Technological Forecasting & Social Change 120 (2017) 284–297

Contents lists available at ScienceDirect

Technological Forecasting & Social Change

Seduced into collaboration: A resource-based choice experiment to explain make, buy or ally strategies of SMEs

Frank J. van Rijnsoever [a,b,*], Sander N. Kempkes [a], Maryse M.H. Chappin [a]

[a] Innovation Studies, Copernicus Institute of Sustainable Development, Utrecht University, Utrecht, The Netherlands
[b] INGENIO (CSIC-UPV), Universitat Politècnica de València, Valencia, Spain

ARTICLE INFO

Article history:
Received 28 June 2016
Received in revised form 27 February 2017
Accepted 9 March 2017
Available online 18 March 2017

Keywords:
Internal or external R&D
Make, buy, ally
Make, buy or ally strategy
Resource-based view
Discrete choice experiment

ABSTRACT

When engaging in an innovation project, small- and medium-size enterprises (SMEs) can choose to engage in three different strategies: make, buy and ally (MBA). As collaborating firms are seen as more innovative, policy makers actively promote the ally strategy using various measures. However, when SMEs choose to engage in a particular MBA strategy is unknown. This study aims 1) to understand how the attributes of an innovation project lead to the choice for an MBA strategy for different latent classes of SMEs. This is done by linking the MBA strategies to a series of attributes of the innovation project using a discrete choice experiment that is conducted on 427 SMEs. We identify four latent classes of SMEs that have distinctive choice patterns: 1) externally oriented SMEs, 2) internally oriented SMEs, 3) collaborators and 4) flexible SMEs. We demonstrate that the choices of an MBA strategy are related to the SME's past behavior, and only externally oriented SMEs or flexible SMEs are likely to change their MBA strategy. Overall, measures for stimulating SMEs' ally strategies with other parties can seduce a substantial part of the population. However, policy makers should be aware that a significant number of SMEs are already collaborating, and these SMEs might benefit from policy measures without changing their behavior.

1. Introduction

When engaging in innovation projects, small- and medium-size enterprises (SMEs) need to choose whether they develop new knowledge through internal or external R&D (Love and Roper, 2002). When they decide to rely upon external R&D, SMEs can either *buy* the knowledge from another party or jointly develop the knowledge in *collaboration* with the other party (Fey and Birkinshaw, 2005; Teirlinck and Spithoven, 2013). This latter strategy is also referred to as "ally" in the literature. Thus, the SME has three broad strategies from which it can choose (Borah and Tellis, 2014). These three strategies are known under various names in the literature, such as governance structure (Geyskens et al., 2006), governance mode (Fey and Birkinshaw, 2005), governance choice (Felin and Zenger, 2014), internal versus external R&D (Love and Roper, 2002; Veugelers, 1997), strategies for acquiring knowledge (Cassiman and Veugelers, 2006) or the choice to make, buy or ally (MBA) (Geyskens et al., 2006; Mudambi and Tallman, 2010; Borah and Tellis, 2014). In this paper, we use the last term.

Understanding SMEs' choice for an MBA strategy is important. For example, research suggests that enterprises that ally with other partners generally perform better than those that stick to a make strategy only (Meeus et al., 2004; Laursen and Salter, 2006; Carlsson et al., 2011). Policy makers are also aware of this potential and implemented policy schemes to stimulate alliances (Faber et al., 2016; Van Rijnsoever et al., 2015). This is especially true in the context of SMEs, as they are seen as more innovative than large firms (Knight, 2001) but often don't have the resources to form alliances (Faber et al., 2016). Thus, it is unknown when SMEs choose to engage in an MBA strategy. A number of gaps in the literature prevent us from understanding this choice, and thus for formulating informed policies.

First, most previous studies that attempt to predict the choice for an MBA strategy depart from a transaction costs economics (TCE) perspective (Geyskens et al., 2006; Williamson, 1998). Attributes of the transaction in terms of asset specificity, uncertainty and frequency are considered to decide which strategy is most cost-efficient in terms of its transaction costs (Crook et al., 2013). TCE elaborates little on the benefits of choosing an MBA strategy. This is surprising as each MBA strategy has its own benefits. Innovations that are developed through the make strategy, for instance, are more likely to enjoy a first-mover advantage (Lieberman and Montgomery, 1988; Kessler et al., 2000; Suarez and Lanzolla, 2007). An ally contributes to a social network, which can be called upon in the future (Jack, 2005). Another shortcoming of TCE is that it does not take into account past behavior and routines, although they have been shown to influence future choice (Greve, 1998; Becker, 2004; Betsch et al., 2004; Van Rijnsoever et al.,

* Corresponding author at: Innovation Studies, Copernicus Institute of Sustainable Development, Utrecht University, Utrecht, The Netherlands.
E-mail address: f.j.vanrijnsoever@uu.nl (F.J. van Rijnsoever).

http://dx.doi.org/10.1016/j.techfore.2017.03.015

2012). These shortcomings mean that TCE does not offer a sufficient explanation for the choice of an MBA strategy.

An alternative theory that can explain the choice of an MBA strategy is the resource-based view (RBV; Eisenhardt and Schoonhoven, 1996; Mention, 2011). The RBV focuses on how unique, rare and difficult-to-imitate resources and capabilities can be used to obtain a sustained competitive advantage (Barney, 1991). Although the RBV originally focused on resources within the firm, an increasing emphasis is placed on the role that partners play as a source for resources that contribute competitive advantage (Eisenhardt and Schoonhoven, 1996; Lavie, 2006; Lin et al., 2009; Mention, 2011). Within the RBV, knowledge is regarded as a key resource that provides a strong basis for a competitive advantage (Conner and Prahalad, 1996; Grant, 1996). Acquiring this key resource means that firms need to engage in an MBA strategy. Thus, RBV-driven studies are much more focused than, for instance, TCE studies on the benefits of MBA strategies. Such a benefit-driven approach provides a stepping stone for practitioners who design policies to promote the ally strategy among SMEs and other partners.

Second, innovation is a multilevel phenomenon that involves individual-, firm-, and network- and industry-level factors (Gupta et al., 2007; Ardito et al., 2015). These factors come together in projects where innovations are actually developed (Van Rijnsoever et al., 2015). SMEs can be involved in multiple innovation projects at the same time and can be engaged in each of the three strategies. Most studies look at how MBA strategies are used at the firm level. However, Bonesso et al. (2011) show that firms use different strategies for different projects. In addition, Borah and Tellis (2014), who look at different choices within firms, empirically observe that most firms favor one strategy, but most actually use all three strategies. The MBA strategy is chosen for each innovation project, based on the project attributes. It is possible that existing routines, habit- or firm-level characteristics also influence this choice (see Becker, 2004), but such influences are conceptually different from the choice itself. Analyzing MBA choice at the level of the firm as a whole does not take into account the attributes of the innovation project itself and will lead to an incomplete understanding. Further, understanding the role of project attributes in the choice for an MBA strategy aids practitioners with ingredients for project-based innovation policy measures to stimulate the ally strategy. Therefore, we need to analyze MBA choice at the level of the innovation project (Bonesso et al., 2011; Felin and Zenger, 2014).

Finally, to really understand the choice of an MBA strategy, we need to consider heterogeneity among SMEs. This heterogeneity fits with the RBV (Barney, 2001). Thus far, studies have attempted to capture only the heterogeneity that comes from observed variables, such as firm characteristics. However, unobserved sources of heterogeneity are known to greatly improve the understanding of choice (Masyn, 2013; Vermunt and Magidson, 2002). The unobserved sources of heterogeneity can be inferred from the choices made by agents under comparable conditions and can serve as the basis for identifying latent classes of SMEs that have similar preferences for MBA strategies. The size of the latent classes gives managers of firms, universities and other potential R&D partners a good idea about what share of SMEs pursue a particular MBA strategy and under what conditions they are likely to change their strategy. This provides insights into the market potential for allying with interested SMEs and in what potential partners can do to persuade or even seduce SMEs to collaborate. Latent classes also allow policy makers to estimate with relative precision what share of SMEs will respond to policy measures to stimulate alliance formation and which share of SMEs already prefer the ally strategy. Thus, unobserved heterogeneity is a tool for estimating the effectiveness of policy measures. However, unobserved heterogeneity has not been used in the context of SMEs.

Therefore, this study aims to compare the influence of the attributes of an innovation project on the choice of a make, buy or ally strategy for different latent classes of SMEs. Using attributes that were derived from the RBV, we conducted a discrete choice experiment (DCE; Louviere and Woodworth, 1983) on a sample of 427 SMEs from the United Kingdom and Germany.

DCEs are a well-established method for eliciting stated preferences in marketing, transportation research and health economics. They are particularly useful in situations where reliable data about revealed preferences are lacking (Baltas and Doyle, 2001), such as the choice of an MBA strategy. Using an experimental design, DCEs can incorporate all relevant attributes in a series of systematically varying choice tasks that respondents can use to indicate their preferred option (Ben-Akiva et al., 1991). Using data from this DCE, we identify latent classes of SMEs that pursue similar MBA strategies and how the SMEs value different resources associated with innovation projects. Our results provide opportunities for managers in their partner selection process and for policymakers who wish to influence the choice of an MBA strategy, for example, to seduce them into collaborating.

In the next section, we discuss the different MBA strategies. Then we identify the attributes of innovation projects that influence the choice of an MBA strategy. In the methods section, we provide more information about DCEs and our empirical approach. Then we present the results, followed by a discussion and the conclusion.

2. Theory

2.1. Make, buy or ally strategies

Huber (1991) claims that firms such as SMEs can learn from their own experience or from other sources. This distinction theoretically grounds the difference between internal and external R&D (Teirlinck and Spithoven, 2013) and forms the basis for the different MBA strategies. Regarding external sources, SMEs can decide to use a market governance structure in the form of "buy," or engage in an alliance (Veugelers and Cassiman, 1999; Fey and Birkinshaw, 2005; Geyskens et al., 2006; Teirlinck and Spithoven, 2013). This results in three broad strategies (Borah and Tellis, 2014): make, buy and ally. In the literature, various other names are used to describe these strategies. We chose these three as we found that they were easy to communicate to respondents.

Make means that the SME invests its own resources to generate the required knowledge for an innovation internally. Because the SME does not consult external sources, the outcome of the R&D process is more likely to be new and unique (Van Rijnsoever et al., 2015), which can lead to a first-mover advantage (Kessler et al., 2000; Lieberman and Montgomery, 1988; Montgomery and Lieberman, 1998; Suarez and Lanzolla, 2007). Moreover, the SME has full ownership of the outcome (Lin and Wu, 2010; Kreutzer, 2012). However, the result of the make process is not necessarily superior to existing alternatives. Learning processes involve a lot of trial and error (Bandura, 1977; Carbonara, 2004), which makes them inefficient, risky and lengthy. The outcome is thus uncertain.

Buy refers to the acquisition of knowledge by an SME from the market (see Fey and Birkinshaw, 2005; Mangematin and Nesta, 1999). Instead of producing knowledge internally, an SME can procure a license from an external party that allows the use of an existing stock of knowledge. It is also possible that the SME outsources the development of required knowledge to an external party or that the SME simply copies knowledge without intellectual property protection. A distinct feature of buy is that the SME itself has not (co-) developed the knowledge, and the knowledge thus is not new. Moreover, the transfer of knowledge is a one-way stream from the external source to the SME. Being a form of social learning (Bandura, 1977), buy is more efficient, less risky and faster than a make strategy. However, the knowledge procured using the buy strategy manner is not unique, and is therefore less likely to lead to a first-mover advantage. However, the outcome of this strategy is also less uncertain.

