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Abstract

This article investigates how business incubators' various support forms affect subsequent firm performance. We delimit our study to activities that protect (buffer) nascent organizations from their demanding environments and apply an extended buffering theory lens. Using data from the entire population of business incubators in Sweden from 2005 to 2015, and the performance of all their graduated firms in terms of revenues and job creation up to 2017, we test five buffering hypotheses, pertaining to incubation time, financial support, legitimacy, coaching, and total resources. The results mainly span from substantially positive to neutral effects of additional buffering on start-up performance, and we propose an inter-organizational buffering concept to help capture the specificities of BI sheltering support.

Keywords
Business incubator, Buffering, Entrepreneurship support, Entrepreneurial firms, Organizations, Firm performance

Preface

The public sector in nations worldwide put in a lot of resources and efforts to support entrepreneurship. The creation of new small organizations has become a standard solution in the promotion of job opportunities, innovation and economic growth. The support generally comes in various organized forms, where the business incubator (BI) is one of the most common and widely diffused. But what kind of support activities do BIs perform, and what are the effects of their efforts and resources used?

In this report, we address the effects of BI support on the revenues and job creation of their graduated firms. Small newly founded organizations have been described as specifically vulnerable, suffering from a liability of newness. Applying an extended buffering theory lens, we investigate the effects of five generic BI support forms that seeks to shelter start-up organizations from their environments during the limited time of incubation. Data from all BIs in Sweden, and from the longitudinal performance of all their graduated firms, are used.

This study is part of a research project studying business incubators in Sweden. We are grateful to many persons and organizations in the project. The Torsten Söderberg foundation supported the project financially. Colleagues at Score (Stockholm centre for organizational research), Stockholm School of Economics and the University of Cape Town Graduate School of Business, gave us valuable comments during the project. Our warm thanks to all!

Stockholm and Cape Town, March 2022

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1. INTRODUCTION

Since the concept was developed in the late 1950s (Adkins, 2001), the "business incubator" (BI) has become one of the most widely diffused forms of entrepreneurial support (Knopp, 2012). The large and expanding number of BIs worldwide reflects a strong belief in their positive effects, particularly among policymakers at the macro level of entrepreneurial support, who largely finance BIs in most states (Lewis, 2001; Organisation for Economic Co-operation and Development (OECD), 2010). BIs have become prominent tools in the promotion of innovation, job opportunities and economic growth.

Despite this widely held conception of a positive relationship between BIs and the success of their start-ups, however, there remains a dearth of theorizing and systematic testing of key constructs that link BI activities, structures and environments to the performance of their incubated firms (Amezcua, Grimes, Bradley, & Wiklund, 2013; Hackett & Dilts, 2004, 2008; Phan, Siegel, & Wright, 2005; Schwartz, 2013; Theodorakopoulos, Kakabadse, & McGowan, 2014). This scarcity specifically reflects a need to develop the differentiated and BI management-oriented analysis of entrepreneurship support beyond comparing just the performance of incubated and non-incubated firms. As with any organization, a BI can be operated in many ways, all potentially affecting the subsequent performance of its incubated firms.

The purpose of this article is to contribute to our understanding of entrepreneurship support by investigating how various BI support activities affect graduated firm performance. Specifically, we delimit our study to the outcomes of BI *buffering* activities (i.e., activities to protect nascent firms from their demanding environments), drawing on the seminal work of James D. Thompson (1967). For many "projects"—raising a child, training a new employee, or supporting a nascent firm, for example—the questions of how much or how little support, and what kind of support, will promote the desired development, are truly relevant. According to the concept advanced by Thompson (1967), the technical core of production in an organization needs stability and certainty to function efficiently. As the environments of open system organizations commonly provide the opposite, turbulence and uncertainty, various methods of buffering the technical core from dynamic external demands constitute substantial managerial tools. Such basic methods include, for example, stockpiling, education and forecasting.

Uncertain and dynamic environments also impose substantial challenges on nascent firms, however, not only on mature large ones. In entrepreneurship literature, start-up firms are often described as suffering from a "liability of newness" (Stinchcombe, 1965). Many of them fail in their first stages due to the steep demands of complex environments, in combination with scarce and undeveloped resources to deal with the challenges (Brüderl & Schüssler, 1990; Shane, 2008; Zacharakis, Meyer, & DeCastro, 1999). BIs can be understood as instruments to respond to this liability of newness. They typically use a set of activities to shelter their nascent firms for a limited

amount of time, indicating the relevance of the buffering concept (Lynn, 2005; Thompson 1967). Importantly, applying a buffering lens on entrepreneurship support addresses a conceptual challenge as buffering traditionally has dealt with intra-organizational protection of mature organizations' core processes—a generally neglected delimitation by scholars.

