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In Search for the Not-Invented-Here Syndrome: The Role of Knowledge Sources and Firm Success

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Abstract

The not-invented-here (NIH) syndrome refers to internal resistance against external knowledge. This syndrome can occur when external knowledge conflicts with the prevalent routines and beliefs within a company so that employees respond with resistance. In this paper, we argue that the occurrence of a NIH syndrome depends on the source of external knowledge and firm performance. In line with social identity theory, we hypothesize that internal resistance is most likely to occur if knowledge is acquired from similar organizations. This hypothesis is supported by our finding that the NIH syndrome is most likely to happen when knowledge is acquired from competitors rather than from suppliers, customers or universities. Further, we show that top performing companies are most likely to experience a NIH syndrome if knowledge is acquired from competitors. This is in line with our hypothesis that firm success increases the extent to which their employees identify themselves with the company resulting in in-group favoritism and a tendency to reject externally generated knowledge.

Jelcodes:O31,O32

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Keywords: not-invented-here syndrome; external knowledge sources; competitive position

JEL: O31, O32, O33

1. Introduction

Innovation management has to pay careful attention to the fact that the institutional locus of technological advances can lie outside of the firm's boundaries (Teece, 1986; 1992). The acquisition of external technological knowledge can be an essential complement to in-house research and development (R&D) (Kogut and Zander, 1992; Teece, 1986; 1992; Laurensen and Salter, 2006; Chesbrough, 2003) as it can shorten development times (Hagedoorn, 2002), allows realizing synergy and efficiency effects (Veugelers, 1998), can help overcoming path-dependencies within the firm and trigger new technology developments (Teece, 1986). A skilled combination of external knowledge and the firm's own knowledge base can, hence, have substantial effects on firm performance (e.g. Rosenkopf and Nerkar, 2001; Cassiman and Veugelers, 2006).

Managing knowledge inflows from external sources is a complex task though (Lane and Lubatkin, 1998). Flexible processes facilitating changes in the company's vision, strategy and culture (Kanter, 1983) and supporting the implementation of new operating routines (Zollo and Winter, 2002) are prerequisites. The openness of individual employees towards externally developed technologies is quintessential (Lichtenthaler and Ernst, 2006). A welcoming attitude of employees towards new ideas can, however, not be taken for granted. The fact that knowledge creation is a highly complex process involving many different tasks and individuals with different backgrounds, know-how and employment histories leads organizations to develop routines which renders the organizational innovation process highly embedded and path-dependent (Dosi, 1982; Nelson and Winter, 1982; Teece et al., 2001). Individual employees, working teams and communities within the firm develop their own beliefs, artifacts and habits alongside their daily work which supports powerful path-dependencies (Dosi, 1982; Nelson and Winter, 1982; Garud and Rappa, 1994; Szulanski, 1999; Garud and Karnoe, 2001). Externally generated knowledge often requires employees to change beliefs, to look beyond the boundaries of their communities and to break with routines. Such boundary spanning activities can be challenging since they create tensions within their communities (Van Looy et al., 2001). Individuals tend to avoid such tensions because they derive their self-worth

from being part of an in-group and being different from out-groups (Abrams and Hogg, 1990; Tajfel and Turner, 1986). Ashforth and Mael (1989) established the concept of organizational identity; the degree to which the self-concept of an individual and the perceived organizational identity are defined by the same attributes (Dutton et al. 1994). Individuals strive for self-enhancement within their organization so that they tend to favor in-groups and aim for distinguishing themselves from out-groups (Ashfort and Mael, 1989; Bartel, 2001). The introduction of externally generated technologies can be significantly hindered by internal resistance if the in-group identity is challenged by external knowledge. This phenomenon is referred to as the not-invented-here (NIH) syndrome (Clagett, 1967; Katz and Allen, 1982; Lichtenthaler and Ernst, 2006).

Although an often discussed phenomenon among practitioners, the NIH syndrome has received relatively little attention in the academic literature (Katz and Allen, 1982; Clagett, 1967; de Pay 1989; 1995a; b; Boyens, 1998; Mehrwald, 1999; Menon and Pfeffer, 2003; Lichtenthaler and Ernst, 2006). Previous studies focus on organizational antecedents for the NIH syndrome like group tenure (Katz and Allen, 1982), the lack of or negative group experience with external knowledge (Mehrwald, 1999), dysfunctional intra-organizational communication (Mehrwald, 1999) or inappropriate incentive systems (de Pay, 1989; 1995a,b; Mehrwald, 1999). Previous studies therefore often investigate the NIH syndrome at the team or project level (Clagett, 1967; Katz and Allen, 1982; Mehrwald, 1999).

This study, in contrast, focuses on the level of the organization and proposes that the source of externally generated knowledge and the success of the company can be important antecedents for the occurrence of a NIH syndrome. First, in line with social identity theory (Tajfel and Turner, 1986), we suggest that the rejection of external knowledge is stronger if the out-group from which the knowledge is acquired is very similar to the in-group. If the out-group shares characteristics important for in-group identification individuals fear their group identity threatened. In-group favoritism emerges in order to restore identity (Gabarott et al., 2009). We argue that competitors are the most similar out-group for companies as compared to suppliers, customers and universities and hypothesize that employees refuse to value rivals' knowledge, in particular, in order to avoid degradation of own technological advances and the loss of

group-identity. We submit and empirically show that a NIH syndrome is most likely to occur if firms source knowledge from competitors rather than from suppliers, customers or universities.

Second, we establish a relationship between a firm's success and the occurrence of the NIH syndrome. According to attribution theory (Weiner, 1971), individuals tend to attribute successful outcomes to their own actions, but failures to actions taken in their environment. In consequence, successes of their company are experienced as a personal success by the members of the organization. Employees derive self-esteem and satisfaction from a positive social comparison to less successful organizations (Ashforth and Mael, 1989). Identification of individuals with their company increases. Following this line of reasoning, we hypothesize and show that top-performing firms are more likely to experience a NIH syndrome than low or medium well performing companies. Our findings are based on a sample of firms in German manufacturing and allow us to derive important implications for innovation management.

