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Finding the balance in university-industry research centres: The use and consequences of firms influencing strategies

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Abstract
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Keywords: University-industry collaboration; Research centres; Research dependency theory; Power imbalance; Mutual dependence; Influencing strategies; Coercive; Noncoercive
“Our challenge is to know how and when we should influence [the research], and when we should not influence!? This is very challenging; the university researchers have their needs, and we have ours” [Firm representative in university-industry research centre].

1. Introduction
University-industry collaboration (UIC)\(^1\) is to an increasing extent looked upon as essential for firms, universities and for the society as a whole (Ankrah and Al-Tabbaa, 2015, Galán-Muros and Plewa, 2016) as it is found to contribute to firm innovations, higher productivity, and economic growth (Cohen et al., 2002, Mansfield, 1991, Mueller, 2006). However, partners likely to provide the most complementary knowledge, are also the most challenging actors for firms to collaborate with (Ratcheva, 2009, Howells et al., 2012). Accordingly, UIC is rather challenging, and often ascribed to university and industry’s contradictions in term of incentive structures and opposing logics between academic publications and industrial commercialization (Bjerregaard, 2010, Perkmann and Walsh, 2007, Galán-Muros and Plewa, 2016). Although these challenges are widely acknowledged, there is lack of knowledge on how to handle these challenges and achieve the desired outcomes (Bruneel et al., 2010, Harryson et al., 2007).

This paper aims to address parts of this gap by exploring one of firms’ greatest challenges, namely how to “steer” or “bend” the collaborative projects towards firms business-objectives (Harryson et al., 2007, Sydow and Windeler, 1998), and the consequences for firms and university partners. In developing its main theoretical argument, this paper draws on resource dependence theory (RDT). RDT is a theory of power and dependence (Pfeffer and Salancik, 2003), and provides insights into how organisations depend on other organisations for the provision of vital resources, and that this dependence often is reciprocal (Drees and Heugens, 2013). One of the core ideas of RDT is that organizations take actions to manage their interdependencies to enhance their autonomy and pursue their interests’ (Davis and Cobb, 2010, Pfeffer, 1987). Paradoxically, limited insights have been provided regarding how organizations actually impose their interest on others in organizational research. This comprise both the literature on RDT (Wry et al., 2013, Pfeffer and Salancik, 2003), inter-organizational collaboration (Gulati et al., 2012) and UIC (Bruneel et al., 2010, Miller et al., 2016, Estrada et al., 2016). To address these gaps, I apply theory triangulation (Patton, 2015), drawing on, and

\(^{1}\) As Perkmann and Walsh (2007) and Estrada et al. (2016) I use UIC as an umbrella term including all types of ‘public research organizations’ (PROs) that are predominantly government-funded, such as universities, research institutes and research centers.
combining RDT with the literature on influencing strategies, which is prominent in the industrial marketing literature and commonly distinguished into coercive and noncoercive influencing strategies (Hausman and Johnston, 2010, Frazier and Summers, 1986). Hence, I pose the following research question:

*How do industry partners influence the research agenda in university-industry research centres, and what are the consequences?*

The research question is explored through a longitudinal study of five university-industry research centres (UIRCs). These UIRCs are one of the predominant policy responses to stimulate UIC (Ponomariov and Boardman, 2010), and are chosen as cases because their purpose is to create a valuable collaboration with innovations and academic publications, despite of the partners different institutional logics (Lind et al., 2013, Perkmann and Walsh, 2007, Hayton et al., 2013). Moreover, as university partners’ lead the research centres, were the industry partners should be able to influence the research agenda, the UIRCs long-term operation and similar structure, makes them appropriate for longitudinal studies of power-dependence relations.

While the majority of papers on UIC has been cross-sectional (Ankrah and Al-Tabbaa, 2015, Thune and Gulbrandsen, 2014), and the effects of university-industry links are extensively studied, we know much less about *how* UIC develop (Thune and Gulbrandsen, 2014, Perkmann and Walsh, 2007). Accordingly, this longitudinal multiple case study offer three distinct contributions to the literature on RDT, influencing strategies and UIC. First, based on a theoretical review of the literature, I develop a typology suitable for analysing the type of R&D conducted, and how it changes over time, due to changes in partners’ power imbalance and mutual dependence. Thus, it takes into account the challenging and dynamic nature of UIC (Boardman and Gray, 2010, Thune and Gulbrandsen, 2014), extending prior research that take a static approach, mainly presenting different types of R&D (e.g. Stokes, 1997, Carayol, 2003).

Secondly, I operationalize firms influencing strategies in three main themes at the activity level, i.e. in terms of the specific actions taken by firms. While most studies of influencing strategies has focused on partners intentions, rather than their actual behaviour (Hausman and Johnston, 2010), the noncoercive themes labelled “influencing and suggesting research activities in official meetings” and “providing industrial perspectives and data”, and the coercive theme of “forcing change”, provides insights into how firms “steer” or “bend” the research agenda towards their objectives (Harryson et al., 2007, Sydow and Windeler, 1998).

Thirdly, I explore how firms’ influencing strategies’ alters the power imbalance and mutual dependence between university and firm partners, and by employing the typology, I
show which type of R&D that is conducted in the five research centres over time, answering the calls for more research on power relations between university and industry partners (Miller et al., 2016). While most of the previous literature has cited RDT in a ceremonial manner (Wry et al., 2013), and granted limited empirical extending and testing of RDT (Pfeffer and Salancik, 2003), the findings show how firms’ coercive influencing strategies may lead to a large shift in the power imbalance in favour of the firms, and lowering the mutual dependence. As a result, the research agenda becomes much more applied, with research that is more relevant for the single firm, but of less relevance for the industry as a whole, and fewer publications for the university partners. Firms’ noncoercive influencing strategies may result in minor shifts in power imbalance in favour of the industry partners, which may yield a bit more applied research, resulting in research that is more relevant for the industry partners, but still having potential for academic publications.

The paper is structured as follows. The next section present the theoretical framework. Thereafter follows a description of the research methodology and empirical data collection. I then present the empirical case study upon which this paper is based and submit the analysis and discussion. Conclusions and implications regarding firms’ influencing strategies, and power and dependence relations in UIC are proposed in the final section.

2. Theoretical Framework
In this section, I first review how power imbalance and mutual dependence are likely to be present, and affect the type of R&D conducted in UIC. From this, a typology is derived (see Figure 1). Subsequently, I review the literature on influencing strategies.

2.1 Power imbalance and mutual dependence in university-industry collaboration
The fundamental idea in resource dependency theory is that organizations are constrained and affected by their environments and that they are dependent on resources found outside of the firm boundaries (Pfeffer and Salancik, 2003). RDT is based on the premise that all organizations are critically dependent on other organizations for the provision of vital resources, such as finances, information and knowledge, and that the dependence is reciprocal (Drees and Heugens, 2013). Hence, interdependence is a key term in RDT, but has lately been criticized to confound the theoretically separate dimensions of power imbalance and mutual dependence (Drees and Heugens, 2013, Casciaro and Piskorski, 2005). This paper follow this line of thought, and consider the two dimensions simultaneously. Power imbalance captures the
‘power differential between two organisations’, while mutual dependence\(^2\) captures the ‘sum of their dependencies’, and may be balanced or imbalanced (Casciaro and Piskorski, 2005, p. 168).