Ally refers to the joint development of knowledge by the firm and external parties (Powell et al., 1996; Schilling and Phelps, 2007). Examples are joint ventures and alliances (Grant and Baden-Fuller, 2004) but also subsidized collaborative innovation projects (Van Rijnsoever et al., 2015). The term ally implies that the SME has co-developed the knowledge while interacting with external parties during the R&D process. Partners combine parts of their knowledge bases, to make novel combinations

(Lin and Wu, 2010) that can lead to new knowledge and radical innovations (Van Rijnsoever et al., 2015). Moreover, partners can share the costs and risks that are associated with innovation (Powell et al., 1996; Borah and Tellis, 2014; Antonioli et al., 2016). Ally is not necessarily a more efficient or faster strategy than make but is more likely to result in unique knowledge that can help with gaining a first-mover advantage. However, the benefits from this advantage, such as intellectual property, likely need to be shared between the collaborating parties.

Make, buy and ally are three fundamentally different strategies, each with its own strategic implications. These strategic implications are not set in stone but are tendencies that are derived from the strategic management literature. We argued that the first difference between make and ally and buy is that the latter does not result in new knowledge. Buy can lead to innovations new to the SME but usually does not lead to innovations that are radically new to the market. Thus, buy is not likely to lead to a first-mover advantage. The most risky strategy is the make strategy, as buy does not have the uncertainty of developing new innovations, and risks are shared between partners when allying. Buy, however, commonly has the shortest time to bring a product to the market, as no new knowledge needs to be developed.

2.2. Attributes

We let the choice of an MBA strategy depend on how the SME values the attributes that are associated with an innovation project. Many attributes potentially influence the choice of an MBA strategy. A possible strategy would have been to translate the factors from TCE to attributes of the task. However, as explained in the introduction, the focus of TCE on cost-efficiency in terms of its transaction costs means that TCE does not offer a sufficient explanation in our case. Given that the RBV considers the strategic implications of each choice and provides room for understanding resource benefits, the RBV forms our starting point. These resources can be tangible, such as physical or financial capital, or intangible, such as knowledge or social capital (Amit and Schoemaker, 1993; Del Canto and Gonzalez, 1999).

In addition, this purely deductive approach might lead to the omission of important attributes and can lead to a lack of realism of the choice. In order to avoid this, we opted for a bottom-up approach to identify the attributes. We first reviewed the RBV literature and created a long list of potential attributes in the literature. Next, as is recommended in choice modeling (see Kløjgaard et al., 2012), we conducted seven semi-structured 25- to 40-minute qualitative interviews with founders of young SMEs. The purpose of the interviews was to identify which attributes were deemed important by SMEs in their choice of an MBA strategy. As a lot is already known about relevant attributes and the interviews did not reveal any new attributes or levels, we limited ourselves to seven interviews. The interviews resulted in a better feeling for the considerations made by SMEs regarding an MBA strategy. Finally, after intense discussion, based on our literature review and the insights from the interviews, we chose the final list of nine attributes that gives a broad representation of the considerations for choosing an MBA strategy. The first four attributes are strategic aspects of MBA strategies as discussed in Section 2.1. The second set of five attributes represents the different types of resources that can contribute to the competitive advantage of innovative SMEs (Barney, 1991; Del Canto and Gonzalez, 1999). The main outcomes of the R&D process are innovations, but during the R&D process, SMEs can acquire other beneficial resources, such as funding, intellectual property network contacts or specialized equipment. These resources are captured by the set of attributes. From the literature, we know that all nine attributes likely influence the choice of an MBA strategy. However, the literature does not provide insights into the relative size of these influences or how they differ among latent classes of SMEs. For this reason, we cannot formulate any hypotheses up front, and we explore this in the study. We now discuss each attribute and its levels (e.g., the values it can take). Moreover, we note when there is a theoretical reason to suspect that certain attribute levels are fixed to an MBA strategy. In Section 3.2, we discuss how we dealt with these interrelations empirically.

2.2.1. Speed to market

The first attribute is *speed to market*, which refers to gaining a first-mover advantage (Kessler et al., 2000; Lieberman and Montgomery, 1988; Suarez and Lanzolla, 2007). Although this attribute is strategic and not often mentioned in the context of the RBV, speed to market was identified by Wernerfelt (1984) in his seminal paper that forms one of the cornerstones of the RBV. Moreover, the attribute is fully compatible with a dynamic perspective on the RBV (Montgomery and Lieberman, 1998). A first-mover advantage means that the first firm that brings the innovation to the market will acquire an initial monopoly position for a (short) period of time (Grant and Baden-Fuller, 2004). The initial monopoly allows the firm to set the price, acquire an initial market share, go down the learning curve and receive customer feedback earlier than competitors. However, first movers need to invest in maintaining their position; otherwise, competitors can overtake the first mover with relative ease by using a buy strategy (Teece, 1986). This is called a "second mover advantage" (Hoppe, 2000). Thus, the attribute has two levels: *first mover* and *second mover*. As explained in Section 2.1, make and ally strategies are more likely to have this first-mover advantage. Therefore, this attribute is fixed to a first mover. The buy strategy is fixed to a second mover.

2.2.2. Risk

The attribute *risk* refers to the certainty that the innovation project will achieve the expected results (see Sitkin and Pablo, 1992). Innovation is characterized as an uncertain and risky process (Ozer, 2007; Verworn, 2009). Moreover, risk has consistently been shown to be important in organizational decision-making (Greve, 1998; Sitkin and Pablo, 1992). The choice to engage in innovation is to a large extent determined by the risks and uncertainties associated with a project (Bloom and Milkovich, 1998; Van Rijnsoever et al., 2012; Rosenkopf and McGrath, 2011; Slevin, 1971), which is why we include it in our model. The attribute has two levels: *low risk* and *high risk*. Based on Section 2.1, the make strategy is high risk, while buy and ally are low risk.

2.2.3. Development time

The *development time* of a new innovation varies greatly by sector. For small software applications, it can be as short as several weeks to a few months (Boudreau, 2012). In contrast, the development time in biotechnology is around 10 to 12 years (Pisano, 2006). Longer development times imply more costs without returns, and larger risks that a competitor will launch a similar product. This jeopardizes the chances of gaining a first-mover advantage. Being able to develop innovations faster depends on the firm's capabilities and can be a source of a competitive advantage (Verona, 1999). This places development time within the conversation of the RBV. Some MBA strategies are more time-consuming than others. The attribute therefore has two levels: *short development time* and *long development time*. For make and ally, the development time is long; for buy, the time is short (see Section 2.1).

2.2.4. Knowledge source

An external R&D strategy requires an external party that serves as *knowledge source* from which the SME can buy, or with which it can ally. The increase in the external focus of the RBV has made it necessary to also take into account partners that can contribute resources (Eisenhardt and Schoonhoven, 1996; Lavie, 2006). Potential knowledge sources relevant to innovation development have already been identified in the open innovation literature (Chesbrough, 2003) and are relevant to the RBV. Examples are suppliers, customers, competitors, research institutions and universities, as well as other organizations in different industries (Huizingh, 2011; Nieto and Santamaría, 2007; Van Rijnsoever et al., 2013). These sources operate in different institutional environments (Boon et al., 2014; Etzkowitz and Leydesdorff, 2000; Van Looy et al., 2006). Universities, for example, are pressured to develop knowledge

that is publishable in scientific journals, while SMEs need to develop knowledge that is commercially exploitable. For this reason, universities are more likely to possess basic knowledge, while firms are likely to have more applied knowledge (Laursen and Salter, 2004). The knowledge source is an important part in the choice of an MBA strategy (Kleinknecht and Reijnen, 1992; Miotti and Sachwald, 2003) as it influences the performance of R&D (Fey and Birkinshaw, 2005; Laursen and Salter, 2006). We distinguish the following six levels for this attribute: *supplier*, *competing firm*, *noncompeting firm*, *buyer*, *university or public research institution* and *private research institution*. By definition, make has no level at all. For buy and ally, these levels are not fixed.

2.2.5. Intellectual property

Intellectual property (IP) is intangible, but it can be a key resource for the SME as an outcome of the innovation process. IP provides the legal protection that prevents other parties from using or imitating the innovation (David, 1993; Hagedoorn, 2003; Verspagen, 2006). This, in turn, enables the patent holder to increase the commercial benefits of the innovation. IP rights can be fully owned by a single firm, but alliance partners can also share IP rights, for example, through joint patenting (Hagedoorn, 2003). Moreover, the IP holders can set the terms under which others can use the knowledge that is covered by the IP, for example, through licensing (Braga et al., 2000). However, IP is not always important (see Cohen et al., 2000). In some sectors, firms rely on alternative ways to protect their knowledge, such as secrecy. This can be because of the high costs associated with applying and defending a patent, or because the knowledge is simply not patentable. Consequently, the attribute has four levels: *full ownership*, *licensed IP*, *shared IP* and *free IP*. For the make strategy, the level is fixed at full ownership. For the external R&D strategies (buy and ally), the exact IP rights have to be negotiated (Hagedoorn, 2003); therefore, they are not fixed.

2.2.6. Office and specialized equipment

When SMEs ally with other parties, the SMEs can, in some instances, get access to physical resources (Lin et al., 2009). For example, incubators or science parks can facilitate collaboration by providing SMEs with office space near potential collaboration partners (Lindelöf and Löfsten, 2003). Another benefit of an ally can be access to specialized equipment that is necessary to develop the innovation, but that the SME would otherwise not be able to use (Chan and Lau, 2005); examples include laboratory space (Mian, 1997) and mainframe computers (Hisrich and Smilor, 1988). Thus, this attribute has four levels: *none*, *office*, *specialized equipment* and *office and specialized equipment*. Because these benefits can result only from an ally, the levels for make and buy are fixed at none for this attribute.

2.2.7. Social network

Social networks are often considered a key intangible resource that explains the success of the innovation process (Adler and Kwon, 2002). A large and heterogeneous social network allows the SME access to resources the company does not have internally (Davidsson and Honig, 2003). This network can be for the current innovation project, but these contacts can also be used to gain resources in future projects (Granovetter, 1973; Jack, 2005). Moreover, social networks help the SME gain legitimacy (Rao et al., 2008; Van Rijnsoever et al., 2014). SMEs can expand their social network by being introduced to connections of their partners in the external R&D process. Following Laursen and Salter (2004), we distinguish between scientific actors (universities, public or private knowledge institutions) and business actors (suppliers, competitors or noncompeting firms) of which the network can consist. Consequently, the attribute has four levels: *none*, *scientific network*, *business network* and *scientific and business network*. The levels for make and buy are set at none for this attribute.

2.2.8. Training and coaching

Human capital is the stock of employee skills within the firm (Wright et al., 2001). Educational level, experience with management and entrepreneurship are important intangible human capital factors that influence the success of entrepreneurs (Davidsson and Honig, 2003; Robinson and Sexton, 1994) and established firms (Hitt et al., 2001). In addition, regarding innovation these human capital factors are important. To strengthen human capital, SMEs can choose to hire additional employees. However, SMEs often have limited resources, which often exclude hiring as an option. Alternatively, SMEs can invest in strengthening the human capital of their existing workforce through *training and coaching* (Kutzhanova et al., 2009). Training refers to collective learning processes via workshops and master classes. Coaching takes place on an individual basis. Thus, this attribute has four levels: *none*, *training*, *coaching* and *training and coaching*. Because human capital investments require interaction between the SME and another actor, the levels for make and buy are fixed at none for this attribute.