The remainder of the paper is structured as follows. The next section presents a review of the literature on the NIH syndrome. Section 3 develops a theoretical framework and derives hypotheses. Section 4 introduces our data set and section 5 shows the empirical results. The last section concludes with a discussion of the results and managerial implications.

2. The NIH Syndrome: Where Do We Stand?

Clagett's (1967) experience at an Engineering Research Center made him aware of frequent failures of implementions of external technologies caused by the NIH syndrome. Clagett (1967) analyzes several cases of successful and unsuccessful implementation of process innovations reporting notable resistance against externally developed knowledge. It concerns knowledge developed in the central R&D unit of a large U.S. firm and implemented at different production sites. He concludes that in order to reduce internal resistance it is important to have the engineers at the production sites involved in the whole process of problem definition, development and integration of the innovation. Clagett (1967), further, recommends that the person responsible for the introduction of an innovation should aim at reducing factors that

hamper the adaption of the innovation rather than trying to establish support for the innovation.

While Clagett (1967) assigns a key role for preventing a NIH syndrome to the individual responsible for introducing the external innovation, Katz and Allen (1982) look into group characteristics facilitating the occurrence of a NIH syndrome. They point at the importance of project team tenure. Their study of 50 project groups within a R&D facility reveals two opposing effects of team tenure on group performance. On the one hand, project team tenure is associated with a building component in that it fosters group members' understanding of each other's capabilities and of the technologies they are entrusted with so that group tenure improves the working relationship. On the other hand, Katz and Allen (1982) show that stable team membership reduces communication within groups, across groups and with external parties. Individuals working in teams with stable membership tend to isolate themselves from sources providing critical evaluations, information and feedback which does not coincide with group ideas; this leading to resistance against externally developed knowledge. In conclusion, Katz and Allen (1982) find a curvilinear relationship between tenure and group performance.

Extending Clagett's (1967) observation that the person responsible for introducing external knowledge plays a critical role regarding the NIH syndrome, de Pay (1989; 1995a;b) argues that miscommunication within an organization and inappropriate incentive systems can be further antecedents of the NIH syndrome. A comprehensive study about the NIH syndrome is provided by Mehrwald (1999), who carried out a survey among 51 R&D managers and 89 scientists in 53 large companies in Germany. His findings largely confirm prior results by Clagett (1967) and Allen and Katz (1982). Mehrwald's work adds team experience with external knowledge as another important antecedent of a NIH syndrome: teams with no or negative experience with externally generated knowledge are more likely to show resistance against adaptation. He, further, underlines the importance of inappropriate incentive systems to foster employees' intolerance against external knowledge (see also de Pay, 1989; 1995a;b).

Recent research contrasts the attitude of insiders towards externally generated knowledge with their readiness to accept new *internally* generated innovations (Menon and Pfeffer, 2003).

Prior studies have shown that the adaption of any new knowledge can provoke resistance being it internally or externally generated (e.g. Szulanski, 1996; von Hippel, 1994). Menon and Pfeffer (2003) present two cases of technology adaption in which external knowledge is preferred over internally generated knowledge. This is what is referred to as a not-invented-there syndrome (Laden, 1996).

Lichtenthaler and Ernst (2006) provide an extensive review of the scarce literature on the NIH syndrome. They extent existing theory by considering internal and external knowledge flows at different stages of the innovation process and by focusing on different organizational levels, e.g. individuals, groups, business units, organizations and inter-organizational levels. Similar to the concept of absorptive capacity (Cohen and Levinthal, 1989; 1990), Lichtenthaler and Ernst (2006) define knowledge management consisting of three "knowledge management cycles": knowledge acquisition, knowledge accumulation and knowledge exploitation (Hall and Andriani, 2003; Argote et al., 2003). At the level of each cycle, the management needs to decide whether the innovation activity should take place internally or externally. At each cycle an excessively negative attitude towards external knowledge but also an excessively positive attitude can occur. Both extremes can be detrimental for the knowledge management in the organization (Lichtenthaler and Ernst, 2006). An overly negative attitude at the knowledge acquisition level would induce a NIH syndrome (Menon and Pfeffer, 2003; Laden, 1999). Lichtenthaler and Ernst (2006) propose an integrated framework for the antecedents of resistance at the various innovation cycles and organizational levels and suggest possible conflict solutions.

The NIH syndrome, as we perceive it, situates at the knowledge acquisition level. It can be caused by a lack of experience with external knowledge, prior negative experiences with external information or dysfunctional intra-organizational communication (Mehrwald, 1999). A bureaucratic organization, for instance, can inhibit the effectiveness of communication (Allen, 1977). The NIH syndrome can also find its origin in a social environment which does not support a positive attitude towards external knowledge or an environment that is, in general, resistant to change (Mehrwald, 1999). In addition, inappropriately incentive systems can stimulate employees' intolerance against external knowledge (de Pay, 1989; 1995a; b; Mehrwald, 1999). Further, individuals' commitment can limit the information flow

across boundaries since a high commitment might cause reluctance towards external knowledge (Allen, 1977). In consequence, external knowledge can be wrongly evaluated (Mehrwald, 1999; Menon and Pfeffer, 2003), adaption can fail, projects can be delayed or canceled (Clagett, 1967; Katz and Allen, 1982; de Pay, 1989; 1995a;b) and, in the long run, the innovative performance of the firm can suffer (Lichtenthaler and Ernst, 2006).

Previous literature on the NIH syndrome has primarily focused on the NIH syndrome at the team/project level and the identification of possible organizational-internal causes of the NIH syndrome. We focus on the NIH syndrome at the organizational level and extent prior research by scrutinizing the source of external knowledge and company success as possible antecedents of the NIH syndrome.