In UIC, both sides are dependent on the other party, and engage to get access to necessary resources and to generate synergies (Carayol, 2003, Santoro and Chakrabarti, 1999, Lind et al., 2013). Due to increased industry competitiveness, firms are searching to complement their in-house knowledge and develop innovations through external collaboration with universities (Hagedoorn, 2002, Hayton et al., 2010, Chesbrough, 2003). Universities are increasingly dependent on industry partners for external funding as their share of basic funding has decreased (Laudel, 2006, Lee, 2000, Perkmann et al., 2013). However, the desirable output of research activities conducted in UIC are found to differ, where firms often want applied results that could be commercialised and university partners seek to publish academic papers (Perkmann and Walsh, 2007, Galán-Muros and Plewa, 2016)\(^3\).

Therefore, it is reasonable to assume that different variations of the power imbalance and mutual dependence between UIC partners would influence the type of R&D conducted by university-industry research centres. R&D are commonly divided into basic or applied research. Stokes (1997) extended this by conceptualising three quadrants where the considerations for use and fundamental understanding lie in the three axes: pure basic research (ex. Niels Bohr), use-inspired basic research (ex. Louis Pasteur) and pure applied research (ex. Thomas Edison). Although this is an important contribution, the dichotomy of yes or no with regard of fundamental understanding and use implies a static view, thus less applicable with the inherently challenging and dynamic nature of UIC (Galán-Muros and Plewa, 2016, Perkmann and Walsh, 2007, Bruneel et al., 2010). Building on these realizations, this paper develop a typology (see Figure 1) based on the Frascati Manual who distinguish between four types of R&D activity: basic research, oriented basic research, applied research and experimental development (OECD, 2015), and combine it with the dimensions of power imbalance and mutual dependence (Casciaro and Piskorski, 2005).

\(^2\) As this paper deal with UIRCs aiming to promote mutual benefits for firms’ and university partners (Santoro and Chakrabarti, 1999), mutual benefit are regarded as an interrelated aspect of mutual dependence, where the degree of mutual dependence (e.g. low mutual dependence) are expected to correspond to the degree of mutual benefit (e.g. low mutual benefit)

\(^3\) Although some science-intensive sectors may prefer basic research, such as pharmaceuticals, this general statement, and the rest of the literature review, correspond to the R&D preferences of most industrial sectors (Perkmann, et al., 2011; Cohen et al., 2002; Meyer-Krahmer and Schmoch, 1998)
Basic research is “experimental or theoretical work undertaken primarily to acquire new knowledge of the underlying foundations of phenomena and observable facts, without any particular application or use in view” (OECD, 2015, p. 50). A lot of the research conducted in the universities have historically been basic research. Although some claim that basic research is declining (Nowotny et al., 2003), Bentley et al. (2015) found that basic research still has a strong presence in universities, although differing between countries and academic disciplines. Perkmann and Walsh (2009) found that university partners often initiated and set the agenda for UIC that contained basic research, and that these projects granted more publications for the university partners than more applied research collaborations. Because university researchers are likely to choose research topics perceived by their peers to be of interest and advancing the knowledge in their specific area to raise on the academic ladder (Nelson, 2004), I suggest that when university researchers hold the power, and have low mutual dependence towards industry partners, basic research would be more prominent (see Figure 1).

Oriented basic research is distinguished from basic research as it is more oriented towards economic or social benefits and “is carried out with the expectation that it will produce a broad base of knowledge likely to form the basis of the solution to recognised or expected current or future problems or possibilities” (OECD, 2015, p. 51). Other similar characteristics used to describe this quadrant is ‘translational research’ (Woolf, 2008) and ‘strategic research’ (Irvine and Martin, 1984). The common focus is to conduct basic research that provides relevant knowledge for industry partners to exploit in the future (Lee, 2000, Bentley et al., 2015). Carayol (2003) found that university researchers who conduct basic research would have a preferred match with firms who want to conduct risky and long-term research. Lee (2000) and D’Este and Perkmann (2011) found that most academics collaborate with industry to further their research, learn from the industry and financing their research, rather than to commercialize their knowledge. Thus, oriented basic research are expected when university partners have the power advantage in UIC, but have high mutual dependence towards the industry partners.

Applied research is “original investigation undertaken in order to acquire new knowledge. It is, however, directed primarily towards a specific, practical aim or objective” (OECD, 2015, p. 51). Applied research has a shorter time horizon for use, and narrower potential field of application than oriented basic research. Accordingly, Carayol (2003) finds that university researchers with an applied research agenda have a preferred match with firms who want to conduct low-risk and short-term research. The related findings of Calderini et al. (2007) shows that university researchers that conduct applied research are more likely to
produce industrial applications than researchers that conduct basic research. Yet, applied research grants fewer academic publications (Perkmann and Walsh, 2009), and is therefore in conflict with the long-term goals of most university researchers (Nelson, 2004, D’Este and Perkmann, 2011, Lee, 2000). However, because firms are likely to desire more applied research in effort to create commercial value (Lee, 2000, Nelson, 2004), it is expected that when industry partners have the power advantage in UIC and high mutual dependency towards university partners, applied research will be the outcome of this collaboration.

*Experimental development* represents the “D” in R&D, and is “systematic work, drawing on knowledge gained from research and practical experience and producing additional knowledge, which is directed to producing new products or processes or to improving existing products or processes” (OECD, 2015, p. 51). Experimental development is often a short-term activity, and firms short-term perspectives is seen as the biggest disadvantage of UIC by university researchers (Meyer-Krahmer and Schmoch, 1998). Hence, there is no surprise that it is mostly firms that takes the initiative to problem-solving activities, where they get assistance from university researchers (Perkmann and Walsh, 2009). Accordingly, experimental development are related to academic consulting, which are research activities or advisory services provided by university researchers to industry partners (Perkmann and Walsh, 2008, D’Este and Perkmann, 2011). In this broad category, some academic consulting are more relevant for academic publications than others are. Research-driven consulting focus on new technologies, which is expected to benefit academic publications. Opportunity-driven consulting emphasises problem solving for firms with existing scientific knowledge on a specific problem, and is therefore not expected to yield any impact on academic productivity (Salter and Martin, 2001, D’Este and Perkmann, 2011). Based on the provided literature, I suggest that when industry partners hold the power and the mutual dependence are low, experimental development would be more prominent.