Based on our focus on buffering of nascent organizations, we test five hypotheses pertaining to the effects of incubation time, financial support, BI legitimacy, coaching and total resources. We do this by matching data from the entire population of BIs operating in Sweden during the period 2005–2017 (50 BIs) with data on the subsequent performance of all their firms (1,956 graduated firms). Following the basic argument of the buffering theory (Lynn, 2005; Thompson, 1967), our hypotheses reflect a positive relationship between the amount of protective support in the forms of coaching provided, length of incubation, etc., on the one hand, and firm performance on the other. However, we also acknowledge that there could be potentially reversed effects stemming from extensive buffering that prevent firms from creating a competitive market position. From a practical point of view, however, we do not expect BIs to keep firms longer than perceived necessary and from a buffering theory perspective we cannot find support for such a hypothesis.

Through the empirical study and the application of a buffering theory lens, we aim to make two contributions. The first being to literature on the effects of entrepreneurship support by testing the extent to which additional amounts of different support forms affect firm performance. The second being to literature on organization buffering by developing the original buffering concept to more adequately reflect the characteristics of entrepreneurship support.

The paper is organized as follows. First, we turn to the concept "business incubator", define and compare it with other support forms of start-ups, and position our study to earlier research on BI support. Second, we develop the theoretical underpinnings of the study by applying and elaborating the buffering concept to capture significant features of entrepreneurship support. Third, the theoretical section leads up to our five hypotheses on buffering effects. Fourth, we briefly describe the empirical setting of BIs in Sweden and present the methodology. Fifth, the results of the study are presented. We end the article with a conclusion and discussion of the results.

2. ADDRESSING BI SUPPORT

2.1 Business Incubators

BIs traditionally have been defined in terms of the basic tangible and intangible support forms they commonly provide: office space and other physical facilities (free or subsidized); shared support services; "coaching" in terms of professional business support and advice; and access to networks

within and outside of the incubator (e.g., Aernoudt, 2004; Allen & McCluskey, 1990; Bergek & Norrman, 2008; Hackett & Dilts, 2004; Rice 2002). Other basic support forms offered in conceptual definitions include BI legitimacy (Lasrado, Sivo, Ford, O'Neal, & Garibay, 2016; Schwartz, 2013) and financing (Hallen, Bingham, & Cohen, 2016; Mozzarol, 2015).

Moving beyond this rudimentary consensus of what constitutes a BI, additional characteristics appear in the comparison with other entrepreneurship support forms. First, BIs provide support in the early phases of ventures' life cycles (Aernoudt, 2004; Grimaldi & Grandi, 2005), during which key milestones typically include developing a primary business plan and acquiring initial customers. Science parks, for example, generally provide support during later, more fully fledged, stages of business development (Bergek & Norrman, 2008). The early-stage support of BIs may, however, be preceded by shorter education programs for entrepreneurs (e.g., "bootcamps").

Second, the support duration of BIs is relatively lengthy compared to other forms—in our study of BIs in Sweden, the average time of incubation was 731 days. The accelerator tends to be presented as a different model for entrepreneurial support, in which support is typically given for 10 weeks or less (Goswami, Mitchell, & Bhagavatula, 2017; Pauwels, Clarysse, Wrighta, & Van Hove, 2016). While the accelerator model implies a rapid "launch pad" approach to help nascent firms take off, the much longer incubation time of BIs enables different and more thorough support approaches.

Third, BIs are formal organizations. This means that BI support is facilitated by the basic elements of organization: rules, monitoring, sanction, membership and hierarchy (Ahrne & Brunsson, 2011). In addition, managerial tools such as leadership (Bolden, Hawkins, Gosling, & Taylor, 2011), information (Bloomfield, 1997), and organizational culture (Alvesson, 2002) are accessible complements or substitutes to organization. Furthermore, organizations concentrate responsibility (Kühl, 2005), in contrast to networks and markets (Brunsson & Jutterström, 2018). The organization form thereby provides both possibilities and responsibility when managing the incubator-incubatee relationship. In comparison, science parks are set up more as informal networks than as formal organizations (Hobbs, Link, & Scott, 2016), decreasing the managerial influence and responsibility. The accelerator tends to be a formal organization like the BI, although sometimes used as a component program within an incubator (Lamine et al., 2018; Mian, Lamine, & Fayolle, 2016). If set up as a formal organization, the much shorter support duration in an accelerator affects the managerial prerequisites for individual firm impact.

All in all, the BI characteristics outlined above—can be summarized as a relatively long process and early stage support with extensive managerial possibilities—not only help to clarify the BI concept. They also underscore the application of a buffering lens as BI managers may use many methods to shelter start-ups during a relatively long incubation time.