3. Theoretical Framework

3.1. The NIH Syndrome on the Level of the Organization

Knowledge creation is a complex process involving different tasks and individuals with different backgrounds, interests and information. In order to faciliate the knowledge creation process, organizations develop routines. Individual employees and working teams develop subroutines within the corporate context in order to support information processing and problem solving (Dosi, 1982; Nelson and Winter, 1982; Szulanski, 1996; Garud and Karnoe, 2001). Such routines evolve over time and are mainly tacit so that they are difficult to be imitated or changed (Teece et al., 2001). They create strong path-dependencies regarding the firm's innovation process. Garud and Karnoe (2001) define path-dependence as "*a sequence of events constituting a self-reinforcing process that unfolds into one of several potential states. The specific state that eventually emerges depends on the particular sequence of events that unfold*". Path-dependencies support cumulativeness in innovation, but are not supportive for the adaption of new and, in particular, externally developed innovations (Cohen and Levinthal, 1990).

Path-dependencies are fostered by community formation, and vice versa. Within communities, common beliefs, artifacts and habits are developed alongside daily activities that create powerful path-dependencies (Van Looy et al., 2001). Those path

dependencies affect the formation of expectations and the self-concept of individuals and teams (Garud and Rappa, 1994). Individuals identify themselves with their community and relate their self-concept and self-esteem to community membership as predicted by the theory of social identity (Tajfel, 1978; Tajfel and Turner, 1986) and the concept of organizational identity (Ahford and Mael, 1998; Dutton et al. 1994).In consequence, individuals strive for maintaining a positive social identity within their organization and engage in self-enhancement (Tajfel and Turner, 1986; Ahford and Mael, 1998) which can lead to in-groups favoritism (Brewer, 1979; Ashforth and Mael, 1989; Abrams and Hogg, 1990; Tajfel and Turner, 1986). If individuals feel the identity of their organization is threatened they show a hostile behavior protecting their organization's self-concept.

External knowledge is a factor that can threaten the self-concept of communities. The acceptance and valuation of external knowledge can be perceived by insiders as a degradation of the achievements and the competence of the in-group. In consequence, individuals tend to reject external ideas to defend their group identity (Tajfel and Turner, 1979; Brown, 2000). In-group favoritism counteracts boundary spanning activities between communities which are essential for adapting new ideas and perspectives (Van Looy et al., 2001). This attitude renders the acceptance, integration and application of external knowledge difficult or impossible: the NIH syndrome occurs. Hence, our first hypothesis reads:

Hypothesis 1: If firms source external knowledge the likelihood of internal resistance against new innovation projects increases: a NIH syndrome occurs.

3.2. Source of External Knowledge and the NIH Syndrome

As argued in the previous section, internal resistance against external knowledge, the NIH syndrome, is consistent with the concept of in-group favoritism. Individuals tend to identify themselves with their organization and their self-concepts and self-esteem is related to organizational membership. Social comparison between different groups induces evaluation of the own organizational identity (Bartel, 2001). Individuals seek a positive comparison between the in-group and out-groups, i.e. other organizations, in order to obtain a positive distinction and, therewith, protect their

organization's integrity and identity (Tajfel, 1978; Tajfel and Turner, 1986; Gabarrot et al. 2009; Ahford and Mael, 1998; Dutton et al. 1994).

Two important remarks have to be made concerning social comparison. First of all, organizations tend to compare themselves with similar, proximal or salient organizations (Ashforth and Mael, 1989; Bartel, 2001). In-group favoritism further, suggests that tensions and the feeling that the in-group's identity is threatened by outsiders intensify with increasing similarity between in-group and out-group (Tajfel, 1974; Tajfel, 1982; Abrams and Hogg, 1990; Branscombe et al., 1999). Similarity between in-group and out-group increases their comparability (Caddick, 1982) and the boundaries between groups threaten to obliterate (Sanchez-Mazas et al., 1994). Individuals react with increased efforts to reassure distinctiveness and to reinstall the boundaries between groups which is accompanied by an intensified in-group bias (Jetten et al., 2003). Second, organizations make social comparisons on multiple dimensions. In this sense, organization can appreciate complementary or distinct dimensions of other organizations (Ashforth and Mael, 1989). Applying these predictions for group similarity and the need for self-differentiation to external knowledge sourcing suggests that the source of external knowledge matters.

Previous innovation literature has acknowledged the heterogeneity of different sources with regard to the nature of external knowledge that can be gathered and its contribution to firm performance and innovation (Belderbos et al., 2004a;b). Prior studies distinguish between knowledge acquired from vertical partners (customer and suppliers), competitors and universities. Knowledge from (lead) customers can help defining innovations and reducing risk associated with their market introduction (Von Hippel, 1988; Brown and Eisenhardt, 1995). Customer knowledge has been shown to be, in particular, important for the development of novel and complex new products (Tether, 2002). Knowledge from customers can lead to fast and flexible services, which allows the supplier to hedge against uncertain demand (Fischer, 1997). Supplier knowledge, in contrast, has been shown to be important for realizing cost reductions within the firms' production process and product quality enhancements (Choi et al., 1996; Ireland et al., 2002; Saeed et al., 2005; Belderbos et al., 2004b). Information from suppliers can spur a faster delivery, decreased production lead time, reduced cost and increased quality (Choi et al., 1996). Universities and public

research institutions are an important source for science-based knowledge that increases firms' understanding of engineering and recent scientific developments (Klevorick et al., 1995). Knowledge from universities is often sourced when firms aim at opening up entirely new markets (Tether, 2002; Fleming and Sorensen, 2004). Cassiman and Veugelers (2002) denote that the more generic nature of knowledge from universities and public research institutions leads to fewer appropriation issues as compared to rather applied knowledge produced for subsequent commercialization. Most crucial with regard to appropriation is competitor knowledge. At the same time, rivals' knowledge can be most valuable since rivals operate similar products and technologies in the same market.