Based on the literature review above, figure 1 are developed, and illustrates how variations in the dimensions of power imbalance and mutual dependence in UIC are likely to affect the type of R&D conducted, shown through the four distinct R&D types.
However, because both firms and university partners, to some degree, is mutually
dependent on each other, it means that neither part do control all of the necessary resources or
conditions for engaging in, and reaping the benefits of UIC (Pfeffer and Salancik, 2003). This
is an important premise, because when partners have resource dependences with each other they
have the potential to exert influence over the other party (Wu, 2015, Emerson, 1962). Still, there
is limited knowledge on organizations’ activities during the course of a partnership in general,
and how firms impose their interest on others especially (Wry et al., 2013, Gulati et al., 2012,
Bruneel et al., 2010). To address this gap, we have to search for alternative theories, where
some advice are found in the literature on coercive and noncoercive influencing strategies,
which has received considerable attention in the industrial marketing literature (Hu and Sheu,
2005).

2.2 Coercive and noncoercive influencing strategies
Influencing strategies is ‘the alternative means for applying power’ (Frazier and Summers,
1986, p. 169). A premise is that firms may take actions to bring better outcomes for its own
firm (Anderson and Narus, 1990). This by altering the behaviour of the other party (Frazier and
Summers, 1984), which would have consequences for the firm, the university partner(s) and
their ongoing relationship. Influencing strategies are generally distinguished into coercive and
Coercive influencing strategies is defined as ‘putting direct pressure on the target to perform a
specific behavior or set of behaviors, with adverse consequences of noncompliance stressed
and mediated by the source’ (Frazier and Rody, 1991, p. 54) such as threats, demands, legalistic
pleas and punishments (Frazier and Summers, 1984, Gundlach and Cadotte, 1994). Noncoercive influencing strategies are less compulsive and involves little, if any, direct
pressure from the source (Frazier and Rody, 1991, Hu and Sheu, 2005) such as requests, information exchange, discussions, promises and rewards (Gundlach and Cadotte, 1994, Hu and Sheu, 2005).

Although most studies of coercive and noncoercive influencing strategies has focused on partners intentions, rather than the actual behaviour of organisations (Hausman and Johnston, 2010), remarks has been made that noncoercive strategies may lead to integration and goal alignment (Gundlach and Cadotte, 1994), long-term and solid relationships (Frazier and Rody, 1991). Accordingly, Hu and Sheu (2005) find that noncoercive influencing strategies are more effective when partners are highly dependent on each other, and that it may build mutual understanding and trust, creating a more harmonious climate between partners. This is confirmed by Hausman and Johnston (2010) who find that coercive influencing strategies are destructive for the collaborative relationship while non-coercive have positive outcomes where the partners are more likely to proceed their collaboration. Translating these findings to the UIC context, it is natural to expect that noncoercive influencing strategies by firms may contribute to a more integrated, and balanced collaboration where both parties obtain their goals, thus easing some of the commonly found tensions between the university and industry partners (Bjerregaard, 2010; Lind et al., 2013; Perkmann and Walsh, 2007).

In this line of reasoning, this paper seeks to shed new light on the influencing strategies carried out by firms in UIRCs, and its consequences, assuming that the objective is to steer the research agenda towards their business-objectives. As the literature to a very limited extent has explored such processes over time, I pursue an inductive approach. I study the development of five UIRCs over time, exploring how firms’ coercive and noncoercive influencing strategies alter the partners’ power imbalance and mutual dependence, and its consequences on the conducted R&D in the UIRCs over time.

3. Methodology
3.1 Research design and cases
An inductive longitudinal multiple case study of five university-industry research centres was conducted, as it is suitable for answering the ‘how’ questions about complex contemporary processes (Eisenhardt, 1989, Langley, 1999, Gephart, 2004). Accordingly, theoretical sampling was deemed suitable to give in-depth insight into, and develop theory on, the dynamics of UIC (Eisenhardt and Graebner, 2007, Perkmann and Walsh, 2007, Eisenhardt, 1989). Although
UIRCs are one of the predominant policy responses to stimulate UIC (Ponomariov and Boardman, 2010), the UIRCs could be seen as extreme cases of UIC, because they are supposed to produce both innovations and academic publications, thus resolving the inherently conflicting goals between university and industry partners (Lind et al., 2013, Hayton et al., 2013). The UIRCs similar structure and long-term operation, offer opportunities for a systematic exploration on whether and how firms influence the research agenda over time, and its consequences for firms and university partners.

The five research centres in this study operates from 2009 - 2017 under the Norwegian public program Centres for Environment-friendly Energy Research. The scheme seeks to develop basic research of high international calibre and promote innovation, and is funded by the Research Council of Norway (50%), university- (25%) and industry partners (25%). The funding for the last three years depend on a favourable mid-term evaluation, and the firms may choose to leave the research centres on one-year’s notice, which would lead to a cease in the funding from the Research Council.

3.2 Data collection

This study emerged from a larger research project that focused on the collaborative dynamics in UIRCs over a period of seven years, from 2009 to 2017. The primary mode of data-collection was interviews with firm- and university representatives, where two or three interviewers were present to minimize interviewer bias. This study is based on 42 interviews, where six was via phone, with two major rounds of interviews (Table 1). By interviewing university and industry representatives, we got multiple accounts on the same process (Pentland, 1999), thus lowering the risk of impression management bias (Eisenhardt and Graebner, 2007).

The first round of interviews was conducted from September – November 2013; lasting an average of 80 minutes. We contacted the centre director and asked for an interview and permission to study their UIRC. After this interview, we conducted snowball sampling and asked for potential universities and industry informants (Gobo, 2004). This was particularly necessary for getting in touch with industry partners’ representatives, as they are often only known by their company name in secondary data, with their representative unnamed. The follow-up interviews was conducted from October – November 2015 and lasted an average of 75 minutes, and aimed to uncover any changes in the UIC and to obtain additional information about topics of interest that arose from the analysis of the first-round interviews (Eisenhardt, 1989).
The interviews were retrospective and semi-structured, starting in chronological order with the informants’ educational background and work relations, continuing with the initial phases of the research centres, proceeding with the ongoing research and innovation activities and exploring if- and how they tried to influence the research agenda during the UIC, and ended with their views on future collaboration. Although the semi-structured interview guide served as a checklist, we aimed to establish a conversational atmosphere in which the interviewees could speak as freely as possible about the topics (Patton, 1990). To gain detailed insights into key events and activities, we asked follow-up questions such as “How did you do that?”, “Who was involved in that event?”, and “When did this happen?”. To avoid bias, we avoided the use of theoretical concepts in the interview setting. As requested by the informants, the cases are anonymized for confidentiality. This approach helped to obtain statements from the informants that were more honest. The interviews was recorded and transcribed in verbatim for further analysis (Alvesson, 2011, Yin, 2013).