2.2.9. Funding model

The financial costs of R&D can be between zero and up to around €1 billion (Pisano, 2006). There are several funding models to cover these expenses. First, the SME can invest its own resources in the project. However, external capital can also be attractive, for example, when internal funds are insufficient, to reduce risks or because of favorable regulations. A second finance model that is attractive to SMEs and entrepreneurs is to gather investments from "friends, family and fools" (Kotha and George, 2012). However, this funding source is often limited in size, and the entrepreneur places the well-being of those who are close to him or her at risk. A third alternative is borrowing money with interest from a bank. A well-known problem with loans is that banks are often risk averse and prefer physical assets to secure the loan in case of bankruptcy (Hall, 2002); not all SMEs have these assets. A fourth mode is turning to external investors, such as venture capitalists or angel investors. Such investors are often willing to take more risks than banks and can offer the SME valuable advice (see Sapienza and Gupta, 1994). However, investors ask for high returns on their investment, and often demand shares of the company or some form of control (Hellmann, 1998). Fifth, many governments invest in R&D by providing subsidies or tax benefits to innovative SMEs (Nooteboom and Stam, 2008). Examples are the European Framework Programs and the Small Business Innovation Research (SBIR) program in the United States. Although governments often ask little in return, SMEs can experience a high administrative burden in obtaining these funds (Barajas et al., 2012; Faber et al., 2016). A sixth and new way to finance R&D is crowdfunding. Crowdfunding is "an initiative undertaken to raise money for a new project proposed by someone, by collecting small to medium-size investments from several other people" (Ordanini et al., 2011, p. 444). These donations are usually raised over the Internet. Crowdfunding enables a broad audience to make a specific innovation possible. A downside of crowdfunding is that the project has to compete with other ideas, which makes the outcomes uncertain. Moreover, the SME has to disclose part of the innovative idea publicly to obtain funds. Overall, this attribute thus has six levels: *own investment*, *friends and family*, *bank loans*, *investor*, *government subsidy* and *crowdfunding*.

2.3. Observed SME characteristics

SME characteristics can also influence the choice of a specific MBA strategy. We consider the past use of an MBA strategy and the SME's existing knowledge as SME characteristics. The past use of an MBA strategy fits with the idea of organizational Learning. This theory argues that the choice of an MBA strategy is likely the result of accumulated organizational practices (Greve, 2003; Levitt and March, 1988) of which the successful ones are stored in routines (Becker, 2004; Van Rijnsoever et al., 2012). These routines make SME behavior more efficient (Argote and Epple, 1990; Epple et al., 1991) but limit the SME's degrees of

freedom to change their existing strategy, because SMEs have to unlearn one strategy and relearn another (Betsch et al., 2004). Borah and Tellis (2014) have shown that most firms favor one strategy. This argument is compatible with the RBV, although within the RBV the argument is somewhat eclectic. It claims that firms are unlikely to change strategy because resources are mobile to a limited extent (Barney, 2001; Wernerfelt, 1984), because dynamic capabilities might be underdeveloped (Teece et al., 1997), and consequently, a SME's strategy is constrained by the firms' resources and capabilities. We consider past use of an MBA strategy to be an important covariate that can help explain choice.

In addition, to engage in external R&D, SMEs need to have a knowledge base that gives a sufficient absorptive capacity (Cohen and Levinthal, 1990) and combinative capabilities (Kogut and Zander, 1992). Otherwise, the SME will be unable to accumulate, interpret and integrate the external knowledge. To this end, SMEs need to have a sufficient knowledge base and be sufficiently large. Therefore, we take into account the SME's current innovative performance and size. This argument fits with the RBV claim that the current resource stock influences the external acquisition of resources (Eisenhardt and Schoonhoven, 1996).

2.4. Unobserved heterogeneity among SMEs

Conventional deductive research usually formulates hypotheses between attributes and preferred options, which can be tested with some form of regression analysis. However, it is possible that these relationships vary according to observed characteristics of the SME or its environment. These preferences can also be explained by sources of heterogeneity that are unobserved but that can be inferred from the choice behavior of agents (Vermunt and Magidson, 2002). The unobserved characteristics are not measured directly but are inductively inferred from the data. Based on the firms' choices, agents such as SMEs can be clustered into latent classes with similar preferences for an MBA strategy. Latent classes often explain a large amount of preference heterogeneity (Hensher et al., 2005). The observed characteristics can be used to describe these latent classes.

3. Discrete choice experiment

We model the influence of the attributes on the choice of an MBA strategy in a random utility theory (RUT) framework (Manski, 1977; McFadden, 1974). According to RUT, each individual *i* attaches a certain amount of utility U_{ij} to each *j* alternative, in our case the MBA strategy. This utility consists of an observed component V_{ij} and an unobserved random component part ε_{ij}:

$$U_{ij} = V_{ij} + \varepsilon_{ij} \quad (1)$$

The observed component V_{ij} is comprised of the attributes that are associated with alternative *j* and respondent characteristics that explain the choice. The error component ε_{ij} captures the unobserved factors that influence the choice, such as latent classes. Because ε_{ij} is stochastic by nature, the final choice of alternative *j* is represented as a probability.

This model was tested through a DCE (Louviere and Woodworth, 1983). In a DCE, respondents receive a questionnaire that contains a series of choice tasks. Each choice task has a number of alternatives from which respondents can select their preferred option. Respondents base their choices on the levels of the attributes that are associated with each alternative. These attribute levels vary systematically over the choice tasks and different questionnaire versions, in such a manner that the overall DCE contains an experimental design in which the correlations between the attributes are minimized.

As a research design, DCEs have three major advantages over conventional cross-sectional surveys. First, DCEs have a high internal validity. The experimental design ensures that attribute levels have little to no correlation with each other, which makes it possible to assess the relative influence of each attribute on the choice of an alternative without any confounding factors. Thus, DCEs give the researcher direct insight into how attributes can be manipulated to influence choice (Aguinis and Bradley, 2014). Second, because the levels of the attributes are given by the experimental design, DCEs do not suffer from common method bias (see Podsakoff et al., 2003). Third, because each respondent receives multiple-choice tasks, DCEs allow identification of unobserved latent classes of respondents with similar choice patterns (see Vermunt and Magidson, 2002). Thus, DCEs can capture an additional source of heterogeneity, next to the observed respondent characteristics that are usually measured in cross-sectional surveys. A downside of DCEs is that they measure stated preferences or intended behavior instead of revealed preferences or actual behavior. However, research has shown that DCEs can be used to successfully forecast revealed preferences (Adamowicz et al., 1994; Ben-Akiva et al., 1994) or strategic decisions for innovation (Van Rijnsoever et al., 2012).

DCEs were originally designed to elicit preferences from consumers. However, they have also been applied to understand organizational behavior, such as retail strategies from managers (Oppewal et al., 2000), the preferences for alternative fuel vehicles by local governments (van Rijnsoever et al., 2013) or networking preferences of food SMEs (Lefebvre et al., 2014). However, when applying DCEs to organizations, it is important to take into account that respondents are part of an organization in which decisions are the results of negotiation processes and power plays (Cyert and March, 1963; March, 1994). Therefore, respondents need to be considered as informants who accurately predict the behavior of their organization (Oppewal et al., 2000). To obtain reliable results, it is important that these informants have sufficient insight into how the organizational decision process works. Therefore, it is often better to survey respondents who are involved in making strategic decisions. Moreover, reliability increases as the influence a respondent has over an organizational decision process becomes larger, because the respondent becomes more an informant about his or her own behavior instead of the organization. Finally, reliability is likely to increase when the organization is smaller (Van Rijnsoever et al., 2012). Smaller organizations are less inert than large organizations (Hannan and Freeman, 1984), which means that smaller firms are better able to implement changes that follow from strategic decisions stated by management.

3.1. Data collection

We collected data among entrepreneurs or former entrepreneurs that founded or owned innovating small- or medium-sized manufacturing firms. Data were collected via an online business-to-business panel of a large European marketing agency. The sectors were selected according to the Eurostat classification based on NACE codes (Eurostat, 2009). Respondents were surveyed in the United Kingdom (UK; n = 284) and Germany (n = 143). These countries are two of the major economies in the European Union, but they operate under different institutional regimes,[1] which leads to differences in how the innovation process operates (Hall and Soskice, 2001). By sampling from two different countries, we increase the external validity of our results. However, the response per country was limited by the number of potential respondents in its panel. To correct for this, the SMEs in our sample were weighted according to the occurrence in the population of manufacturing SMEs in their respective countries in 2011 (see Eurostat, 2013). Thus, the weight ratio between UK and German SMEs was set at 0.565 to 1.864 with a mean of 1.

The average age of the respondents ranged between 22 and 70 years (mean = 51.0); most (89.5%) were male. Three quarters (76.4%) of the respondents was the chief executive officer (CEO) of the firm, 12.9% was the chief financial officer (CFO), 12.2% was the chief marketing officer (CMO), 16.4% was the chief technical officer (CTO) and 8.0% claimed to fulfill some other position. Note that one person can hold multiple board positions. This result demonstrates that the respondents in this sample are suitable informants for their firm. The average firm age

[1] In political economy, the United Kingdom is often characterized as a "liberal market" economy, while Germany is often seen as a "coordinated market" (Hall and Soskice, 2001).

ranged between 1 and 42 years (mean = 10.24), while the size ranged between 0 and 400 full-time employees (mean = 29.70). However, this distribution was negatively skewed due to outliers. The 5% trimmed mean of size was 18.19 full-time employees. Filling out the questionnaire took approximately 20 min. For their participation, the respondents received a small monetary reward.

3.2. Experimental design

The first part of the questionnaire consisted of the DCE. Respondents were asked to imagine that their enterprise needed to acquire knowledge for research and development to bring an innovative idea to a proof of concept for their market. Respondents received a series of choice tasks containing three alternatives with systematically varying attribute levels. Before the choice tasks were given, respondents received instructions about how the DCE works, the attributes in the choice tasks and the associated levels. This information is given in Appendix A. We used the terms internal R&D, buy and collaborate instead of make, buy or ally, as they were deemed clearer for respondents. For each choice task, the following question was posed: Given the following conditions, which of the following strategies would your enterprise most likely pursue to acquire knowledge to research a new innovative idea to a proof of concept in your current market?

After reading the instructions, respondents proceeded to the choice tasks. Because of the complexity, each task contained a link to a pop-up screen on which the attributes were again explained. Appendix B shows an example choice task. To make the risk attribute more realistic for the respondents, we operationalized low risk as a more than 50% chance that the project would succeed. High risk implied a less than 50% chance of success. We made the development time sector specific by enquiring about the average time to develop an innovation in the respondent's specific sector. A short development time was operationalized as completing the project in half that time. A long development time meant the industry average. We restricted the IP attribute to patenting. The reason is that it is a common and effective way to protect IP in manufacturing, and it was easy to comprehend for respondents.

An important topic to consider when constructing a DCE is the effect of labeling alternatives (De Bekker-Grob et al., 2010; Hensher et al., 2005). Alternatives in a choice task can be labeled with, for example, a brand, product or technology name. In the case of a labeled task, respondents base their choice not only on the attribute levels given in the task. They can also infer (accurately or not) attributes from the label, or they can experience certain emotions that influence their decision state (Loewenstein et al., 2001). Thus, the label can greatly influence choice. In our case, it is possible that the respondents are influenced by the name of the MBA strategy, as it makes an alternative more realistic to them. Although realism is clearly a desirable feature of a choice task, the downside of labeling alternatives is that certain attribute levels are nested in an MBA strategy, as was described in the theory section. Without independence between the label and the attribute levels, it is impossible to separate the effect of individual attribute levels from that of the label.

To control for this problem, the respondents were randomly assigned to an unlabeled condition and a labeled condition. The alternatives in the choice tasks of the unlabeled condition contained all nine attributes, but the name of the MBA strategy was omitted. In the labeled condition, the name of the MBA strategy was given for each alternative, and the levels of the attributes were fixed according to the MBA strategy.

Both conditions contained 72 choice tasks that were blocked over eight questionnaire versions to which respondents were randomly assigned. The attribute levels varied in such a manner that all choice tasks and questionnaire versions added up to a fractional orthogonal design (e.g., attributes were uncorrelated). Respondents in the unlabeled condition received eight or 10 choice tasks, while respondents in the labeled condition received nine choice tasks.