Social identity theory indicates that social comparison is most crucial when it takes place amongst organizations which are most similar (Tajfel and Turner, 1986). With regard to external knowledge sources, competitors can be seen as being most similar to the organizations. Competitors can be considered, on the one hand, as the most interesting source of knowledge for the focal company since they have the most relevant knowledge about the market, products and technologies. On the other hand, the valuation of competitors' knowledge, technologies and products goes hand in hand with a comparison along the same dimensions, e.g. in terms of technologies and knowledge, and, hence, enforces the acknowledgment of own strengths and weaknesses. In response, social comparisons with competitors can trigger a strong need to differentiate the own group from the out-group. Individuals can react with increased efforts to reassure distinctiveness and to reinstall the boundaries between groups in order to protect their self-concept and the identity and integrity of their company. To safeguard the organizational identity, individuals might try to limit the interaction with competitors and knowledge inflows.

With regards to other types of knowledge sources, organizations can make social comparisons along different dimensions and value complementary or different knowledge. Customers, suppliers and universities do not operate in the same market and industry and are less likely to have similar goods or services. The competitive dynamics between the focal organization and these types of knowledge sources are not strong enough to induce comparisons invoking actions of individuals to differentiate themselves, to safeguard their self-concept and the identity of the firm.

Boundary-spanning activities in order to allow and facilitate knowledge inflows from horizontal partners and universities are, hence, expected to not conflict with self-concept of individuals. At least, the conflict potential is expected to be lower. Along these lines, we hypothesize:

Hypothesis 2: Internal resistance against new innovation projects is more likely if the firm sources knowledge from competitors rather than from vertical partners (customers and suppliers) and universities.

3.3. Competitive Position and the NIH Syndrome

In-group favoritism and defensive actions to preserve group identity can be triggered by external stimuli such as out-group similarity as discussed in the previous section. In-group favoritism is, however, most strongly determined by the attitude within the in-group. If the in-group consists of individuals that show a strong identification with the group, so-called high identifiers, there is a superior tendency towards in-group favoritism and a higher willingness to take defensive actions against out-groups than if the in-group consists of low identifiers (Branscombe et al., 1993; Doosje et al., 1995; Spears et al., 1997). High identifiers are strongly motivated to differentiate themselves from the out-group. Low identifiers may be insufficiently aware of or insufficiently interested in group identity so that they do not take actions to maintain group identity when it is be threatened by an out-group. Low identifiers rather accept a superordinate identity that encompasses both the in-group and the out-group, or they focus on their individual identity or an alternative social identity when the in-group identity is threatened (Jetten et al., 2003). Blanchard et al. (1975) argue that success is an important factor for a strong group identity. According to attribution theory (Weiner, 1971), individuals tend to attribute the succes of the organization to their own actions, whereas unsuccesfull outcomes are attributed to actions in the environment. Since individuals derive their self-concept and self-esteem from their organizational membership a higher belief in their own competencies emerges. Positive comparison with the less well performing organization protects the group's integraty and identity (Ashforth and Mael, 1989). In other words, the prestige or the success of the company matters for the degree to which individuals identify themselves with their company. In high-performing firms, the attributes which define the individual tends to become more similar with the perceived organizational identity

which, in turn, increases identification of the individuals with their organization. The identification of individuals with their organization, further, increases when the identity of the individual as part of the organization becomes more salient compared to other identities (Dutton et al. 1994). This means that the individual will see his organizational identity as one of most important identities. Since individuals with a strong identification with the firm tend to favor in-groups and compete with out-groups (Dutten et al. 1994) we hypothese that:

Hypothesis 3a: Internal resistance against new innovation projects is more likely if a company acquires external knowledge and if the company is among the top performers.

A strong identification with the group as an internal factor provoking internal resistance should not render external factors such as out-group similarity ineffective. It is much more likely that internal resistance is stronger if the company is a high identifier and, in addition, confronted with external knowledge generated by similar out-groups, i.e. competitors. Hence, we hypothesize:

Hypothesis 3b: Internal resistance against new innovation projects is more likely if a company acquires external knowledge from competitors (rather than from customers, suppliers and universities) and if the company is among the top performers.

4. Data, Definition of Variables and Descriptive Statistics

4.1. Data

The empirical analysis is based on the Mannheim Innovation Panel (MIP), a survey which is conducted annually by the Centre for European Economic Research (ZEW) on behalf of the German Federal Ministry of Education and Research (BMBF) since 1992. The MIP is the German part of the Community Innovation Survey (CIS) of the European Commission. Each CIS survey conducted in Germany includes questions on a specific topic. The special section of the 2003 questionnaire focuses on internal resistance as a hampering factor for innovation activities. A distinction of the hampering factors with regard to different knowledge sources a firm uses is available. The survey distinguishes between competitors, suppliers, customers and universities

and other public research organizations. The survey response 2003 constitutes a cross-sectional database for our empirical analysis. We focus on manufacturing firms only and exclude firms operating in service industries. This leaves us with a sample of 905 firms. Table 1 in the next subsection presents descriptive statistics for the variables used in the empirical analysis.

4.2. Definition of Variables and Descriptive Statistics

The dependent variable measures internal resistance regarding innovation activities. The variable is based on the question whether innovation projects were delayed, canceled or not started at all in the period 2000-2002 due to resistance within the firm. In total, 47 firms admitted that innovation projects were delayed, 20 stated that innovation projects were canceled and 39 reported that innovation projects were not started due to internal resistance. Due to the small number of firms reporting either form of internal resistance we define a binary indicator that equals one if one of the innovation obstacles occurred and zero otherwise. In total, 90 firms reported that internal resistance had a negative impact on their innovation activities. The descriptive statistics in Table 1 distinguish between the full sample and the subsamples of top-performing and less well performing firms. The distinction is important to test our hypotheses 3a and 3b. Top performing firms are distinguished from others according to their returns on sales. We split the sample so that one third of the firms are considered as top performers within the sample (at 7% returns on sales) and the remaining firms as medium or less well performing firms. It appears that there is no significant difference between top-performing firms and others regarding the likelihood that they will experience resistance as the t-test for mean differences of both groups in Table 1 shows.