### Table 1
Sources of primary and secondary data

<table>
<thead>
<tr>
<th>Research Centre</th>
<th>Alpha (A)</th>
<th>Beta (B)</th>
<th>Gamma (C)</th>
<th>Delta (D)</th>
<th>Epsilon (E)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Firm A3: Technical director*</td>
<td>University: Centre Director</td>
<td>University: Centre Director</td>
<td>University: Centre Director</td>
<td>University: Centre Director</td>
</tr>
<tr>
<td></td>
<td>University: Centre Director</td>
<td>WP-leader B</td>
<td>WP-leader C</td>
<td>WP-leader D</td>
<td>WP-leader E*</td>
</tr>
<tr>
<td></td>
<td>University: Centre Director</td>
<td>University: Centre Director</td>
<td>University: Centre Director</td>
<td>University: Centre Director</td>
<td>University: Centre Director</td>
</tr>
<tr>
<td></td>
<td>WP-leader A</td>
<td>WP-leader B</td>
<td>WP-leader C</td>
<td>WP-leader D</td>
<td>WP-leader E*</td>
</tr>
<tr>
<td>Total no. of interviews</td>
<td>11</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>7</td>
</tr>
</tbody>
</table>

* These informants were interviewed at a single time.

### 3.3 Data analysis

The interview data was triangulated by including several secondary data sources (Eisenhardt, 1989, Yin, 2013) (Table 1). The data analysis comprised three main phases, and was an
highly iterative process, comparing the emerging findings with extant theory (Eisenhardt, 1989). First, primary, or ‘raw interpretations’, was made before, during and after the interviews, and further along the research process (Alvesson and Sköldberg, 2009), implying that the data collection phase overlapped with the data analysis phase (Eisenhardt, 1989). By reading the interview transcripts’ multiple times, I searched for broader patterns and insights into how the UIC developed (Eisenhardt et al., 2016, Pentland, 1999, Yin, 2013). By applying a temporal bracketing strategy (Langley, 1999), the mid-term evaluation was singled out as the triggering event for the alterations in all the research centres’ research agenda. Hence, two distinct ‘periods’ were identified; before and after the mid-term evaluation, and provided a temporal structure for the in-depth analysis.

In the second phase, after reviewing existing literature, RDT, and especially the dimensions of power imbalance and mutual dependence, were deemed applicable for exploring the shift in the research agenda. In what followed, I coded and analysed the data, systematically linking empirical observations towards the dimensions of power imbalance and mutual dependence (Miles et al., 2014, Gioia et al., 2013). In this process, I used qualitative analysis software (NVivo 10) to facilitate the coding and categorization process. I mostly used theory-driven deductive codes (e.g., dependent on financing), and some data-driven inductive codes (e.g., few incentives for industry contact) (Langley, 1999). Then relevant codes and quotes for power imbalance and mutual dependence were put together in a matrix over the two periods for each research centre (Miles et al., 2014). Each dimension was characterised for each case (e.g. high vs. low mutual dependence) and condensed into Table 2 (Eisenhardt and Graebner, 2007, Pentland, 1999). Based on within- and cross- case analysis (Yin, 2013), the power imbalance and the mutual dependence were found to shift during the two periods in all research centres, but to various degrees, leading to diverse consequences for the UIRCs research agendas’. Although it was evident that firms influencing activities contributed to the change, it was less apparent how this played out.

Hence, the third phase, and second coding round, sought to explaining the shift in power imbalance and mutual dependence in the research centres by identifying critical characteristics, activities and events that firm representatives performed in steering the research agenda towards their business-objectives (Langley, 1999). In this inductive process, I solely used inductive codes (e.g., suggesting research activities) and followed the Gioia et al. (2013) method, identifying similar codes and clustering them in first-order categories, before I searched for linkages among the categories, which led to the development of second-order analytical themes.
(Nag and Gioia, 2012). Next, I assembled the second-order themes into aggregate dimensions that were labelled ‘soft’ and ‘hard’ influencing. By reviewing the extant literature for theoretical concepts that could explain and elaborate on my findings (Eisenhardt, 1989), influencing strategies (Frazier and Summers, 1986) were deemed applicable, where coercive and noncoercive influencing strategies were similar to the aggregate dimensions I first labelled ‘soft’ and ‘hard’ influencing. Consequently, the analysis resulted in an elaboration of the theory on influencing strategies (Hausman and Johnston, 2010). This contribution is visualized in Figure 2, where the data structure of firms influencing strategies are presented (Gioia et al., 2013), whereas Table 3 provides additional quotes for each of the first order categories. Hence, theory triangulation by combining RDT and influencing strategies were necessary to explain the changes in the research agenda of the research centres, and enabled me to verify the findings by adopting multiple perspectives (Patton, 2015). This process, thus enhanced the internal validity and generalizability (Eisenhardt, 1989).

4. Results and discussion

To answer the research question on “how do industry partners influence the research agenda in university-industry research centres, and what are the consequences?”, the results and discussion are presented in three parts. I first explore the power imbalance and mutual dependence in the five UIRC over two periods. Then I operationalize firms’ coercive and noncoercive influencing strategies at the activity level. Finally, firms’ influencing strategies’ are connected to the shifts in power imbalance and mutual dependence, showing, by employing the typology developed in Section 2, which type of R&D that is conducted in the research centres over time.


The literature section illustrated how university and industry partners are mutually dependent on each other, which give them the potential to exert influence over the other party (Wu, 2015, Emerson, 1962). In the following, the interdependence between university and firm partners over two periods are analysed, distinguishing between power imbalance and mutual dependence within each UIRC. In all the UIRCs in this study, the power imbalance and mutual dependence are observed to change over time (see Table 2). The Alpha research

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4 Hu and Sheu (2005) actually uses the term ‘soft influencing’ as a synonym for noncoercive influencing strategies.
centre are observed to undergo a big shift in power imbalance in favour of the industry partners in period 2, with lowering mutual dependence. The other centres are observed to undergo a small shift in power imbalance in favour of the industry partners and no shift in mutual dependence. The next section explores how these changes in mutual dependence and power imbalance happens over time because of firms’ coercive and noncoercive influencing strategies.
Table 2  
Power imbalance and mutual dependence over two periods

