04**	-0.02	-0.07***	0.02	-0.15***	0.24***	0.30***	-0.05**	0.06***	-0.14***	0.61***	0.24***	0.39***	1.00

Notes: Significance levels: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

**Weighted Regression****Table 7.** Weighted Regression: The Propensity to Trademark.

	(1)		(2)	
	Trademarks (D)		Trademarks (D)	
	$\beta$ /SE	ME	$\beta$ /SE	ME
<b>Basic Characteristics</b>				
Firm Size	0.243*** (0.017)	0.062***	0.345*** (0.041)	0.067***
Group	0.036 (0.051)	0.009	0.055 (0.114)	0.011
East Germany	-0.180*** (0.047)	-0.046***	-0.082 (0.090)	-0.016
Firm Age	0.013 (0.026)	0.003	-0.048 (0.047)	-0.009
<b>Personal Distance</b>				
Few Customers	-0.159** (0.066)	-0.039**	-0.262** (0.123)	-0.045**
Many Customers	0.146*** (0.046)	0.038***	0.107 (0.090)	0.021
<b>Geographical Distance</b>				
Regional Market	-0.177*** (0.044)	-0.046***	-0.229*** (0.086)	-0.046***
National Market	0.401*** (0.059)	0.101***	0.553*** (0.120)	0.101***
International Market	0.353*** (0.049)	0.094***	0.337*** (0.093)	0.069***
<b>Product Quality</b>				
Quality Assessable	-0.138*** (0.051)	-0.035***	-0.192* (0.104)	-0.036*
<b>Substitutability</b>				
Products Substitutable	-0.036 (0.054)	-0.009	0.016 (0.105)	0.003
Few Competitors	0.093** (0.046)	0.024**	0.270*** (0.088)	0.057***
Many Competitors	-0.173*** (0.060)	-0.043***	-0.221** (0.112)	-0.038**
<b>Innovator</b>				
Continuous R&D	0.208*** (0.062)	0.056***	0.235** (0.111)	0.049**
EPO Patent	0.800*** (0.069)	0.240***	0.705*** (0.119)	0.173***
Process Innovation	-0.042 (0.047)	-0.011	-0.035 (0.083)	-0.007
Product Innovation	0.203*** (0.052)	0.053***	0.016 (0.087)	0.003
W_Industry	0.000		0.000	
McFadden's R2	0.263		0.247	
McFadden's Adj R2	0.247		0.247	
Correctly Classified (%)	75.275			
Correctly Classified 1 (%)	74.342			
Correctly Classified 0 (%)	75.699			
Observations	5.464		5.464	

Column (1) provides results of an unweighted regression and Column 2 of a weighted regression.

Source: ZEW: Mannheim Innovation Panel, survey 2011.