The regressors of main interest capture information about external knowledge inflows. We define a binary variable that equals one if external knowledge was acquired for a process and/or product innovation in the period 2000-2002. The majority of 617 sample firms reported external knowledge inflows. This binary variable allows testing whether the likelihood of internal resistance against innovation activities increases in the presence of external knowledge inflows (hypothesis 1). The descriptive statistics show no significant difference regarding knowledge inflows between top-performers and other firms in the sample.

The survey allows us to distinguish between external knowledge from competitors, suppliers or customers (vertical relationships) and scientific institutions knowledge that led to a process and/or product innovation. Most of the firms (569) acquired knowledge from their vertical relationships. A much smaller share of firms acquired knowledge from scientific institutions (121) and competitors (218). We expect that the NIH syndrome is most likely to occur if knowledge is acquired from competitors (hypothesis 2). Table 1 shows that differences between top-performers and other companies occur with respect to the knowledge sources. As compared to the top-performers, less well performing companies are more likely to source knowledge from competitors and they are less likely to experience knowledge inflows from universities.

In addition to our main variables, we use a number of control variables. First, we use the number of employees as a measure for firm size. We expect that the conflict potential and, hence, the likelihood of internal resistance increases with the number of employees as large firms require a more sophisticated organizational structure. There might exist more communities within the firm, communication channels are presumably longer and there is a high chance that decision processes are more centralized (Allen, 1977). The average firm in our sample has about 428 employees. For the empirical analysis, the logarithm of firms' labor force is used to take account of the skewness of the firm size distribution.

Moreover, we control for firms' innovation performance. The survey would allow us to use firms' R&D expenditure as a measure for their innovativeness. R&D expenditure could be influenced by our resistance variable, however. For instance, if an innovation project is canceled due to internal resistance the R&D expenditure of that firm would be lower by definition. We, therefore, prefer using the firms' patent stock as a measure for the firms' innovativeness instead. The patent stock has the further advantage that it also accounts for firms' innovation success in the past. We calculate the patent stock as follows:

$$patent\ stock_{it} = (1-\delta) patent\ stock_{it-1} + patent\ applications_{it}$$

We use a constant depreciation rate of knowledge (δ) of 15%, as is common practice in the literature (see Griliches and Mairesse, 1984). We expect that a firm with a larger patent stock is more likely to experience internal resistance regarding new

innovation projects as the conflict potential within firms is likely to increases with the number of R&D projects. Previous literature has shown that conflicts between different departments are more frequent in firms with a high R&D intensity (Robert, 2004; Laden, 1996; Mehrwald, 1999). The average firm in our sample has a patent stock of about 8.8. Since a firm's patent stock is typically highly correlated with firm size we orthogonalize this variable with firm size. On average, a firm in our sample has a patent stock per employee of 0.02.

We also control for the human capital composition within a firm's labor force. We do so by defining a variable that captures the share of low skilled workers. The majority of employees are low skilled. Table 1 shows that this share is, however, significantly lower among top-performing firms. We expect that the share of low skilled people affects the likelihood of resistance negatively. The fewer low skilled employees a firm has, the fewer management positions, the fewer possibilities to get into internal conflicts between groups.

Moreover, firm age is taken into account. The expected effect of age is ambiguous since, on the one hand, firms are developing routines over time which might help avoiding internal conflicts. On the other hand, firms are likely to grow, expand their market, product and technology portfolio over time which might increase the likelihood of internal resistance. Table 1 shows that the average firm in our sample is about 32 years old.

Furthermore, we control for firms being part of a firm group. We would expect that the conflict potential is larger in firm groups as decisions are often not made within the firm itself but are taken centrally (Clagett, 1967). Similarly, we would expect that there is a higher likelihood of internal resistance for firms which are head-quartered in a foreign country. The individual firm is in a greater distance to the head quarter in this case which complicates communication. Table 1 shows that more than 40% of the firms are part of a firm group. The share of firms being part of a group is significantly higher among the top-performing firms. More than 10% of all firms have a foreign head-quarter. There is no significant difference between the two performance groups in this regard.

Lastly, we control for firms industry affiliation by means of 9 industry dummies and for firm location in East Germany. East Germany was a planned economy until

the fall of the Berlin wall in 1989 and is since then undergoing a transition process into a market economy. Recent studies have shown that East German firms lack behind West German firms in terms of productivity (Czarnitzki, 2005) and innovativeness (Czarnitzki and Kraft, 2006). We want to allow for the possibility that this impacts the conflict potential within the firms. About one third of the sample firms (33%) are located in the eastern part of the country.

Table 1 about here

5. Empirical Results

We test our hypotheses using a series of probability models. The dependent variable is always the binary variable that indicates the presence of internal resistance. In order to take into account that the dependent variable can only take the values zero and one we use probit models. The main regressors are the three dummies for the source of external knowledge. We include firm size, the patent stock, the share of low skilled workers, being part of a firm group with a foreign head-quarter, firm age and eight industry dummies as control variables. The regression results are presented in Tables 2 and Table 3.

The first column of Table 2 presents the test for the presence of a NIH syndrome (hypothesis 1). The results show that the likelihood of internal resistance is not significantly affected by the dummy variable indicating external knowledge inflows. Although the estimated coefficient for external knowledge inflows is positive the effect is not statistically significant. Hence, we do not find evidence for a NIH syndrome in response to external knowledge inflows within the average German manufacturing firm. We do not find support for hypothesis 1.