We measured the time it took a respondent to complete each choice task. We removed 10 observations from the data (0.1%) that took longer than 1500 s (25 min)[2] to complete as we deemed the observations unrealistic. After we removed these observations, the average time to complete a task was 31.02 s (SD = 48.67). Respondents in the labeled condition needed, on average, 27.51 s, which made them significantly faster ($p < 0.001$) than the respondents in the unlabeled condition where the average was 34.55 s. This is because the label could serve as a heuristic cue. In addition, there were fewer varying attributes as some were nested in the MBA strategy.

3.3. Measurement of SME characteristics

In addition to the DCE, respondents were asked to report a series of SME characteristics. We measured past use of an MBA strategy with various knowledge sources. This measures the SME's past behavior and thus can indicate whether the SME has already developed routines for a strategy. Past R&D activities, patent stock, product innovations and firm size were measured as indicators of the knowledge base (see Cohen and Levinthal, 1990; Meeus et al., 2004). The measures and their frequencies are reported in Table 1. We also tested the effects of factors external to the SME, such as industry, but they did not give significant results. To save degrees of freedom, these external factors were not included in our models.

3.4. Analysis

We analyzed our data via a latent class analysis using the Latent Gold program. This software is specifically designed to analyze choice models and has been demonstrated to outperform other programs when it comes to identifying latent classes (Haughton et al., 2009). Before our analyses, we pooled the observations from both conditions (labeled and unlabeled) together in one data set. The total number of observations in the data was 12804; 6390 (49.9%) observations were from the unlabeled condition.

The dependent variable in the latent class model was the choice a respondent made for an alternative in a choice task. Because the choice tasks forced respondents to give the most likely and least likely alternatives, we were able to construct a full ranking per task (see Flynn et al., 2007). This ranking was predicted by the attribute levels of the alternatives. In the labeled condition, some attribute levels were nested in the MBA strategy; therefore, we included alternative specific constants for each MBA strategy that capture the variance from the label (De Bekker-Grob et al., 2010; Hensher et al., 2005). Through the attributes and alternative specific constants, we model the observed component V_{ij} from RUT.

The unobserved heterogeneity in the sample comes from ε_{ij}, which was modeled by identifying latent classes. Respondents were assigned to these latent classes based on the extent to which they made similar choices (see Vermunt and Magidson, 2002). Each latent class has its own set of estimators to predict the choice of an MBA strategy. To aid in the identification of latent classes, we added the labeling condition and country (UK or Germany) as a covariate to the model. Doing so takes into account the experimental conditions or sampling and controls for the fact that we nested some attributes in an MBA strategy. We used the Bayesian information criterion (BIC; Schwarz, 1978) as a heuristic tool to determine the number classes (Greene and Hensher, 2003; Nylund et al., 2007; Roeder et al., 1999), where a lower BIC implies a better solution. Because the BIC penalizes the inclusion of additional parameters, a parsimonious solution is most likely favored. We explored solutions of between one and five latent classes using different model specifications.

[2] This cutoff point was determined after we examined the distribution of the time to complete variable. Observations under 1500 s were quite frequent and distributed evenly, while observations that were longer than 1500 s were scarce and unevenly distributed.

Table 1
Indicators and frequencies of SME characteristics.

SME characteristic	Item (response categories)	Frequencies
Past use of MBA strategy with knowledge source	Please indicate the strategies your company used for the following external technological knowledge sources in the last three years. *(Buy, Ally, Not used)*	
	• Suppliers of equipment, materials, components or software	Buy: 155 (36.3%), ally: 205 (48.0%), not used: 67 (15.7%)
	• Competing firms inside your sector	Buy: 28 (6.6%), ally: 164 (38.4%), not used: 235 (55.0%)
	• Noncompeting firms outside your sector	Buy: 22 (5.2%), ally: 179 (41.9%), not used: 226 (52.9%)
	• Prospective customers or users of your product	Buy: 40 (9.4%), ally: 305 (71.4%), not used: 82 (19.2%)
	• University, other higher education institutes or public research institutes	Buy: 31 (7.3%), ally: 153 (35.8%), not used: 243 (56.9%)
	• Private research institutes that primarily conduct applied contract research, such as Frauenhofer	Buy: 31 (7.3%), ally: 119 (27.9%), not used: 277 (64.9%)
R&D	Did your enterprise engage in R&D activities to develop knowledge in the past three years? *(No, Yes)*	No: 186 (43.3%), yes: 242 (56.7%)
Patent stock	How many patents does your firm own? *(0, 1–2, 3–10, >10)*	0: 287 (67.2%), 1–2: 76 (17.8%), 3–10: 42 (9.8%), >10: 22 (5.2%)
Product innovations	How many new or significantly improved products has your enterprise introduced in the last three years? *(0, 1, 2, 3, >3)*	0: 159 (37.2%), 1: 102 (23.9%), 2: 81 (19.0%), 3: 42 (9.8%), >3: 43 (10.1%)
Size	How many full-time equivalents* (FTEs) does your enterprise employ? *(recoded to micro (0–10), small (11–50), medium (51–250), medium–large (251–400))*	Micro: 269: (63.0%), small: 100 (23.4%), medium: 50 (11.7%), medium–large: 8 (1.9%)

Moreover, we explored whether scale classes could be identified. The idea behind scale classes is that respondents exhibit different degrees of consistency when making their choices. This consistency is based on the variance in responses (Magidson and Vermunt, 2007). Not taking scale into account can lead to a bias in model estimates (Sælensminde, 2001; Swait and Louviere, 1993). By clustering respondents who display a similar degree of consistency into one scale class, a correction for this bias can be added. We explored solutions of between one and four scale classes. We plotted the BIC against the number of scale classes. Using a scree-type analysis, we determined the optimal number of classes at the point where the curve leveled off (see Masyn, 2013).

Finally, we estimated a multinomial regression model in which we use the observed SME characteristics to predict the latent class membership of the previous model. In this way, we can identify SMEs in the latent classes by the firms' observed characteristics.

We report the McFadden (1974) pseudo-R^2 as the model performance indicator. The Wald χ^2 indicates the relative importance of the attributes. The coefficients for each level are effects coded, which means that the effects are uncorrelated with the intercept and that the estimators add up to one (Bech and Gyrd-Hansen, 2005).

4. Results

Table 2 presents the outcomes of the latent class analysis. The BIC indicators revealed that a solution with four latent classes and two scale classes fitted the data best[3]. The McFadden pseudo-R^2 is 0.27, which indicates a good fit for a DCE (Hensher et al., 2005). Moreover, it is a major improvement over the fit of a simple one-class model that has a pseudo-R^2 of only 0.03. This result confirms the notion that unobserved variables help to explain the heterogeneity in choices by SMEs.

All attributes are significant, but the Wald χ^2 shows that the largest influence on choice comes from the funding model, followed by risk, knowledge source and IP. Moreover, the experimental condition significantly influenced class membership, while country did not. For the first classes, the largest estimates come from MBA strategies, indicating that they are difficult to change. Table 3 displays the ranking of MBA strategies per latent class and the attributes that can change the preferred MBA.

Table 4 presents the results of the multinomial regression to predict class membership using the SME characteristics. The pseudo-R^2 is 0.15, which is acceptable. Using Tables 2 to 4, we describe the four latent classes by the attribute levels and SME characteristics that are significant.

Class 1, *Externally oriented SMEs*: This class values the external R&D strategies over make, and ally slightly over buy. This is the only class that finds a second-mover position more attractive than a first-mover position. Consistent with the preference for external R&D and being a second mover, this class prefers to take small risks only. Class 1 prefers to work with noncompeting firms as an external knowledge source, while competitors are least preferred. The class members are indifferent to the other knowledge sources. Of the resource endowments, class members find a business network and getting access to an office space attractive. However, they have no interest in combining office space with specialized equipment and are not interested in human capital resources. Finally, class members prefer to finance innovation through their own investments. Investors are seen as the most likely external alternative. Family and friends and crowdfunding are unlikely sources of funding. The SME characteristics show that SMEs ally with suppliers and buy knowledge from competitors and noncompetitors. Thus, the choice of an MBA strategy is largely consistent with the SME's current behavior. This class is least likely to conduct R&D itself and few SMEs hold more than 10 patents; most hold between three and 10. Finally, SMEs in class 1 are most likely medium sized.

Class 2, *Make SMEs*: This class has a strong preference for make and a strong preference against buy. If a class 2 SME consults an external knowledge source, it is most likely a noncompeting firm. Universities and public research institutions are seen as the least likely sources. In line with these SMEs' internal orientation, they find full IP ownership important. None of the resource endowments positively influence the SMEs' choice of an MBA strategy, except for gaining access to a coach on an individual basis. Of all classes, this group has the strongest preference for using their own funds to finance innovation. Table 3 shows that the estimators that are significant for past use of MBA strategy indicate that SMEs in this class made the least use of external knowledge sources. Consistent with the choice of a make strategy, the SMEs in this class are most likely to already conduct R&D themselves. As a result, this class has a large share of SMEs that introduced more than three innovations on the market.

Class 3, *Allying SMEs*: This class has a strong preference for the ally strategy and against buy. Consistent with this, they prefer a first-mover advantage and like to take small risks. They prefer a shorter development time over a longer one, which is consistent with their preference to be a first mover. In line with other classes,

[3] To further check how experimental condition influenced our results, we also specified a model in which experimental condition is used to predict the exact ranking of an alternative. This model gave similar results as the model presented here. It had a higher BIC, but no additional explanatory value. For these reasons, we choose not to present the model here.

Table 2
Latent class model. Wald $\chi 2$ indicates attribute importance, Wald $\chi 2$ (=) indicates attribute differences between classes. *p < 0.05, **p < 0.01, ***p < 0.001.

Attribute	Wald $\chi 2$	Sig.	Wald $\chi 2$ (=)	Sig.	Level	β class 1	Sig.	β class 2	Sig.	β class 3	Sig.	β class 4	Sig.
Knowledge acquisition strategy	53.66	***	30.59	***	Make	−8.08	**	16.93	***	−1.61		0.75	***
					Buy	3.95	**	−17.61	***	−8.16	***	−0.15	
					Ally	4.12	**	0.68		9.77	***	−0.60	***
Speed to market	76.85	***	76.40	***	First mover	−0.33	***	0.03		2.23	***	0.23	
					Second mover	0.33	***	−0.03		−2.23	***	−0.23	
Risk	133.85	***	79.15	***	Small	0.82	***	0.13		2.24	***	−0.05	
					Large	−0.82	***	−0.13		−2.24	***	0.05	
Development time	32.38	***	30.20	***	Short	0.00		−0.12		0.85	***	0.51	**
					Long	0.00		0.12		−0.85	***	−0.51	**
Knowledge source	96.24	***	63.71	***	Buyer	0.16		−0.26		0.28		0.15	
					Competing firm	−0.80	***	0.08		−0.93	**	0.04	
					Private research institute	−0.23		0.22		0.62	*	−0.46	*
					Noncompeting firm	0.77	***	0.44	**	1.30	***	−0.27	
					Supplier	0.17		0.11		−0.43		0.33	*
					University or public research institute	−0.08		−0.59	**	−0.84	*	0.22	
IP	86.06	***	76.48	***	No IP	−0.16		−0.20		0.35		0.18	
					Full ownership	0.01		0.96	***	1.53	***	−0.33	*
					License IP	0.15		−0.38	**	−1.54	***	0.25	
					Shared IP	0.00		−0.38	**	−0.35		−0.10	
Network	48.37	***	42.87	***	None	−0.14		−0.10		0.96	**	−0.36	
					Business	0.38	**	0.19		−1.82	***	0.39	
					Scientific	−0.23		0.10		−0.31		−0.05	
					Scientific & business	−0.01		−0.19		1.18	***	0.01	
Office & specialized equipment	49.10	***	46.02	***	None	0.00		0.22		−0.17		−0.50	**
					Office	0.34	**	0.12		−0.40		0.07	
					Specialized equipment	0.02		−0.30	*	0.93	***	−0.24	
					Office & specialized equipment	−0.36	**	−0.04		−0.36		0.66	***
Training & coaching	49.91	***	40.57	***	None	0.33	**	−0.25	*	−0.97	**	−0.20	
					Training	−0.28	*	0.16		1.43	***	−0.19	
					Coach	0.12		0.32	*	−0.26		0.47	**
					Training & coach	−0.17		−0.22		−0.21		−0.09	
Funding model	207.07	***	181.68	***	Own investment	0.71	***	3.02	***	0.66	*	−0.27	
					Family & friends	−0.84	***	0.09		0.90	*	−0.06	
					Investor	0.44	**	−0.47	**	0.43		−0.19	
					Loan (bank)	0.37		−1.16	***	−2.06	***	−0.42	**
					Crowd funding	−0.77	***	−0.97	***	−2.51	***	0.72	***
					Subsidy (government)	0.09		−0.51	**	2.59	***	0.22	
Task position	48.75	***	35.45	***	Left	0.06		0.21	*	0.29		0.63	***
					Middle	0.06		−0.14		−0.13		0.77	***
					Right	−0.12		−0.08		−0.16		−1.40	***
Intercept	9.50	*				−0.19		0.35	**	−0.10		−0.06	
Label	34.54	***			Labeled	−0.66	***	−0.12		−0.04		0.83	***
					Unlabeled	0.66	***	0.12		0.04		−0.83	***
Country	5.55				UK	−0.09		0.24	*	−0.13		−0.03	
					Germany	0.09		−0.24	*	0.13		0.03	
N (Class)						102		121		92		112	
McFadden R2	0.27												
Number of parameters	126												
Log-likelihood (LL)	−5890.9201												
BIC (based on LL)	12545.00												