<table>
<thead>
<tr>
<th>Research centre</th>
<th>Power imbalance</th>
<th>Mutual dependence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alpha (A)</td>
<td>University partners hold the power, and mainly decides the research agenda:</td>
<td>High mutual dependence, but higher industry engagement are desired:</td>
</tr>
<tr>
<td></td>
<td>“We perceive that we don’t get through to the university partners, and their research is not relevant for us or the business sector that we represent”. (Firm A2)</td>
<td>“We have tried to emphasize the importance of involvement if the industry want more output, which is important for us as well; We need data from them. But we are (financially) dependent on the industry, so it is difficult to criticize them back”. (WP leader A1)</td>
</tr>
<tr>
<td></td>
<td>The industry is often very busy. If they contact us, it is typically if they have some sort of a problem, which is not given that we can solve in the research centre. Alpha is a research centre that has a time horizon on things”. (WP leader A2)</td>
<td></td>
</tr>
<tr>
<td>Beta (B)</td>
<td>University partners hold the power. The industry partners have influenced the agenda from the start, which have contributed to a better overall performance:</td>
<td>High mutual dependence. Industry partners need the research results:</td>
</tr>
<tr>
<td></td>
<td>“When we joined the research centre, we… meant that the research plan did not reflect the research centre objectives … we discussed that with the centre management and got support on that opinion”. (Firm B1)</td>
<td>“It is very useful to have active industry partners… It is important to know their challenges, so you can focus on things that matter”. (WP leader)</td>
</tr>
<tr>
<td></td>
<td>Some knowledge gaps are filled by the conducted research, but I wish for an increased amount of applied results and feedback in the last half of the centre period”. (Firm B2)</td>
<td>“Some knowledge gaps are filled by the conducted research, but we need more forces the university partners to conduct experimental development and consulting: “We thought the research centre would have a different focus. Gradually we understood that we have to engage more, demanding to set the strategy for the research centre”. (Firm A1)</td>
</tr>
<tr>
<td>Gamma (C)</td>
<td>University partners hold the power. The industry partners may influence the research activities to some degree:</td>
<td>High mutual dependence:</td>
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<td></td>
<td>“The industry were involved in discussing the research activities, but we are to a large extent aligned with the industry partners”. (Centre director)</td>
<td>“We don’t have a R&amp;D department… we are therefore totally dependent on collaboration with the university partners”. (Firm C1)</td>
</tr>
<tr>
<td></td>
<td>“The university partners have financed a lot of the centre. We cannot force them to do a specific thing. We can wish and suggest, but in the end the university partners decide what they want to do”. (Firm C2)</td>
<td>“We have a close relationship with the university, and it will remain important”. (Firm C2)</td>
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<tr>
<td></td>
<td>Small shift in power imbalance in favour of the industry partners: The mid-term evaluation render it possible to steer the research into a more applied form:</td>
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<td></td>
<td>«There has been a very good mid-term evaluation, which indicated the need for a bit more applied research”. (Firm B2)</td>
<td>“We are trying to turn a click, and steer us that way (towards applied research). We are trying to calibrate our research and experiments to be relevant for ‘real world’ issues, and the problems currently faced by the industry”. (Centre Director)</td>
</tr>
<tr>
<td></td>
<td>“We are now trying to turn a click, and steer us that way (towards applied research). We are trying to calibrate our research and experiments to be relevant for ‘real world’ issues, and the problems currently faced by the industry”. (Centre Director)</td>
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<table>
<thead>
<tr>
<th>Period 1 (2009-2013)</th>
<th>Power imbalance</th>
<th>Mutual dependence</th>
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<tbody>
<tr>
<td>Alpha (A)</td>
<td>High mutual dependence</td>
<td>High mutual dependence</td>
</tr>
<tr>
<td>Beta (B)</td>
<td>High mutual dependence</td>
<td>High mutual dependence</td>
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<tr>
<td>Gamma (C)</td>
<td>High mutual dependence</td>
<td>High mutual dependence</td>
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<tr>
<td>Big shift in power imbalance. Industry partners are now the more powerful actor: Industry partners more or less force the university partners to conduct experimental development and consulting: “We thought the research centre would have a different focus. Gradually we understood that we have to engage more, demanding to set the strategy for the research centre”. (Firm A1)</td>
<td>Big shift towards lower mutual dependence: Dissatisfied firms threatened to dropout, and focuses on their own needs. University partners are therefore more dependent on the industry partners: “We struggle with a problem in our process, and we are now going to get support from the university researchers on the improvement project”. (Firm A1)</td>
<td></td>
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<tr>
<td>No shift: High mutual dependence:</td>
<td>No shift: High mutual dependence:</td>
<td></td>
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<tr>
<td>“We use a lot of money on these challenges. Therefore it is important for us to use the knowledge [developed in the centre] to take the right decisions”. (Firm B1)</td>
<td>“It is really exciting to follow [firm C1] and their development”. (Centre Director)</td>
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</table>


| Delta  | **University partners hold the power, and wants input on the research activities, which enables the industry partners:**

“The research centre has been good at trying to collaborate with the industry. We can influence the research plan”. (Firm D1)

“The industry partners clearly signal what they want... However, it is not easy to follow every ‘signal’... It is a balance of what the university partners has time to carry out, their strategic needs, and what the industry partners in sum has agreed to”. (Centre Director) |
|---|---|
| High mutual dependence. Firms support competence-building for the university partners, which needs industrial data for their research:

“We joined the research centre to develop our work and research field, and to interact with the university partners... building their competence, which we could ‘harvest’ on later”. (Firm D2)

“The university partners has requested a lot of data from us. But before we hand it over, we need to know how the research may improve our operations”. (Firm D1) |
| Small shift in power imbalance in favour of the industry partners that are more able to influence the research activities over time:

“We have discussed it a lot [with the industry], and the research are now turned a bit from basic to more applied research, which can grant prototypes and possibilities for commercialization”. Centre Director

“Overall, the research centre have been very sensitive to the industries requests and they have been extremely good in involving the industry”. (Firm D1) |
| No shift: High mutual dependence: “We are totally dependent on the university partners; we don’t have research on all necessary subjects”. (Firm D2)

“We have shared some data [with the university partners], but not everything”. (Firm D2)

“The industry partners show large interest every time the papers are in their field of interest”. (WP-leader)

“We learn from each other, if not, we would not have participated”. (Firm D2) |
| Epsilon (E)  | **University partners formally hold the power, but the research agenda is highly influenced by industry partners ongoing activities:**

“Epsilon have no financial responsibility [for the industry’s projects]. They contribute with their competence. Thus, I believe they realize that the agenda has to be set by the industry”. (Firm E2)

“Some of the projects [in the centre] involves activities close to consulting. But they generate academic papers as it is new processes and new ways to calculate”. (Centre Director) |
| Mutual dependence as industry partners need academic input, and the university partners need industrial data:

“We would not have succeeded without the assistance from the university partners, but our projects are very important for Epsilon as well”. (Firm E1)

“We could have done some of our research activities for single firms outside of the research centre, but without the generic [research] results”. (Centre director) |
| Small shift in power imbalance in favour of the industry partners:

“We focus now even more on the industry partner’s research and development needs... This happened 3-4 years into the centre, based on a continuous dialogue with the industry, which also were echoed in the mid-term evaluation”. [Centre director]

“Collaborating with the university partner has been vital for the knowledge development”. (Firm E1) |
| No shift: Mutual dependence as the applied research grant industry partners with academic input, and academic papers for the university partners:

“We use Epsilon as a consultant... and they need us for research purposes”. (Firm E3)

“It is interesting to get input from a real project and test new solutions and concepts in practice”. (Centre director)

“Collaborating with the university partner has been vital for the knowledge development”. (Firm E1) |
4.2 Firms influencing strategies

I found clear patterns of variation in how firms influenced the research agenda in the research centres. Figure 2 shows the emergent data structure, including first order categories and second order themes that led to the overreaching dimensions. Table 3 shows additional first-order data that led to the development of the second order themes and aggregate dimensions. It is evident that firm partners used more noncoercive actions, than coercive ones, which confirms the findings of Gundlach and Cadotte (1994). The three main influencing strategies (Second order themes) are briefly discussed.