The second specification in Table 2 distinguishes between different sources of external knowledge by including dummy variables indicating knowledge inflow from vertical partners (customers and suppliers), from horizontal partners (competitors) and from scientific organizations. If we allow for a heterogeneous response to the different types of knowledge acquisitions it appears that a NIH syndrome exists for knowledge inflows from competitors, confirming hypothesis 2. External knowledge

inflows from competitors increase the likelihood of internal resistance increases by 35% at the means of all other variables.[1] There is no evidence that knowledge from vertical partners (customers and suppliers) or universities provokes internal resistance. This finding is in line with the prediction derived from social identity theory that resistance is strongest if the out-group is similar to the in-group. The valuation of knowledge from a similar out-group threatens in-group identity and individuals tend to favor internal knowledge to preserve the organizational identity.

With regard to the control variables the results show that internal resistance is mainly determined by firm size. The larger the firm, the larger the innovation portfolio and, hence, the conflict potential. There is a weak significant effect of firm location in Eastern Germany. In the formerly socialist part of the country internal resistance is less likely. All other variables, including the industry dummies, do not have a significant impact on the likelihood of internal resistance. LR-tests for the joint significance of the industry dummies cannot reject the null hypothesis that they are not jointly different from zero.[2] This shows that internal resistance is largely determined by unobservable factors.

Since we only observe a few firms that report internal resistance in our sample (about 10%) we repeat the regressions using rare event logit models (King and Zeng, 2001; Tomz et al., 2003) to check the robustness of our results. These models take explicitly into account that the dependent variable takes the value one for a very low number of cases only. The last two columns of Table 2 show that the estimated effects are very similar to those found based on standard probit regressions.

Table 2 about here

Table 3 shows the regression results for the tests of hypotheses 3a and 3b. We distinguish between the top-performing firms and firms with a medium or low performance. We repeat the regressions presented in Table 2 for both subsamples. The results show that there is, as before, no evidence for a higher likelihood of internal resistance if the firm experiences external knowledge inflows, neither among the top

[1] The percentage change is the marginal effect for a discrete change of the dummy variable from zero to one.

[2] The LR-test statistics are 4.26 for the first specification of Table 2 and 4.24 for the second specification respectively.

performing firms (column 2) nor among the less well performing firms (column 1). This means that we do not find support for hypothesis 3a: the NIH syndrome is not more likely to occur among the top performing firms.

Columns 3 and 4 show the results for the existence of internal resistance in response to different sources of external knowledge. It appears that the top performing firms are more likely to experience internal resistance if knowledge is acquired from competitors, while there is not such an effect for the less well performing firms. Hence, we find evidence for our hypothesis 3b in that we show that the NIH syndrome occurs, in particular, in top performing firms if knowledge is sourced from competitors. The finding is in line with our argumentation that individuals attribute company success to their own actions which increases their self-esteem and raises identification with the in-group and might cause in-group favoritism. This implies a tendency to favor internal knowledge over knowledge sourced from similar organizations which threaten in-group identity.

Interestingly, there is weak evidence for the likelihood of internal resistance to decrease within the top performing firms if they are sourcing external knowledge from vertical partners. If top performers want to maintain their position it is crucial for them to have close contacts to suppliers and customers (Bower and Christiansen, 1995). The empirical results show that there exists a welcoming attitude against external knowledge from vertical partners among the top performing firms. There is no such effect for the low or medium performing firms.

Regarding the control variables, we find for the subsample of medium or low performing companies that company size matters as we saw before for the full sample. For this subsample, the share of low skilled workers has a significant impact as well. The higher the share of low skilled workers the lower is the likelihood of internal resistance. Firm size and the share of low skilled workers have no effect within the subsample of the top performing firms. For top performers, however, we find that being part of a firm group impacts the likelihood of internal resistance significantly. A likely explanation is that resistance stems from the fact that decision are often taken by the head quarters and that these decisions might not always find agreement within the single firms. If the top performing firms are treated separately, industry effects matter. LR-tests reject that they eight industry dummies are jointly

equal to zero at the 5% level of statistical significance (LR = 8.22** for model II; LR = 8.35** for model IV).[3]

As before we demonstrate robustness of our estimation results by employing a rare events model as an alternative estimator that accounts for the fact that our dependent variable takes the value one for a few observations only. The results are presented in Table 4 in the Appendix. Again, the results do not change if the alternative estimator is used.

Table 3 about here

6. Discussion and Managerial Implications

External knowledge can provoke resistance within companies. This phenomenon is referred to as the not-invented-here (NIH) syndrome. The NIH syndrome is well known among practitioners, but received relatively little attention in the academic literature so far (Katz and Allen, 1982; Clagett, 1967; de Pay 1989; 1995a; b; Boyens, 1998; Mehrwald, 1999; Menon and Pfeffer, 2003; Lichtenthaler and Ernst, 2006). Academic studies have identified several important antecedents for the occurrence of a NIH syndrome inside the firm like group tenure (Katz and Allen, 1982), the lack of or negative group experience with external knowledge (Mehrwald, 1999), dysfunctional intra-organizational communication (Mehrwald, 1999) or inappropriate incentive systems (de Pay, 1989; 1995a,b; Mehrwald, 1999). These antecedents occur at the level of the team/project that is confronted with external knowledge inflows.

This study contributes to our understanding of the NIH syndrome in that we argue and show that the occurrence of the NIH syndrome at the organizational level is facilitated by the similarity between the knowledge source and the company and by company success Drawing from social identity theory and organizational identity theory (Tajfel and Turner, 1986; Ashforth and Mael, 1989), we argue that the source of external knowledge matters for the occurrence of a NIH syndrome. Internal resistance against external knowledge is expected to be stronger if the out-group, from which the knowledge is acquired, is very similar to the in-group. If the out-group

[3] For the subsample of low and medium well performing firms the he LR-tests on joint significance are not statistically different from zero. The LR-statistics are 7.03 for model I and 7.17 for model II.

shares characteristics that are important for in-group identification, individuals fear their group identity threatened and in-group favoritism occurs (Gabarott et al., 2009). We show that knowledge from competitors as the most similar out-group is most likely to provoke internal resistance as compared to knowledge acquired from suppliers, customers and universities and public research institutions. If the knowledge comes from a similar out-group employees are most likely to refuse to value this knowledge in order to avoid degradation of own technological advances and a loss of group-identity. There is no evidence for internal resistance against knowledge acquired from suppliers, customers or public research institutions.