noncompeting firms are preferred knowledge sources. In addition, private research institutions are preferred, while competitors and universities are least preferred. If possible, this class wants to have full IP ownership. Consistent with their aversion against the buy strategy, SMEs in this class do not want to license IP. The network preferences for this class are difficult to interpret. SMEs prefer either a network that consists of scientists and businesses or no network at all, which indicates that only integrated networks are of added value to class 3. This preference seems inconsistent with the preference for allying and the aversion against using universities as a knowledge source. Further, access to specialized equipment and collective training can positively influence the choice of an MBA strategy. The most attractive funding model is government subsidies; as many subsidy instruments aim to promote the ally strategy, this finding is expected. Alternative finance models are family and friends or own investment. Loans from banks and crowdfunding are deemed unlikely. In line with the MBA strategy choice, these SMEs have allied in the past, mostly with noncompeting firms and customers. Many SMEs in this class hold no patents and have brought about three new products to the market. Finally, this class contains the largest firms in our sample but few medium-sized ones.

Class 4, *Flexible SMEs*: This class has the least pronounced preference for an MBA strategy. There is a slight preference for make strategy R&D and a small aversion against ally. Members prefer a short development time over a long one. Suppliers are the most preferred knowledge source, while private research institutions are least preferred. This group is not interested in gaining full IP, although the differences between estimators are modest here as well. When it comes to resource endowments, class 4 attaches a lot of value to office and specialized equipment and individual coaching. Moreover, this class is the only one that finds crowdfunding the most interesting funding model, while loans from a bank are least valued. Table 3 shows that consistent with their MBA strategy choice these SMEs allied less in the past, but they did acquire knowledge from customers

Table 3
Ranking of preferred MBA strategies per latent class and attributes levels that can change MBA strategies. +: Attribute increases utility; −: Attribute decreases utility.

	Class 1 – *externally oriented SMEs*	Class 2 – *make SMEs*	Class 3 – *allying SMEs*	Class 4 – *flexible SMEs*
Preferred MBA strategies	- Ally - Buy	- Make	- Ally	- Make - Ally - Buy
Attribute levels that can change preferred MBA strategies	- Second mover (+) - Low risk (+) - Ally with competing firm (−) - Ally with non-competing firm (+) - Business network (+) - Office (+) - Office & specialized equipment (−) - Training nor coaching (+) - Training (−) - Own investment (+) - Family & friends (−) Investor (+) Crowdfunding (−)	*A change in attribute levels does not change the preferred MBA*	*A change in attribute levels does not change the preferred MBA*	- Short development time (+) - Ally with private research institute (−) - Ally with supplier (+) - Full IP ownership (−) - Office nor specialized equipment (−) - Office & specialized equipment (+) - Coach (+) - Loan (bank) (−) - Crowdfunding (+)

using a buy strategy. SMEs in this class do conduct R&D themselves, and a large share of class members have more than 10 patents. A large share has introduced only one new product to the market.

For all classes, the preferences for attributes within the classes are mostly consistent with each other. Moreover, there is also consistency with the associated SME characteristics. The choice of a strategy is related to past behavior. SMEs, thus, seem to wish to exploit routines they developed in the past for a future MBA strategy. Only SMEs in class 4 are willing or able to break with their existing pattern.

Based on these results, it is possible to estimate whether the resource endowments can bring about a change in MBA strategy. This is the case when the difference between two MBA strategy estimators

Table 4
Multinomial logit model. *: $p < 0.05$, **: $p < 0.01$, ***: $p < 0.001$. a: $p < 0.1$.

SME characteristic	Wald $\chi 2$	Sig.	Category	β class 1	Sig.	β class 2	Sig.	β class 3	Sig.	β class 4	Sig.
Intercept	12.12	**		1.48	**	−0.55		−1.28	*	0.35	
Past use of MBA strategy: suppliers	16.41	*	Buy	−0.17		0.14		−0.05		0.08	
			Ally	0.41	**	−0.01		0.09		−0.49	***
			Not used	−0.25		−0.13		−0.04		0.42	*
Past use of MBA strategy: competing firm	14.50	*	Buy	0.68	*	0.22		−0.92		0.01	
			Ally	−0.23		−0.41	*	0.48		0.15	
			Not used	−0.46	*	0.18		0.44		−0.16	
Past use of MBA strategy: noncompeting firm	14.21	*	Buy	0.34		0.43		−0.55		−0.23	
			Ally	−0.26		−0.48	*	0.50	a	0.23	
			Not used	−0.08		0.04		0.04		0.00	
Past use of MBA strategy: customers	11.27	a	Buy	0.05		0.01		−0.61		0.55	*
			Ally	−0.09		0.14		0.43	a	−0.48	**
			Not used	0.03		−0.14		0.17		−0.07	
Past use of MBA strategy: Universities & public knowledge institutes	8.71		Buy	0.17		−0.47		0.17		0.12	
			Ally	−0.01		−0.09		0.10		0.00	
			Not used	−0.16		0.56	**	−0.27		−0.13	
Past use of MBA strategy: Private knowledge institutes	6.88		Buy	0.23		−0.11		0.05		−0.17	
			Ally	−0.28		0.31		−0.23		0.20	
			Not used	0.05		−0.20		0.18		−0.03	
R&D	16.61	***	Yes	−0.80	***	0.40	*	0.07		0.33	a
Patent stock	20.07	*	0	0.21		−0.23		0.51	*	−0.49	**
			1–2	0.16		0.32		−0.42		−0.06	
			3–10	0.52	*	−0.53	a	−0.04		0.04	
			>10	−0.90	*	0.44		−0.05		0.51	
Product innovations	20.31	a	0	−0.11		0.12		0.10		−0.11	
			1	−0.06		−0.31	a	0.02		0.35	*
			2	−0.35		0.36	a	−0.27		0.27	
			3	0.37		−0.60	*	0.50	*	−0.27	
			>3	0.15		0.42	a	−0.35		−0.23	
Size	24.13	**	Micro	−0.27		0.31		−0.12		0.08	
			Small	0.47		−0.08		0.04		−0.43	a
			Medium	0.62	a	−0.04		−0.91	**	0.33	
			Medium–large	−0.82		−0.20		0.99	a	0.03	
McFadden R2	0.15										
Number of parameters	72										
Log-likelihood (LL)	−502.21										
BIC (based on LL)	1440.51										

(βs) in a class is smaller than the sum of estimators from a set of resource endowments. Table 3 shows which attributes can help to bring about a change in MBA strategy in which class. For example, in class 1 the difference in estimators between buy and ally is 0.17. This means that giving access to an office ($\beta = 0.34$) can change the most likely strategy from ally to buy. In addition, in class 4 the difference in MBA strategy estimators is small enough ($\beta = 1.35$); a combination of giving access to an office and specialized equipment ($\beta = 0.66$), coach ($\beta = 0.47$) and crowdfunding ($\beta = 0.72$) can shift the focus from make to ally in this class. In the other classes, the differences in MBA strategy estimators are too large to bring about a change in MBA strategy, which implies that the developed knowledge acquisition routines are too strong to be changed.

5. Discussion and conclusions

The aim of this study was to compare the influence of attributes of an innovation project on the choice of a make, buy or ally strategy for different latent classes of SMEs. We identified nine attributes using arguments from the RBV. Empirically, we conducted a DCE on a sample of 427 SMEs from the United Kingdom and Germany. We identified four latent classes with distinct choice profiles: 1) externally oriented SMEs, 2) make SMEs, 3) allying SMEs and 4) flexible SMEs. The most important attribute to predict these classes was the MBA strategy label.

5.1. Theoretical implications

This brings us back to the original gaps in research. First, theoretically our exploration of heterogeneity among SME contributes to the RBV literature. The identification of externally oriented SMEs (class 1) and allying SMEs (class 3) confirms the growing awareness among scholars that resources outside the SME are important for explaining the choice of MBA strategy. The behavior of make SMEs (class 2) fits with the early version of the RBV that did not conceive the firm as having an external orientation. For the RBV, this means that both versions of the theory can be valid and are empirically observed, but it depends on the group of SMEs. However, the reliance on external resources is applicable to a larger group than those that rely on internal resources. The higher propensity of externally oriented SMEs (class 1) and flexible SMEs (class 4) to change their strategy due to resource benefits is consistent with our argument that the resource benefits of a transaction are important in the choice for MBA for about half of the SMEs.

Second, in contrast to previous studies, we analyzed choices at the project level, rather than the firm level. As the choices appear to be stable, the findings lend credibility to studies that investigated this topic at the firm level using conventional survey data. This is consistent with RBV arguments about the absence of dynamic capabilities (Teece et al., 1997; Becker, 2004), and the limited mobility of resources (Wernerfelt, 1984; Barney, 2001) and in line with the findings of Borah and Tellis (2014) who empirically observed that most firms favor one MBA strategy. Our study, however, adds that for almost half the SMEs (externally oriented SMEs and allying SMEs), the attributes of the project matter for the MBA choice. This finding supports claims about the importance of innovation projects as the level of analysis (Bonesso et al., 2011; Felin and Zenger, 2014).

Third, taking into account unobserved heterogeneity based on choice patterns allowed us to greatly improve understanding of SME choice for an MBA strategy. To that end, this study is one of the first to use DCEs and latent class to understand these types of organizational decisions. The experimental design used ensures that our results are internally valid. Thus, we are able to claim that a change in attribute levels is causally related to choice, without confounding influences or common method bias. This is an improvement over traditional survey data, and a methodological contribution to the literature.

5.2. Limitations

Despite these conditions, this study also suffers from two main limitations. The first question is whether the DCE tasks sufficiently reflected an actual choice situation made by SMEs for the choice to be a valid indicator. It is possible that certain relevant attributes were omitted, such as the radicalness of the innovation, the complexity of the project or the tacitness of the knowledge. If we missed such an attribute, then this means that the pseudo-R^2 of the model is lower. However, our preliminary interviews did not indicate that relevant attributes are missing, and the pseudo-R^2 is good according to the standards for DCEs (Hensher et al., 2005). Another precaution we took to make the tasks more realistic was to use labeled and unlabeled experimental conditions. We fixed certain attribute levels to the label that indicated the MBA strategy, but situations are conceivable in which this does not need to be the case. However, to make the task comprehensible for the respondents, we chose to tie the attribute levels to the MBA strategy anyway. By pooling the observations from the labeled and unlabeled conditions in one model, and controlling for the experimental condition, we obtained estimates for all attributes. We explored different possible solutions that all gave similar results. In this paper, we presented the model that gave statistically the best fit with the highest pseudo-R^2. The best way to test the validity of our model would be to collect behavioral data about the choice of MBA strategy, while measuring all attribute levels. However, collecting such data at the project level in a way that it includes all attributes is impossible. Our results are consistent with the past behaviors that were reported by the respondents and findings from other studies at the firm level. This is strong evidence that our data are valid.