**Figure 2**

Data structure

<table>
<thead>
<tr>
<th>Influencing strategies (First order categories)</th>
<th>Aggregate influencing strategies (Second order themes)</th>
<th>Overreaching dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Influencing in one-on-one meetings with university partners</td>
<td></td>
<td>Noncoercive influencing strategies</td>
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<tr>
<td>Influencing in annual meetings and workshops</td>
<td></td>
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<tr>
<td>Influencing through position on center board</td>
<td></td>
<td>Providing industrial perspectives and data</td>
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<tr>
<td>Following up on research activities</td>
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<td></td>
</tr>
<tr>
<td>Giving researchers access to facilities and data</td>
<td></td>
<td>Forcing change</td>
</tr>
<tr>
<td>Constructive feedback in official evaluations</td>
<td></td>
<td>Coercive influencing strategies</td>
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<tr>
<td>Harsh feedback in official evaluations</td>
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<tr>
<td>Threatening to leave the research centre</td>
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<tr>
<td>Demanding to influence the research strategy</td>
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**Table 3**

Themes, Categories and Quotations

<table>
<thead>
<tr>
<th>Second-Order Themes</th>
<th>First-Order Categories</th>
<th>Representative Quotations</th>
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</thead>
<tbody>
<tr>
<td>Influencing and suggesting research activities in official meetings</td>
<td>Influencing in one-on-one meetings with university partners</td>
<td>Discussed it [research suggestions] again today with the university partners. (Firm A2)</td>
</tr>
<tr>
<td></td>
<td>Influencing annual meetings and workshops</td>
<td>We provide comments on what we believe is important that Epsilon do research on (Firm E1)</td>
</tr>
<tr>
<td></td>
<td>Influencing through position on center board</td>
<td>[At the Center’s startup] there were some workshops where we discussed possible topics, developed the WPs and considered the content in them. (Firm A2)</td>
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<td></td>
<td></td>
<td>[Firm D2] have repeatedly requested us to implement [a process], which has slowly settled in the university partners. (Centre Director Delta)</td>
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<td></td>
<td>The discussion at the board has been very good. However, I am a bit unsure of how it is reflected in the daily work of Beta. (Firm B1)</td>
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</table>
The Board’s mandate has been a bit indefinite. We discuss things in the board, and afterwards you notice they do not follow up on every aspect. (Firm A2)

<table>
<thead>
<tr>
<th>Providing industrial perspectives and data</th>
<th>Following-up on research activities</th>
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<tr>
<td>Giving researchers access to facilities and data</td>
<td>I am trying to have people close to where the research is conducted. That is why I think the [firm] research fellow should be affiliated with Delta. That would make the commitment much better. (Firm D1) We have participated in defining the research activities, and it is an ongoing discussion: The research community come up with some ideas, and get response from the industry. If there are some things the industry partners do not like, then they try to change the direction. (Firm B2)</td>
</tr>
<tr>
<td>Constructive feedback in official evaluations</td>
<td>It is crucial to demonstrate new knowledge through projects. The projects are very important for Epsilon. It is a perfect match. (Firm E1) Part of the research is going to focus on our product and compare it to other products. That is very interesting for us (Firm C1) [Firm C1] have such an innovative technology, which makes them able to influence the research agenda as they provide the researchers with exciting research possibilities. (Firm C2)</td>
</tr>
<tr>
<td>Forcing change in research activities</td>
<td>Threatening to leave the research centre</td>
</tr>
<tr>
<td>Harsh feedback in official evaluations</td>
<td>think we gave low scores on all the questions [in the evaluation]. (Firm A2) At the mid-term review, there was a person in Firm A2, who, by the way did not have anything to do with Alpha at all, that filled out the evaluation form. The feedback was very negative. Now [after the evaluation], firm A2 is one of the firms that influences the hardest to get things their way. (WP-leader A2)</td>
</tr>
<tr>
<td>Demanding to influence the research strategy</td>
<td>We were so dissatisfied that we considered dropping out. (Firm A1) The university partners understood that it was critical and changed. Several of the industry partners threatened to leave the research centre. (Firm A1)</td>
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<th>Demand to influence the research strategy</th>
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**Influencing and suggesting in official meetings** shows where, and how noncoercive influencing strategies take place in various official meetings in the form of requests, discussions, information exchange etc. (Gundlach and Cadotte, 1994, Hu and Sheu, 2005). This is illustrated by the quote from Firm D2: “We suggest relevant topics, we always do that. That is how we can influence and get research topics that is in line with our strategy”. The second theme of providing industrial perspectives and data includes aspects inherent in the former theme, but is a more proactive noncoercive influencing strategy, which to a larger extent answers to the dependencies of the university partners by providing specific feedback, industrial data and input to the conducted research (Lee, 2000, D’Este and Perkmann, 2011, Perkmann et
This is illustrated by the quote from Firm E1: “We connected some of our projects to Epsilon, and we have devoted many resources towards these research projects”. The last theme of forcing change entails coercive influencing strategies where firms put direct pressure on university partners through threats and demands. If university partners do not comply with these demands, it will often have consequences (Frazier and Summers, 1984, Frazier and Rody, 1991, Gundlach and Cadotte, 1994), such as firm dropping out from the UIRC. ‘Forcing change’ could also be more indirect, such as displaying dissatisfaction in the official evaluation, as illustrated by the quote from Firm A1: “We were very dissatisfied, and we reported that in the evaluation”. Such negative feedback enforced the research agenda to change towards a more applied form.

From the quotes on forcing change in Table 3, it is clear that the firms in the Alpha centre used coercive influencing strategies to a higher extent than firms in the other UIRCs. Hence, to answer the last part of the research question, the next sections further elaborates the consequences of firms influencing strategies.

4.3 Firms influencing strategies and its effects on power imbalance, mutual dependence and the type of R&D conducted in Periods 1 (2009-2013) and 2 (2013-2017)

In Period 1, we observed from Table 2 that most of the industry partners where rather passive and awaited initiatives from the university partners, but were able to influence the research activities to some degree in all research centres, apart from the industry partners in the Alpha centre. However, over time, there is a tendency that the industry partners in all of the research centres got more impatient regarding research results from the research centre. This became evident, especially in the time before, and during the official mid-term evaluation of the UIRCs, four years after the start-up. The long time-period before most of the industry partners started to question which activities that were undertaken in the centre, and requesting research results, may be due to the long-term nature of basic research (Nelson, 2004). Industry partners are also found to make limited contribution to the research conducted in UIC (Barnes et al., 2002), and especially when the basicness of the research is high (Perkmann and Walsh, 2009). Many UIC also go through a ‘honeymoon period’ before partners differences and

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5 Although access to industrial data is of utmost importance for conducting relevant research for university partners, this dependence is scarcely mentioned in the UIC literature. It is often implicitly included in aggregate forms such as the need for industrial perspectives, and learning from industry partners (e.g. D’Este and Perkmann, 2011).
dependencies surfaces (Estrada et al., 2016). Hence, I observe that the firms exerted more power in the later phases of the UIC, compared to the earlier phases.