Building further on the concept of attribution theory we establish that the firm's performance influences the occurrence of the NIH syndrome as well. Individuals tend to attribute the success of the organization to own efforts (Weiner, 1971). The success of a firm generates satisfaction among its insiders. The attributes which define the self-concept of the individual become more similar to the attributes of the believed organizational identity which deepens group-identification. Internally generated knowledge becomes more preferred relative to external knowledge, i.e. in-group favoritism. A strong identification with the in-group is accompanied by an increased readiness to degrade outsiders' competencies (Katz and Allen, 1982). Following this line of reasoning, we argue and show that top performing firms are most likely to experience a NIH syndrome when external knowledge is acquired from competitors. There is no evidence that the average medium or low performing firms experience a NIH syndrome at all.

An interesting result on the side is that the internal resistance among the top performing firms is lower if knowledge is acquired from suppliers or customers. A likely explanation for this finding is that it is crucial for top performering firms to have close contacts to suppliers and customers if they want to maintain a high performance in the future (Bower and Christiansen, 1995). In line with social identity theory, suppliers and customer do not threaten group identification since suppliers and customers are presumably very different from the in-group so that they do not share characteristics of the in-group that establish its identity. In line with attribution theory, firms value complementarity and distinct characteristics of other firms. For our

sample of German manufacturing firms, this is reflected in a welcoming attitude against knowledge from suppliers and customers.

Our results have important implications for management. We have shown that it is not only internal factors that facilitate the occurrence of a NIH syndrome, as most literature prescribes, but that the source of external knowledge matters, in particular. Managers should, hence, take the source of external knowledge into account when preparing their knowledge integration strategies. If the loci of knowledge creation share many important characteristics with the in-group, special means should be taken to support the adaption and integration of external knowledge. For instance, can the person responsible for introducing external knowledge have a key impact on the success of external knowledge acquisitions (Clagett, 1967; Allen, 1977). It is this person's task to manage communication and information flows and this person should, at least to some extent, have an eye on the incentives schemes in place and inform the higher management levels if incentives schemes collide with a welcoming attitude towards external knowledge. This person can be seen as a boundary spanner. Our results suggest that this person should not only take a look at the in-group and the kind of knowledge acquired but also at the source of knowledge. Knowledge inflows from competitors need a more careful introduction than knowledge from other sources.

A second important implication can be derived from the result that the top performing firms are most likely to experience a NIH syndrome. More than other firms, top performing firms have to screen the environment and, in particular, the technological activities of their competitors if they want to maintain their performance level in the future. The openness towards external knowledge developments and the adaption of external knowledge is, hence, especially crucial for these well performing firms. On top of establishing boundary spanners and incentive systems facilitating external knowledge acquisitions top performing firms can work on a more subtle level. We argue that in-group identification is an important trigger of the rejection of external knowledge. In response, employees react defensive if they see their group identity threatened by external knowledge from similar out-groups. Firms can take means to support in-group identification based on internal factors rather than on being different from out-groups. They can attempt to strengthen group identity from the

inside by making their corporate values, by which the firm's uniqueness is identified visible.

7. Limitations

Our study is not free of limitations. One limitation stems from the fact that we use the company as the level of analysis. This has the two important advantages: First, it allows us to focus on a large set of firms in German manufacturing rather than on a few selected cases. Second, it allows us to observe firms with different performance levels and different external knowledge sources. Hence, we consider a firm level approach as appropriate for establishing a link between firm performance, different knowledge sources and the occurrence of a NIH syndrome. Nevertheless, the firm level approach comes at the cost that we have to abstract from detailed team or the project level information. For instance, we cannot observe communication associated with a particular knowledge inflow or the incentive systems within our firms. Since previous studies, reviewed by Ernst and Lichtenthaler (2006), established the importance of such team level factors our study has to be seen as complementary to those prior analyses.

A related disadvantage is that we do not have information on the project level. This means that we cannot observe which projects rely on external information and against which project internal resistance occurs. For future work, it would be interesting to investigate whether our findings for different knowledge sources and hold at the project level. In such a set-up, more detailed project level control variables should be included.

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Appendix

Table 1: Descriptive statistics

	Full sample	Less well performing firms	Top performers		
	mean (st. dev.)	mean (st. dev.)	mean (st. dev.)	mean diff.[A]	
internal resistance	0.10	0.11	0.08	0.03	
	(0.30)	(0.31)	(0.27)		
external knowledge inflows	0.68	0.67	0.71	-0.04	
	(0.47)	(0.47)	(0.45)		
… from vertical partners	0.63	0.63	0.62	0.01	
	(0.48)	(0.48)	(0.49)		
… from competitors	0.24	0.22	0.31	0.09	***
	(0.43)	(0.41)	(0.46)		
… from scientific	0.13	0.12	0.17	-0.05	**
institutions	(0.34)	(0.33)	(0.38)		
number of employees	427.94	454.05	351.33	102.72	
	(1366.96)	(1484.48)	(939.46)		
log(employees)	4.57	4.60	4.51	0.09	
	(1.65)	(1.66)	(1.63)		
share of low skilled	81.23	82.16	78.52	2.64	**
workers	(19.97)	(19.83)	(20.17)		
patent stock	8.83	5.61	18.28		
	(132.32)	(56.24)	(244.32)		
patent stock/employees	0.02	0.02	0.02	-0.01	
	(0.08)	(0.07)	(0.09)		
East Germany	0.33	0.33	0.33	0.00	**
	(0.47)	(0.47)	(0.47)		
part of a firm group	0.45	0.43	0.50	-0.07	***
	(0.50)	(0.50)	(0.50)		
… with a foreign head	0.12	0.10	0.19	-0.09	
quarter	(0.33)	(0.30)	(0.39)		
age	31.55	32.30	29.32	2.98	
	(35.73)	(36.73)	(32.59)		
log(age)	3.00	3.01	2.98	0.03	
	(0.98)	(1.01)	(0.92)		

[A] This column shows the differences in the means of top-performing and less well performing firms for the variables of interest. Significance levels of t-test for a significant difference in the means are presented in the last column.
*,**,*** indicate 10%, 5% and 1% significance levels.