Second, our sample includes SMEs from the UK and Germany only. Therefore, the extent to which the results are applicable to large firms remains untested. McKelvey et al. (2015) show that large and small firms benefit differently from research collaboration. Van Rijnsoever et al. (2012) warn that results from DCEs for large firms may be less reliable, because large firms suffer more from inertia and are thus less likely to follow up on behavioral intentions.

5.3. Practical recommendations

To promote innovation, policy makers often aim to stimulate the collaboration between SMEs and other actors (Klein Woolthuis et al., 2005; Van Rijnsoever et al., 2015). This can be done by using various policy instruments that focus on resource benefits. The most prominent examples are building science parks to promote knowledge spillovers with universities (Quintas et al., 1992), granting subsidies to collaborative innovation projects (Faber et al., 2016), or incubators to gain business knowledge and network contacts (Bruneel et al., 2012). Based on our results, we discuss potentially effective policies for each class.

Policy makers and managers should first realize that not all SMEs are attractive collaboration partners. Externally oriented SMEs (class 1) prefer the ally strategy, but their R&D activities and patent stock suggest that their knowledge base is limited. Moreover, because they prefer to be second movers, it is unlikely that this class will bring groundbreaking innovations to market. SMEs in this class are thus less interesting collaboration partners for innovation. Make SMEs (class 2) are innovative and potentially interesting collaboration partners, as they bring many product innovations to the market. However, given their strong preference for a make strategy, it is very unlikely that this class will open up their innovation process. Thus, there is little need to develop policies to promote the ally strategy for these two classes of SMEs.

Allying SMEs (class 3) already collaborate with other parties, primarily with noncompeting firms and customers, while universities are deemed unattractive. One could argue that this class needs little policy support. However, innovation subsidies that promote the ally strategy can be useful for this class as they help overcome the barriers for collaboration with universities. Moreover, as other classes have little interest in

innovation subsidies from the government, R&D subsidies can promote university–industry interaction for around a quarter of SMEs.

Flexible SMEs (class 4) are the only class for which policies that aim to promote the alliance strategy are effective. This class is also comprised of attractive collaboration partners, because they have a large share of patents and invests in R&D. Our results suggest that this class can best be seduced to ally with suppliers for projects with a short development time by a combination of office space with specialized equipment, a business coach and crowdfunding. The resource benefits fit with the idea of incubators that provide such resources for starting businesses and that can help make crowdfunding successful. Therefore, we suggest that policy makers experiment with expanding business support to existing SMEs as well.

Overall, measures for stimulating SMEs' ally strategies with other parties can seduce a substantial part of the population. However, policy makers should be aware that a significant number of SMEs are already collaborating, and these SMEs might benefit from policy measures without changing their behavior. We further advise policy makers to proceed with care when trying to promote the ally strategy. Researchers have also shown the downsides of too much collaboration. It can have a negative effect on firm performance (Laursen and Salter, 2006) and can reduce the technological diversity needed to sustain a technological path in the future (Van Rijnsoever et al., 2015). Therefore, we advise policy makers to keep this in mind while developing their policy measures.

5.4. Future research

This research opens up a number of avenues for further research. First, we based our analysis on nine attributes and the label with the strategy. Even though this led to a satisfactory model, future research should test whether other attributes, such as the radicalness of the innovation, the complexity of the project or the tacitness of the knowledge, affect the MBA strategy. These attributes can be derived from the RBV but also from other frameworks. Second, we did not relate predicted class membership to measures of firm performance. We did not do so, because performance measures are sector specific and often uncorrelated with each other (Richard et al., 2009). Thus, we recommend future research explore the MBA choice more for SMEs in specific sectors using various performance measures. Third, it is possible that the institutional conditions in a country influence the choice of an MBA strategy. For example, in coordinated market economies (Hall and Soskice, 2001), there might be more consultations between actors, and thus more alliances than in liberal market economies. We did not find any evidence for this in our study, but it is possible that other institutions influence the choice of an MBA strategy. Fourth, the DCE method has shown its usefulness and elegance for this type of decision. We encourage scholars to apply this DCE method to other strategic decisions in organizations, such as the balance between exploration and exploitation or the trade-off between corporate social responsible behavior and profitability.

Finally, the DCE method gives researchers and policy makers the opportunity to experiment with novel policy instruments, when real-world data are lacking. Pre-testing a proposed policy with a DCE can give useful insights into the potential effectiveness of novel policy instruments. However, DCEs elicit only stated preference data. Despite favorable evidence from consumers and individuals, and the fact that our results are theoretically plausible, how these findings translate into actual behavior remains unknown. More research is needed. We recommend policy makers and researchers use this space for experimentation and test whether the theoretical effects are also translated into behavior.

Acknowledgements

The authors would like to thank Eva Niesten and Koen Frenken for their constructive comments. This research was supported financially by the European Climate-KIC initiative (www.Climate-KIC.org) and a Veni grant from the Netherlands Organization for Scientific Research (451-12-029) (NWO).

Appendix A. The explanation of the MBA strategy and the attributes

Strategy	*Explanation*
Make (Internal R&D in the questionnaire)	*(Creative) work undertaken within your enterprise* to increase the stock of knowledge and its use to devise new and improved products and processes (including software development). Research and Development (R&D) is an example of internal knowledge creation. *Advantages of internal R&D:* *1) First mover advantage* *2) Full IP ownership* *Disadvantages of internal R&D:* *1) High risk* *2) Long development time*
Buy	*Copy, purchase or license know-how, patents and nonpatented inventions from other organizations.* Think of advanced machinery, equipment and computer hardware or software you buy from other organizations to devise new or significantly improved products and processes. *Apart from the possible sale, no interaction* between you and the other organization takes place. *Advantages of buy:* *1) Low risk* *2) Short development time* *Disadvantages of buy:* *1) Second mover* *2) IP ownership needs to be negotiated*
Ally (Collaboration in the questionnaire)	*(Creative) work undertaken between your enterprise and other organizations* to increase the stock of knowledge and its use to devise new and improved products and processes (including software development). Your enterprise and other organizations interact frequently in this joint project. Not all partners need to commercially benefit from this collaboration. Think of partnerships, alliances, collaborative projects and so on. *Advantages of collaboration:* *1) Shared first mover advantage* *2) Low risk* *Disadvantages of collaboration:* *1) Long development time* *2) IP ownership needs to be negotiated*

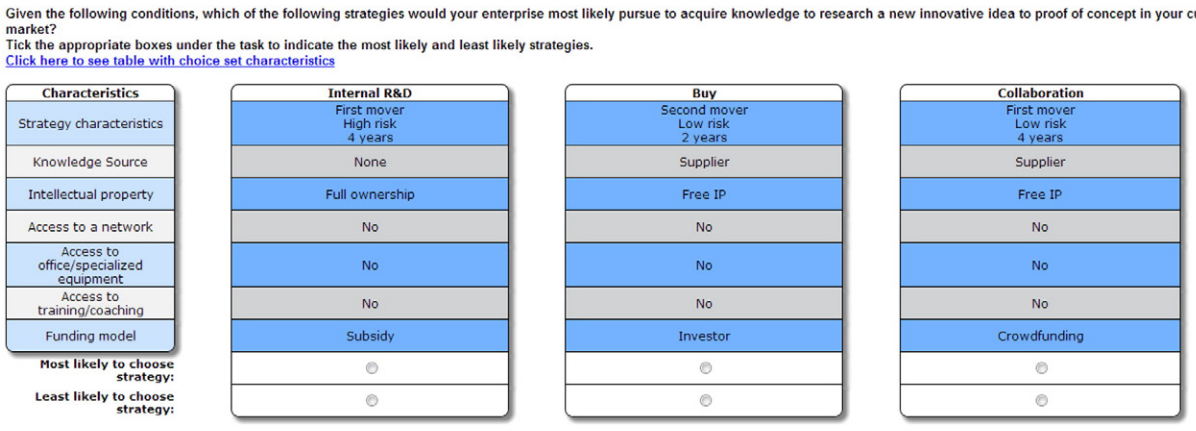
Characteristic	Explanation	Level
Speed to market	Are you ahead of your competitors?	1. *First mover*: your product is the first on the market 2. *Second mover*: other firms have a similar product on the market

(*continued*)

Characteristic	Explanation	Level
Risk	The likeliness the project will fail, does not yield the expected results in the end.	1. *Low risk*: more than 50% chance the project will yield the expected results 2. *High risk*: less than 50% chance the project will yield the expected results
Development time	The timescale of the project.	1. *Short time*: the development time is two times as fast as normal 2. *Long time*: the development time is normal
Knowledge source	Where do you get the knowledge to develop your idea to a proof of concept from?	1. *None*: no external knowledge source is present You only use the knowledge available within your company 2. *Supplier*: supplier of equipment, materials, components or software 3. *Competing firm*: competing firm inside your sector 4. *Noncompeting firm*: noncompeting firm outside your sector 5. *Buyer*: prospective customer or user of your product 6. *University or public research institute*: university, other higher education institutes or public research institutes 7. *Private research institute*: research organization that primarily conducts applied contract research, such as Frauenhofer or a commercial laboratory
Your intellectual property (IP)	How is your IP ownership arranged?	1. *Free IP*: no patents are available for this product 2. *Shared IP*: patents are shared with knowledge source 3. *License IP*: patents are licensed from knowledge source 4. *Full ownership*: all patents are available to your firm
Access to a network	Access to new contacts you gain by choosing a specific strategy with other partners.	1. *No*: no access available 2. *Scientific*: access to a scientific network 3. *Business*: access to a business/market network 4. *Scientific & Business*: access to both a scientific and a business/market network
Access to office/specialized equipment	Free access to an office and/or specialized equipment (e.g. laboratory, field test facilities).	1. *No*: no access available 2. *Office*: access to an office 3. *Specialized equipment*: access to specialized equipment 4. *Office & Specialized equipment*: access to an office and specialized equipment
Access to training/Coach	Free access to a coach and/or training such as master classes and workshops. Coaching includes advisory boards, mentors and other coaches.	1. *No*: no access available 2. *Coach*: access to a coach 3. *Training*: access to master classes, workshops and other training programmes 4. *Coach & Training*: access to a coach, master classes, workshops and other training programs
Funding model	The way the project is financed.	1. *Subsidy*: subsidy from government 2. *Loan:* loan from a bank 3. *Crowd funding*: use the Internet to find individuals that want to invest a small amount of money in your idea. 4. *Investor*: investor[a] takes a minority stake in your company 5. *Family & Friends*: family and/or friends invest in your company 6. *Own investment*: usage of own assets

[a] Investor can be an external investor (e.g. venture capital or angel investor) as well as the organizations in the knowledge source.

Appendix B. Example choice task



References

Adamowicz, W., Louviere, J., Williams, M., 1994. Combining revealed and stated preference methods for valuing environmental amenities. J. Environ. Econ. Manag. 26, 271–292.

Adler, P.S., Kwon, S.-W., 2002. Social capital: prospects for a new concept. Acad. Manag. Rev. 27, 17–40.

Aguinis, H., Bradley, K.J., 2014. Best practice recommendations for designing and implementing experimental vignette methodology studies. Organ. Res. Methods 17, 351–371.