To explore the shift in the R&D conducted in the research centres that took place in period 2, Figure 3 builds on the typology developed in Section 2. The boxes and arrows illustrates how the influencing strategies of firms in the five UIRCs alters the relationship between the dimensions of power imbalance and mutual dependence, and thus the type of R&D conducted in Period 1 and 2. Figure 3 illustrates that all of the UIRCs are steered towards a more applied focus in Period 2, where Alpha has the biggest shift from conducting oriented basic research, towards experimental development and consulting in Period 2 because of the firm partners’ extensive use of coercive influencing strategies. Firms noncoercive influencing strategies steer Beta, Gamma and Delta a bit towards a more applied focus, as well as Epsilon: from a quite applied focus in Period 1 to an even more applied focus in Period 2. These findings are elaborated in the next two subsections.

Figure 3

Power imbalance, mutual dependence and type of R&D conducted in Periods 1 and 2

4.3.1 Firms coercive influencing strategies and its consequences on the conducted R&D

The industry partners in the Alpha centre used the coercive influencing strategies of ‘forcing change’ especially in the beginning of Period 2 due to their lowered commitment to the research agenda. This made the university partners gradually more dependent on the industry partners, which in sum caused the degree of mutual dependence to reduce (Table 2 and Figure 3). Consequently, the university partners had to “please” the industry partners by turning the research agenda towards a much more applied focus, conducting experimental development and consulting. This sort of “pleasing” was also observed in the UIC studied by Estrada et al. (2016). For the university partners in the Alpha centre, pleasing was deemed necessary as the reduction in the financial contribution following an industry partner dropout would cause a multiplied reduction in the funding from the Research Council and the universities’ own funds.
This trade-off was difficult to manage, and reduced the possibility of conducting research that could lead to academic publications, as illustrated by WP-leader A1:

«We need the industry partners… Without them, there is no research centre. Therefore, we need to give in, and we have maybe given in to much… A research centre is supposed to be the ‘national team of research’, but we end up doing many ‘small things’ for them, which is not research or relevant for publications”.

The university partners R&D activities provided them with partial data from single firms on separate subjects, which is of limited use, as comparative data from several industrial firms within the industry are usually necessary for academic publications (Perkmann and Walsh, 2009). While a research centre is designed to do conduct research on issues faced by several the industry partners (Santoro and Chakrabarti, 1999), the consulting activities in the Alpha centre are found to lower the level of innovativeness due to its focus on smaller challenges faced by a single firm, because it provides a narrower field of application than more basic research (OECD, 2015). Accordingly, I observe that experimental development and consulting may grant large benefits for the single firm, but low benefits for the industry as a whole. This is illustrated by the quote from WP-leader A1: “Firm A1 for example, has very specific interests. If we should satisfy them, we have to do things that does not interest other industry partners”. These findings confirm D’Este and Perkmann’s (2011) claims that opportunity-driven consulting have negative impact on academic productivity, and extend the findings by showing how firms’ coercive influencing strategies shift the power imbalance and mutual dependence in UIC. This shift changes the conducted R&D towards experimental development and opportunity-driven consulting, which yields a higher extent of applied research, and fewer publications for the university partners (Salter and Martin, 2001, D’Este and Perkmann, 2011).

Some firms in the Beta, Gamma, Delta and Epsilon centre also used coercive influencing strategies, as exemplified by Firm B1: “When we joined the research centre, we demanded that the university partners should work on [a particular dataset]”. However, the difference between this demand and the demands in the Alpha centre, was that this coercive influencing strategy was in accordance with the needs and dependencies of the university partners; the particular dataset provided the university partners with interesting data, matching universities dependence for industrial data. Hence, some levels of coercive influencing may not be detrimental for the collaboration (Hausman and Johnston, 2010).
4.3.2 Firms noncoercive influencing strategies and its consequences on the conducted R&D

The mutual dependence between the university and industry partners was consistent throughout the two periods in Beta, Gamma, Delta and Epsilon. The industry partners use of noncoercive influencing strategies caused a small shift in the power imbalance in favour of the industry partners. The research agenda thus shifted a bit towards a more applied focus in Period 2 (Table 2 and 3, Figure 2 and 3). The consequences of the influencing strategies in these research centres are consistent with Gundlach and Cadotte (1994), who found that higher dependence towards a partner are related to increased use of noncoercive influencing strategies, as well as Yan and Gray (1994) who studied US-Chinese joint ventures and found that higher levels of interdependence were associated with less opportunistic behaviour. Even though the research agenda became a bit more applied in Period 2, the research were still considered to be oriented basic research in Beta, Gamma and Delta. Especially since access to industrial data and facilities enabled research that where closer to the ‘reality’ as the centre director in Beta stated:

“When I say applied, it does not mean that our research are very different; we do the same research, but we work on research questions that are more relevant for the industry partners. We now steer the research into using data from the industry partners, instead of a purely theoretical exploration of these processes”.

The small shift in research focus in the Beta, Gamma, Delta and Epsilon research centres is the same as Knights and Scarbrough (2010) observed, where the research agenda only had minor modifications. Consequently, the university partners were able to publish journal articles, as well as providing research results that where relevant to the needs of the firms. This development is similar to how buyer-seller relations develop, where benefits for both parties nurture a positive collaboration (Dwyer et al., 1987).

The Epsilon centre are observed to have a similar development path as the Beta, Gamma and Delta research centres with a shift towards a bit more applied focus in Period 2. The difference is that the research agenda is very applied from the start of Period 1, with experimental development and consulting. Accordingly, the industry partners in Epsilon view the university partners as a consultant, as illustrated by the quote from Firm E2: “The university partners are terrific consultants, on a similar level with the other consultant that we use in our projects”. The centre is, however, by doing research-driven consulting, able to do rigorous testing of novel technology, which provides data for academic publications (D’Este and Perkmann, 2011). Because the firms in the Epsilon research centre use noncoercive influencing
strategies in Period 2, the research focus is steered even more towards the short-term needs of the industry partners, which implies that some of the long-term research has to be reduced. A quote from the centre director of the Epsilon centre illustrates this cut-off:

«We have done a solid job on Product X, which has a great potential and has granted us a lot of publicity. However, it is too long-term. We have worked on it for 5-6 years, and about 10 years are necessary for it to become a commercial product. The research are therefore downscaled, and terminating ongoing activities that still grant large publication possibilities is difficult for the university researchers”.

Terminating promising basic research is an action that Carayol (2003) expected to find in dysfunctional UIC, where university partners “would be accepting to postpone promising research agendas, essentially aiming to preserve funding” (Carayol, 2003, p. 906). Calderini et al. (2007) also aired the possibility that university partners would have to re-arrange the research agenda to fit with industry partners short-term industrial objectives. Accordingly, the empirical findings in research centre Alpha and Epsilon illustrates possible downsides of UICs that are supposed to have a long-term focus on basic research, but are steered towards a more applied research agenda.