Table 2: Probit and rare events logit models for the likelihood of internal resistance

	I	II	III	IV
Estimation approach	probit	probit	rare events logit	rare events logit
	coeff. (s.e.)	coeff. (s.e.)	coeff. (s.e.)	coeff. (s.e.)
external knowledge inflows	0.21		0.41	
	(0.15)		(0.29)	
… from vertical partners		0.10		0.21
		(0.14)		(0.28)
… from competitors		0.27**		0.51**
		(0.13)		(0.25)
… from universities		0.02		0.09
		(0.15)		(0.28)
log(employees)	0.13***	0.12***	0.24***	0.22***
	(0.04)	(0.04)	(0.08)	(0.08)
share of low skilled workers	-0.01	-0.01	-0.01	-0.01
	(0.00)	(0.00)	(0.01)	(0.01)
patent stock/ employees	0.34	0.35	0.78	0.82
	(0.71)	(0.72)	(1.23)	(1.24)
East Germany	-0.26*	-0.28*	-0.49*	-0.53*
	(0.15)	(0.15)	(0.29)	(0.29)
part of a firm group	0.09	0.07	0.18	0.13
	(0.15)	(0.15)	(0.28)	(0.28)
… with a foreign head quarter	0.01	0.03	0.02	0.07
	(0.18)	(0.18)	(0.34)	(0.34)
log(age)	-0.02	-0.02	-0.03	-0.02
	(0.07)	(0.07)	(0.13)	(0.13)
constant	-1.44***	-1.41***	-2.58***	-2.56***
	(0.43)	(0.43)	(0.83)	(0.84)
N		905		
Loglikelihood	-276.92	-274.74		

8 industry dummies are included in all specifications.
*,**,*** indicate 10%, 5% and 1% significance levels.

Table 3: Probit models for the likelihood of internal resistance: high performers versus median and low performers

	I	II	III	IV
sample	low and medium performers	high performers	low and medium performers	high performers
	return on sales <= 7%	return on sales > 7%	return on sales <= 7%	return on sales > 7%
	coeff. (s.e.)	coeff. (s.e.)	coeff. (s.e.)	coeff. (s.e.)
external knowledge inflows	0.22 (0.17)	0.27 (0.37)		
… from vertical partners			0.24 (0.17)	-0.67* (0.39)
… from competitors			0.19 (0.15)	0.79** (0.35)
… from universities			-0.06 (0.18)	0.52 (0.36)
log(employees)	0.16*** (0.05)	-0.03 (0.12)	0.15*** (0.05)	-0.09 (0.12)
share of low skilled workers	-0.01** (0.00)	0.00 (0.01)	-0.01** (0.00)	0.00 (0.01)
patent stock/ employees	0.49 (0.87)	0.29 (1.67)	0.44 (0.89)	0.44 (1.96)
East Germany	-0.26 (0.16)	-0.45 (0.40)	-0.28* (0.17)	-0.50 (0.42)
part of a firm group	-0.14 (0.17)	1.62*** (0.53)	-0.14 (0.17)	1.75*** (0.58)
… with a foreign head quarter	0.13 (0.23)	-0.35 (0.33)	0.15 (0.23)	-0.37 (0.37)
log(age)	-0.04 (0.07)	0.03 (0.18)	-0.04 (0.08)	0.06 (0.19)
constant	-1.22*** (0.47)	-3.63*** (1.17)	-1.22*** (0.47)	-3.58*** (1.17)
	675	230	675	230
Loglikelihood	-215.33	-48.06	-213.90	-44.17

8 industry dummies are included in all specifications.
*,**,*** indicate 10%, 5% and 1% significance levels.

Table 4: Rare events logit models for the likelihood of internal resistance: high performers versus median and low performers

	I	II	III	IV
sample	low and medium performers	high performers	low and medium performers	high performers
	return on sales <= 7%	return on sales > 7%	return on sales <= 7%	return on sales > 7%
	coeff. (s.e.)	coeff. (s.e.)	coeff. (s.e.)	coeff. (s.e.)
external knowledge inflows	0.41	0.50		
	(0.32)	(0.72)		
… from vertical partners			0.45	-1.26*
			(0.32)	(0.73)
… from competitors			0.36	1.40**
			(0.29)	(0.66)
… from universities			-0.05	0.99
			(0.33)	(0.68)
log(employees)	0.29***	-0.04	0.27***	-0.16
	(0.09)	(0.22)	(0.09)	(0.22)
share of low skilled workers	-0.01*	0.01	-0.01*	0.01
	(0.01)	(0.02)	(0.01)	(0.02)
patent stock / employment	1.05	0.89	0.94	1.16
	(1.47)	(3.14)	(1.50)	(3.54)
East Germany	-0.50	-0.75	-0.54*	-0.83
	(0.33)	(0.74)	(0.33)	(0.77)
part of a firm group	-0.27	3.24***	-0.27	3.46***
	(0.32)	(1.15)	(0.32)	(1.20)
… with a foreign head quarter	0.28	-0.59	0.31	-0.64
	(0.42)	(0.61)	(0.42)	(0.67)
log(age)	-0.07	0.06	-0.06	0.15
	(0.14)	(0.33)	(0.14)	(0.35)
constant	-2.15**	-7.36***	-2.20**	-7.21***
	(0.90)	(2.41)	(0.91)	(2.39)
N	675.00	230.00	675.00	230.00

8 industry dummies are included in all specifications.
*,**,*** indicate 10%, 5% and 1% significance levels.