Amit, R., Schoemaker, P.P.J.H., 1993. Strategic assets and organizational rent. Strateg. Manag. J. 14, 33–46.

Antonioli, D., Marzucchi, A., Savona, M., 2016. Pain shared, pain halved? Cooperation as a coping strategy for innovation barriers. J. Technol. Transf. 1–24.

Ardito, L., Messeni Petruzzelli, A., Albino, V., 2015. From technological inventions to new products: a systematic review and research agenda of the main enabling factors. Eur. Manag. Rev. 12, 113–147.

Argote, L., Epple, D., 1990. Learning curves in manufacturing. Science 247, 920–924.

Baltas, G., Doyle, P., 2001. Random utility models in marketing research: a survey. J. Bus. Res. 51, 115–125.

Bandura, A., 1977. Social Learning Theory. Prentice Hall, Englewood Cliffs, N.J.

Barajas, A., Huergo, E., Moreno, L., 2012. Measuring the economic impact of research joint ventures supported by the EU Framework Programme. J. Technol. Transf. 37, 917–942.

Barney, J.B., 1991. Firm resources and sustained competitive advantage. J. Manag. 17, 99–120.

Barney, J.B., 2001. Resource-based theories of competitive advantage: a ten-year retrospective on the resource-based view. J. Manag. 27, 643–650.

Bech, M., Gyrd-Hansen, D., 2005. Effects coding in discrete choice experiments. Health Econ. 14, 1079–1083.

Becker, M.C., 2004. Organizational routines: a review of the literature. Ind. Corp. Chang. 13, 643–677.

Ben-Akiva, M., Morikawa, T., Shiroishi, F., 1991. Analysis of the reliability of preference ranking data. J. Bus. Res. 23, 253–268.

Ben-Akiva, M., Bradley, M., Morikawa, T., Benjamin, J., Novak, T., Oppewal, H., Rao, V., 1994. Combining revealed and stated preferences data. Mark. Lett. 5, 335–349.

Betsch, T., Haberstroh, S., Molter, B., Glockner, A., 2004. Oops, I did it again - relapse errors in routinized decision making. Organ. Behav. Hum. Decis. Process. 93, 62–74.

Bloom, M., Milkovich, G.T., 1998. Relationships among risk, incentive pay, and organizational performance. Acad. Manag. J. 41, 283–297.

Bonesso, S., Comacchio, A., Pizzi, C., 2011. Technology sourcing decisions in exploratory projects. Technovation 31, 573–585.

Boon, W.P.C., Chappin, M.M.H., Perenboom, J., 2014. Balancing divergence and convergence in transdisciplinary research teams. Environ. Sci. Pol. 40, 57–68.

Borah, A., Tellis, G.J., 2014. Make, buy, or ally? Choice of and payoff from announcements of alternate strategies for innovations. Mark. Sci. 33, 114–133.

Boudreau, K.J., 2012. Let a thousand flowers bloom? An early look at large numbers of software app developers and patterns of innovation. Organ. Sci. 23, 1409–1427.

Braga, C.A.P., Fink, C., Sepulveda, C.P., 2000. Intellectual Property Rights and Economic Development. World Bank Publications.

Bruneel, J., Ratinho, T., Clarysse, B., Groen, A., 2012. The evolution of business incubators: comparing demand and supply of business incubation services across different incubator generations. Technovation 32, 110–121.

Carbonara, N., 2004. Innovation processes within geographical clusters: a cognitive approach. Technovation 24, 17–28.

Carlsson, S., Corvello, V., Inauen, M., Schenker-Wicki, A., 2011. The impact of outside-in open innovation on innovation performance. Eur. J. Innov. Manag. 14, 496–520.

Cassiman, B., Veugelers, R., 2006. In search of complementarity in innovation strategy: internal R\&D and external knowledge acquisition. Manag. Sci. 52, 68–82.

Chan, K.F., Lau, T., 2005. Assessing technology incubator programs in the science park: the good, the bad and the ugly. Technovation 25, 1215–1228.

Chesbrough, H.W., 2003. Open Innovation: The New Imperative for Creating and Profiting from Technology. Harvard Business School Press, Boston, MA.

Cohen, W.M., Levinthal, D.A., 1990. Absorptive capacity: a new perspective on learning and innovation. Adm. Sci. Q. 35, 128–152.

Cohen, W.M., Nelson, R.R., Walsh, J.P., 2000. Protecting their Intellectual Assets: Appropriability Conditions and Why US Manufacturing Firms Patent (Or Not). National Bureau of Economic Research.

Conner, K.R., Prahalad, C.K., 1996. A resource-based theory of the firm: knowledge versus opportunism. Organ. Sci. 7, 477–501.

Crook, T.R., Combs, J.G., Ketchen, D.J., Aguinis, H., 2013. Organizing around transaction costs: what have we learned and where do we go from here? Acad. Manag. Perspect. 27, 63–79.

Cyert, R.M., March, J.G., 1963. A Behavioral Theory of the Firm Prenctice-Hall International Series in Management. Prentice-Hall, Englewood Cliffs, New Jersey.

David, P.A., 1993. Intellectual property institutions and the panda's thumb: patents, copyrights, and trade secrets in economic theory and history. Global Dimensions of Intellectual Property Rights in Science and Technology. 19, p. 29.

Davidsson, P., Honig, B., 2003. The role of social and human capital among nascent entrepreneurs. J. Bus. Ventur. 18, 301–331.

De Bekker-Grob, E.W., Hol, L., Donkers, B., Van Dam, L., Habbema, J.D.F., Van Leerdam, M.E., Kuipers, E.J., Essink-Bot, M.-L., Steyerberg, E.W., 2010. Labeled versus unlabeled discrete choice experiments in health economics: an application to colorectal cancer screening. Value Health 13, 315–323.

Del Canto, J.G., Gonzalez, I.S., 1999. A resource-based analysis of the factors determining a firm's R&D activities. Res. Policy 28, 891–905.

Eisenhardt, K.M., Schoonhoven, C.B., 1996. Resource-based view of strategic alliance formation: strategic and social effects in entrepreneurial firms. Organ. Sci. 7, 136–150.

Epple, D., Argote, L., Devadas, R., 1991. Organizational learning curves: a method for investigating intra-plant transfer of knowledge acquired through learning by doing. Organ. Sci. 2, 58–70.

Etzkowitz, H., Leydesdorff, L., 2000. The dynamics of innovation: from national systems and "mode 2" to a triple helix of university-industry-government relations. Res. Policy 29, 109–123.

Eurostat, 2009. Aggregations of Manufacturing Based on NACE Rev 2.

Eurostat, 2013. Economic statistics on high-tech industries and Knowledge Intensive Services at the national level (from 2008 onwards, NACE Rev. 2) [WWW Document]. URL. http://appsso.eurostat.ec.europa.eu/nui/show.do?dataset=htec_eco_sbs2&lang=en.

Faber, J., van Dijk, J., van Rijnsoever, F., 2016. Incentives and barriers for R&D-based SMEs to participate in European research programs: an empirical assessment for the Netherlands. Sci. Public Policy 43 (3), 414–428.

Felin, T., Zenger, T.R., 2014. Closed or open innovation? Problem solving and the governance choice. Res. Policy 43, 914–925.

Fey, C.F., Birkinshaw, J., 2005. External sources of knowledge, governance mode, and R&D performance. J. Manag. 31, 597–621.

Flynn, T.N., Louviere, J.J., Peters, T.J., Coast, J., 2007. Best–worst scaling: what it can do for health care research and how to do it. J. Health Econ. 26, 171–189.

Geyskens, I., Steenkamp, J.-B.E.M., Kumar, N., 2006. Make, buy, or ally: a transaction cost theory meta-analysis. Acad. Manag. J. 49, 519–543.

Granovetter, M.S., 1973. The strength of weak ties. Am. J. Sociol. 1360–1380.

Grant, R.M., 1996. Toward a knowledge-based theory of the firm. Strateg. Manag. J. 17, 109–122.

Grant, R.M., Baden-Fuller, C., 2004. A knowledge accessing theory of strategic alliances. J. Manag. Stud. 41, 61–84.

Greene, W.H., Hensher, D.A., 2003. A latent class model for discrete choice analysis: contrasts with mixed logit. Transp. Res. B Methodol. 37, 681–698.

Greve, H.R., 1998. Performance, aspirations, and risky organizational change. Adm. Sci. Q. 43, 58–86.

Greve, H.R., 2003. Organizational Learning From Performance Feedback - A Behavioral Perspective on Innovation and Change. Cambridge University Press, Cambridge.

Gupta, A.K., Tesluk, P.E., Taylor, M.S., 2007. Innovation at and across multiple levels of analysis. Organ. Sci. 18, 885–897.

Hagedoorn, J., 2003. Sharing intellectual property rights—an exploratory study of joint patenting amongst companies. Ind. Corp. Chang. 12, 1035–1050.

Hall, B.H., 2002. The financing of research and development. Oxf. Rev. Econ. Policy 18, 35–51.

Hall, P.A., Soskice, D.W., 2001. Varieties of Capitalism: The Institutional Foundations of Comparative Advantage. Wiley Online Library.

Hannan, M.T., Freeman, J.H., 1984. Structural inertia and organisational change. Am. Sociol. Rev. 49, 149–164.

Haughton, D., Legrand, P., Woolford, S., 2009. Review of three latent class cluster analysis packages: latent gold, poLCA, and MCLUST. Am. Stat. 63, 81–91.

Hellmann, T., 1998. The allocation of control rights in venture capital contracts. RAND J. Econ. 29, 57–76.

Hensher, D.A., Rose, J.D., Greene, W.H., 2005. Applied Choice Analysis: A Primer. Cambridge University Press, Cambridge.

Hisrich, R.D., Smilor, R.W., 1988. The university and business incubation: technology transfer through entrepreneurial development. J. Technol. Transf. 13, 14–19.

Hitt, M.A., Biermant, L., Shimizu, K., Kochhar, R., 2001. Direct and moderating effects of human capital on strategy and performance in professional service firms: a resource-based perspective. Acad. Manag. J. 44, 13–28.

Hoppe, H.C., 2000. Second-mover advantages in the strategic adoption of new technology under uncertainty. Int. J. Ind. Organ. 18, 315–338.

Huber, G.P., 1991. Organizational learning; the contributing processes and the literatures. Organ. Sci. 2, 88–115.

Huizingh, E.K.R.E., 2011. Open innovation: state of the art and future perspectives. Technovation 31, 2–9.

Jack, S.L., 2005. The role, use and activation of strong and weak network ties: a qualitative analysis. J. Manag. Stud. 42, 1233–1259.

Kessler, E.H., Bierly, P.E., Gopalakrishnan, S., 2000. Internal vs. external learning in new product development: effects on speed, costs and competitive advantage. R&D Manag. 30, 213–224.

Klein Woolthuis, R., Lankhuizen, M., Gilsing, V., 2005. A system failure framework for innovation policy design. Technovation 25, 609–619.

Kleinknecht, A., Reijnen, J.O.N., 1992. Why do firms cooperate on R&D? An empirical study. Res. Policy 21, 347–360.

Kløjgaard, M.E., Bech, M., Søgaard, R., 2012. Designing a stated choice experiment: the value of a qualitative process. J. Choice Model. 5, 1–18.

Knight, G.A., 2001. Entrepreneurship and strategy in the international SME. J. Int. Manag. 7, 155–171.

Kogut, B., Zander, U., 1992. Knowledge of the firm, combinative capabilities, and the replication of technology. Organ. Sci. 3, 383–397.

Kotha, R., George, G., 2012. Friends, family, or fools: entrepreneur experience and its implications for equity distribution and resource mobilization. J. Bus. Ventur. 27, 525–543.

Kreutzer, M., 2012. Selecting the right growth mechanism: the choice between internal development, strategic alliances, and mergers & acquisitions. Balanced Growth. Springer, pp. 77–94.