5. Conclusion and implications
This longitudinal multiple case study of firms influencing strategies in five university-industry research centres contributes to a richer theoretical understanding of how firms exert power in UIC and its consequences in three fundamental ways. First, based on a theoretical review of the literature, I develop a typology suitable for analysing the type of R&D conducted, and how it changes over time, due to changes in partners’ power imbalance and mutual dependence. While the typologies developed in prior research take a static approach (e.g. Stokes, 1997, Carayol, 2003), the typology developed in this paper takes into account the challenging and dynamic nature of UIC (Boardman and Gray, 2010, Thune and Gulbrandsen, 2014). Thus, it represent a viable way of analysing how UICs develop, and offer guidance in explaining how UICs with equal formal structures, actually end up producing different types of R&D.

Second, I operationalize firms’ influencing strategies in three main themes at the activity level, i.e. in terms of the specific actions taken by firms, where the noncoercive influencing strategies are labelled “influencing and suggesting research activities in official meetings” and “providing industrial perspectives and data”, and the coercive “forcing change”. The operationalization of these themes provide insights into how firms “steer” or “bend” the
research agenda towards their objectives, which has been stated as one of firms greatest challenges in UIC (Harryson et al., 2007, Sydow and Windeler, 1998).

Thirdly, I explore how firms’ influencing strategies’ alters the power imbalance and mutual dependence between university and firm partners, and by employing the typology, I show which type of R&D that is conducted in the five research centres over time. The paper therefore fills an important void, as few empirical insights has provided insights into how organizations impose their interest on others, and if these strategies are successful or not (Wry et al., 2013, Pfeffer and Salancik, 2003, Gulati et al., 2012). Whereas prior research (e.g. Estrada et al., 2016) find that interpartner dissimilarities in UIC may be overcome, this paper shows how this process play out, and which consequences it may have for university and industry partners. Accordingly, firms’ coercive influencing strategies may lead to a shift in the power imbalance in favour of the firms and lowering the mutual dependence. As a result, the research agenda becomes much more applied, with research that is more relevant for the single firm, but of less relevance for the industry as a whole, and fewer publications for the university partners. Firms’ noncoercive influencing strategies may result in minor shifts in power imbalance in favour of the industry partners, which may yield a bit more applied research, resulting in research that is more relevant for the industry partners, but still having potential for academic publications.

5.1 Implications
This study also yields important recommendations for the management of UIRCs. The findings shows that industry partners are less involved in the beginning of the research centres. It is therefore essential for firms to take actions to participate effectively in UIRCs from the beginning (Perkmann and Salter, 2012). The use of influencing strategies is a way of ensuring that the research focus is relevant for the research needs of the firm. However, the different influencing strategies would grant different outcomes in the short and long-term. Coercive influencing strategies may grant positive outcomes for the short-term objectives of the firm, but at the expense of the university partner. This may harm the relationship and impede further collaborations (Hausman and Johnston, 2010). Hence, for long-term UIC, noncoercive influencing strategies may provide a balanced research agenda with regard to industrial application and academic publications, and lay the foundations for future UIC (Hausman and Johnston, 2010).

In terms of implications for university researchers, the findings provide important insights into a highly debated dilemma, namely if UIC participation harms the academic output,
where the literature has showed diverging results (Perkmann and Walsh, 2009). This paper shows that participation in UIC, in itself, do not lower the academic output; what matters is how the research agenda are adjusted towards the research needs of the industry, and if this is done at the expense of the university partners. For instance, applied research in UIC may lower academic output if it implies problem solving for firms using existing knowledge, but if the applied research provides a sufficient amount and depth of industrial data on novel technology, it could grant academic publications.

My findings also have important implications for policy makers. UIRC often have unclear guidelines to which degree and how, the industry partners should influence the research agenda. The findings show that firms’ coercive influencing strategies may steer the research agenda towards a more applied form than originally intended, due to university partners’ dependence on the firms. A consequence indicated in the findings is that the level of innovativeness may decrease due to its focus on smaller challenges faced by single firms, which narrows the potential field of application. It is therefore important to have clear guidelines and boundaries for how and to which degree firms should be able to steer the research agenda. On the other side, noncoercive influencing strategies are found to shift the research agenda a bit towards more applied research, resulting in research that is more relevant for the industry partners, but still having potential for academic publications. Thus, a ‘win-win’ situation is reached, which still contains the potential for long-term innovations, and enhancing the possibilities of innovations in the short-term.

The findings also show that the official mid-term evaluation four years after start-up was an important incitement for more industry involvement and a steering towards the needs of the industry. I therefore argue that an early phase survey could steer the research agenda towards a better fit with the research needs of both industry and university partners’ at an earlier stage. This survey could ask to which degree and how the industry partners has been involved, and if they are satisfied with the research agenda, and if they have suggestions for improvement. This could create a foundation for a thorough discussion of the centres research agenda. The findings also revealed that firms coercive influencing strategy of ‘harsh feedback in official evaluations’ was used to steer the research agenda towards a more applied form. In effort to obtain a more balanced view of the UIC, a solution could be to ask for university partners’ comments on the industry partners’ involvement and contributions.
5.2 Limitations and future research

Although the research design, with five UIRC in the same institutional context improve the internal validity and the theoretical generalization (Tsang, 2013), it also limits the empirical generalization of the findings. Hence, future research might apply theoretical framework and the typology developed, to analyse UIRCs across different national and institutional contexts. Moreover, as UIC takes various organizational forms (Ankrah and Al-Tabbaa, 2015), it would be interesting to explore the typology, and how the findings may be generalized to other forms of UIC. It would be particularly interesting to compare how UIC relationships develop when, firms and universities, respectively, are supposed to be the lead partners. My findings show that the industry partners are able to steer the research agenda towards their interests, but I shed less light on the university side. It would therefore be interesting to explore the influencing strategies of university partners in UIC. The Research Council is another important actor that is occasionally mentioned. Hence, further research could look at the multifaceted role of Research Councils and how they balance the role of being an important source of funding, and simultaneously acts as a facilitator and evaluator, with the possibility to terminate on-going UICs. It would also be interesting to look at how university and firm partners deal with this rather powerful actor.

Previous research in the field of academic engagement has shown that professors with external funding publish more than colleagues without external funding, while professors with funding from industry publish even more (Gulbrandsen and Smeby, 2005, Perkmann et al., 2013). My findings indicates that this is possible, but difficult, and it is therefore interesting to explore how university researchers actually reach this ‘win-win’ situation, with high publication rates and collaboration with industry. Since university researchers often are involved in multiple research projects, it would be difficult to trace the publications to one specific research project. Hence, a qualitative approach would be especially helpful to unveil the publication and innovation process in UIC.

Since coercive influencing strategies were mostly present in one research centre, more studies in needed to explore this issue in more depth. A related limitation is that while studying the consequences of firms influencing strategies, the firms in the research centres has been treated as more or less homogenous. A more thorough examination of each firm, and their relationship towards other firms would be interesting. For instance would it be interesting to explore the process and consequences when some firms uses coercive influencing strategies for the benefits of their own firm, at the expense of the other firms. Another limitation is that only
firms that continues to participate in the UIC is included. A related and interesting question would be to look at why firms drops out from UIC.

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