Kutzhanova, N., Lyons, T.S., Lichtenstein, G.A., 2009. Skill-based development of entrepreneurs and the role of personal and peer group coaching in enterprise development. Econ. Dev. Q. 23, 193–210.

Laursen, K., Salter, A., 2004. Searching high and low: what types of firms use universities as a source of innovation? Res. Policy 33, 1201–1215.
Laursen, K., Salter, A., 2006. Open for innovation: the role of openness in explaining innovation performance among UK manufacturing firms. Strateg. Manag. J. 27, 131–150.
Lavie, D., 2006. The competitive advantage of interconnected firms: an extension of the resource-based view. Acad. Manag. Rev. 31, 638–658.
Lefebvre, V.M., Raggi, M., Viaggi, D., Sia-Ljungström, C., Minarelli, F., Kühne, B., Gellynck, X., 2014. SMEs' preference for innovation networks: a choice experimental approach. Creat. Innov. Manag. 23 (4), 415–435.
Levitt, B., March, J.J.G., 1988. Organizational learning. Annu. Rev. Sociol. 14, 319–340.
Lieberman, M.B., Montgomery, D.B., 1988. 1St-mover advantages. Strateg. Manag. J. 9, 41–58.
Lin, B.-W., Wu, C.-H., 2010. How does knowledge depth moderate the performance of internal and external knowledge sourcing strategies? Technovation 30, 582–589.
Lin, Z., Yang, H., Arya, B., 2009. Alliance partners and firm performance: resource complementarity and status association. Strateg. Manag. J. 30, 921–940.
Lindelöf, P., Löfsten, H., 2003. Science park location and new technology-based firms in Sweden–implications for strategy and performance. Small Bus. Econ. 20, 245–258.
Loewenstein, G.F., Weber, E.U., Hsee, C.K., Welch, N., 2001. Risk as feelings. Psychol. Bull. 127, 267.
Louviere, J.J., Woodworth, G., 1983. Design and analysis of simulated consumer choice or allocation experiments: an approach based on aggregate data. J. Mark. Res. 20, 350–367.
Love, J.H., Roper, S., 2002. Internal versus external R&D: a study of R&D choice with sample selection. Int. J. Econ. Bus. 9, 239–255.
Magidson, J., Vermunt, J.K., 2007. Removing the scale factor confound in multinomial logit choice models to obtain better estimates of preference. Sawtooth Software Conference, p. 139.
Mangematin, V., Nesta, L., 1999. What kind of knowledge can a firm absorb? Int. J. Technol. Manag. 18, 149–172.
Manski, C.F., 1977. The structure of random utility models. Theor. Decis. 8, 229–254.
March, J.G., 1994. A Primer on Decision Making: How Decisions Happen. Free Press, New York (Toronto: New York).
Masyn, K., 2013. Latent class analysis and finite mixture modeling. In: Little, T. (Ed.), The Oxford Handbook of Quantitative Methods in Psychology. Oxford University Press, Oxford, England, pp. 375–393.
McFadden, D., 1974. Conditional logit analysis of qualitative choice behavior. In: Zarembka, P. (Ed.), Frontiers in Economics. Academic Press, New York, pp. 105–142.
McKelvey, M., Zaring, O., Ljungberg, D., 2015. Creating innovative opportunities through research collaboration: an evolutionary framework and empirical illustration in engineering. Technovation 39–40, 26–36.
Meeus, M.T.H., Oerlemans, L.A.G., Hage, J., 2004. Industry-public knowledge infrastructure interaction: intra- and inter-organizational explanations of interactive learning. Ind. Innov. 11, 327–352.
Mention, A.L., 2011. Co-operation and co-opetition as open innovation practices in the service sector: which influence on innovation novelty? Technovation 31, 44–53.
Mian, S., 1997. Assessing and managing the university technology business incubator: an integrative framework. J. Bus. Ventur. 12, 251–285.
Miotti, L., Sachwald, F., 2003. Co-operative R&D: why and with whom?: an integrated framework of analysis. Res. Policy 32, 1481–1499.
Montgomery, D.B., Lieberman, M.L., 1998. First-mover (dis) advantages: retrospective and link with the resource-based view. Strateg. Manag. J. 19, 1111–1125.
Mudambi, S.M., Tallman, S., 2010. Make, buy or ally? Theoretical perspectives on knowledge process outsourcing through alliances. J. Manag. Stud. 47, 1434–1456.
Nieto, M.J., Santamaría, L., 2007. The importance of diverse collaborative networks for the novelty of product innovation. Technovation 27, 367–377.
Nooteboom, B., Stam, E., 2008. Micro-foundations of Innovation Policy. WRR, Amsterdam University Press, Amsterdam.
Nylund, K.L., Asparouhov, T., Muthén, B.O., 2007. Deciding on the number of classes in latent class analysis and growth mixture modeling: a Monte Carlo simulation study. Struct. Equ. Model. 14, 535–569.
Oppewal, H., Louviere, J.J., Timmermans, H.J.P., 2000. Modifying conjoint methods to model managers' reactions to business environmental trends: An application to modeling retailer reactions to sales trends. J. Bus. Res. 50, 245–257.
Ordanini, A., Miceli, L., Pizzetti, M., Parasuraman, A., 2011. Crowd-funding: transforming customers into investors through innovative service platforms. J. Serv. Manag. 22, 443–470.
Ozer, M., 2007. Reducing the demand uncertainties at the fuzzy-front-end of developing new online services. Res. Policy 36, 1372–1387.
Pisano, G., 2006. Can science be a business? Harv. Bus. Rev. 84, 114.
Podsakoff, P.M., MacKenzie, S.B., Lee, J.Y., Podsakoff, N.P., 2003. Common method biases in behavioral research: a critical review of the literature and recommended remedies. J. Appl. Psychol. 88, 879–903.
Powell, W.W.W., Koput, K.W.K.W., Smith-Doerr, L., 1996. Interorganizational collaboration and the locus of innovation: networks of learning in biotechnology. Adm. Sci. Q. 41, 116–145.
Quintas, P., Wield, D., Massey, D., 1992. Academic-industry links and innovation: questioning the science park model. Technovation 12, 161–175.
Rao, R.S., Chandy, R.K., Prabhu, J.C., 2008. The fruits of legitimacy:why some new ventures gain more from innovation than others. J. Mark. 72, 58–75.
Richard, P.J., Devinney, T.M., Yip, G.S., Johnson, G., 2009. Measuring organizational performance: towards methodological best practice. J. Manag. 35 (3), 718–804.
van Rijnsoever, F.J., Hagen, P., Willems, M., 2013. Preferences for alternative fuel vehicles by Dutch local governments. Transp. Res. Part D: Transp. Environ. 20, 15–20.
Robinson, P.B., Sexton, E.a., 1994. The effect of education and experience on self-employment success. J. Bus. Ventur. 9, 141–156.
Roeder, K., Lynch, K.G., Nagin, D.S., 1999. Modeling uncertainty in latent class membership: a case study in criminology. J. Am. Stat. Assoc. 94, 766–776.
Rosenkopf, L., McGrath, P., 2011. Advancing the conceptualization and operationalization of novelty in organizational research. Organ. Sci. 22, 1297–1311.
Sælensminde, K., 2001. Inconsistent choices in stated choice data. Transportation 28, 269–296.
Sapienza, H.J., Gupta, A.K., 1994. Impact of agency risks and task uncertainty on venture capitalist–CEO interaction. Acad. Manag. J. 37, 1618–1632.
Schilling, M.A.A., Phelps, C.C.C., 2007. Interfirm collaboration networks: the impact of large-scale network structure on firm innovation. Manag. Sci. 53, 1113–1126.
Schwarz, G., 1978. Estimating the dimension of a model. Ann. Stat. 6, 461–464.
Sitkin, S.B., Pablo, A.L., 1992. Reconceptualizing the determinants of risk behavior. Acad. Manag. Rev. 17, 9–38.
Slevin, D.P., 1971. The innovation boundary: a specific model and some emperical results. Adm. Sci. Q. 16, 515–532.
Suarez, F.F., Lanzolla, G., 2007. The role of environmental dynamics in building a first mover advantage theory. Acad. Manag. Rev. 32, 377–392.
Swait, J., Louviere, J., 1993. The role of the scale parameter in the estimation and comparison of multinomial logit models. J. Mark. Res. 305–314.
Teece, D.J., 1986. Profiting from technological innovation: Implications for integration, collaboration, licensing and public policy. Res. Policy 15, 285–305.
Teece, D.J., Pisano, G., Shuen, A., 1997. Dynamic capabilities and strategic management. Strateg. Manag. J. 18, 509–533.
Teirlinck, P., Spithoven, A., 2013. Research collaboration and R&D outsourcing: different R&D personnel requirements in SMEs. Technovation 33, 142–153.
Van Looy, B., Callaert, J., Debackere, K., 2006. Publication and patent behavior of academic researchers: Conflicting, reinforcing or merely co-existing? Res. Policy 35, 596–608.
Van Rijnsoever, F.J., Meeus, M.T.H., Donders, A.R.T., 2012. The effects of economic status and recent experience on innovative behavior under environmental variability: an experimental approach. Res. Policy 41, 833–847.
Van Rijnsoever, F.J., Welle, L., Bakker, S., 2014. Credibility and legitimacy in policy-driven innovation networks: resource dependencies and expectations in Dutch electric vehicle subsidies. J. Technol. Transf. 39, 635–661.
Van Rijnsoever, F.J., Van der Berg, J., Koch, J., Hekkert, M.P., 2015. Smart innovation policy: how network position and project composition affect the diversity of an emerging technology. Res. Policy 44, 1094–1107.
Vermunt, J.K., Magidson, J., 2002. Latent class cluster analysis. In: Hagenaars, J.A., McCutcheon, A.L. (Eds.), Applied Latent Class Analysis. Cambridge University, Cambridge, pp. 89–106.
Verona, G., 1999. A resource-based view of product development. Acad. Manag. Rev. 24, 132–142.
Verspagen, B., 2006. University research, intellectual property rights and European innovation systems. J. Econ. Surv. 20, 607–632.
Verworn, B., 2009. A structural equation model of the impact of the "fuzzy front end" on the success of new product development. Res. Policy 38, 1571–1581.
Veugelers, R., 1997. Internal R & D expenditures and external technology sourcing. Res. Policy 26, 303–315.
Veugelers, R., Cassiman, B., 1999. Make and buy in innovation strategies: evidence from Belgian manufacturing firms. Res. Policy 28, 63–80.
Wernerfelt, B., 1984. A resource-based view of the firm. Strateg. Manag. J. 5, 171–180.
Williamson, O.E., 1998. Transaction cost economics: how it works; where it is headed. De Economist 146, 23–58.
Wright, P.M., Dunford, B.B., Snell, S.A., 2001. Human resources and the resource based view of the firm. J. Manag. 27, 701–721.

Frank van Rijnsoever is an assistant professor at Utrecht University. His research focusses primarily on innovation, entrepreneurship and knowledge utilization. Methodologically, he uses such techniques as discrete choice experiments and social network analysis. He has published in the journals Research Policy, The Journal of Technology Transfer and Science & Public Policy. Frank serves as the academic editor for PLOS ONE and is the program leader of the research master Innovation Sciences at Utrecht University. See, http://www.uu.nl/staff/FJvanRijnsoever/0.

Sander Kempkes completed his bachelor degree in Science and Innovation Management at Utrecht University. He is currently a graduate student studying theoretical physics at the same university.

Maryse Chappin is an assistant professor at Utrecht University. Her research mainly focuses on gaining a better understanding of (the process of) environmental innovation. She studies the success of inter-organizational collaborations in the context of environmental innovation, as well as the collaborations themselves. She has published in the journals Research Policy, Journal of Cleaner Production and Environmental Science & Policy. http://www.uu.nl/staff/MMHChappin/0.