2.2 Effects of BI Manager Activities

Scholarly interest in the effects of BI support on start-up performance goes back several decades. Traditionally, the *similarities* between BIs have been stressed, such as in terms of the basic support activities they provide for their incubated start-up firms (Allen & Weinberg, 1988; Hackett & Dilts, 2004; Rice & Matthews, 1995), or in terms of the early phase support of start-ups (Aernoudt, 2004; Hallen et al., 2016; Mozzarol, 2015; Pauwels et al., 2016). This homogenous approach to BIs has produced discussions around whether they represent an efficient way of supporting entrepreneurship and engendered research testing the effects of BI support versus no BI support, mainly with mixed results (e.g., Ferguson & Olofsson, 2004; Schwartz, 2013; Westhead & Storey, 1996).

Another emerging line of literature has addressed the *differences* between BIs and their effects on firm performance. The examined differences have largely been one-dimensional; for example, whether BIs are specialized or diversified (Schwartz & Hornych, 2010), for-profit or non-profit (Carayannis & von Zedtwitz, 2005), what goals they have (Bergek & Norrman, 2008), the degree of intervention they exert over their start-up firms (Lundqvist, 2014), or whether they are affiliated to a university (Lasrado et al., 2016).

In this article, we seek to contribute to the emerging literature on BI differences. Ultimately, "no two incubators are alike" (Allen & McCluskey, 1990, p. 64), implying a formidable task for scholars seeking to identify and theorize about the heterogeneity of BI structures, environments and processes (Amezcua et al., 2013; Grimaldi & Grandi, 2005; Mian, 1997). While the incubator manager has been acknowledged as a key success factor in business incubation (Allen & McCluskey, 1990; Hackett & Dilts, 2004, 2008; Lalkaka, 2002; Lichtenstein, 1992), previous research on BI differences has primarily examined external contingencies and founding directions beyond the daily work of BI managers. Here, we address this mismatch by investigating factors that may be subject to recurrent managerial decisions and changes in the individual BI—and how differences in these factors affect firm performance. Put differently, we apply a multidimensional approach to reflect the many ways a BI may be managed.

The support forms that managers of individual BIs commonly use have been divided into three main components: selection, direct support, and mediation (Bergek & Norrman, 2008). While selection covers the activities associated with choosing incubatees from among the applicants, mediation covers attempts to connect the incubatees to the outside world (and to each other), and business support covers coaching/training activities provided to incubatees. With a similar logic, Amezcua et al. (2013) distinguish between the *"bridging"* and *"buffering"* support activities of BIs, after selection. While bridging implies help with relational connections to actively engage in the environment, buffering implies the opposite: decoupling from the environment in order to engage in formational or developmental activities without having to directly confront specific and general external threats (Barnett, Greve, & Park, 1994; Singh, 1986). Based on a study of 178 university-sponsored BIs in the USA, Amezcua et al. (2013) demonstrated that the effect of overall

buffering on start-up survival varies due to external contingencies—buffering significantly increased the survival rates when the number of competitors was high.

Delimiting this study to buffering activities in which a BI manager may engage, "buffering" covers an extensive set of such possible activities. However, some support factors are both generic and widely used in BI practice, as well as reflected in common definitions of the BI concept, as described above. *Coaching time*, *length of incubation*, *financing support*, *total BI costs* and *BI legitimacy* are such sheltering support factors. Rather than being external contingencies to BIs, or founding directions beyond a BI's current operations, they are subject to management and decisions in the individual BI. As such, they can be expected to produce differences between BIs, making them suitable factors to address within the described frames of this study.

Having delimited the study to generic buffering factors of BIs, we turn to the traditional buffering concept in the next section. We further discuss the effects of buffering, propose an expansion of the concept to capture distinctions of entrepreneurship support, and present our hypotheses.

3. THEORETICAL UNDERPINNINGS AND HYPOTHESES

3.1 Buffering: Original Concept and Developments

The idea of buffering organizations from external pressures has a relatively long history in organizational theory. Thompson (1967) addressed a generic organizing paradox by describing how the technical cores of organizations—i.e., their production processes—need stability to be efficient, while simultaneously, as open systems (Scott, 1998), need to adjust to dynamic and uncertain external demands to be effective. The technical core represents the center of Thompson's model, boundary spanners the outermost layer, with the administrative level in between, responsible for coping with the simultaneous demands of being both flexible and stable. Buffering activities represent a basic response to the dilemma. Thompson (1967) argues that the input and output units of organizations, under norms of rationality, serve to shelter the organizational core from changing extrinsic demands in many ways. Buffering tools on the input side include stockpiling of raw material, forecasting and preventive training, and buffering on the output side includes stockpiling of products in the organization or in reseller organizations. In Thompson's (1967) original concept, production lines were buffered, not the employees working there. Subsequently, scholars included more factors in the buffering analysis, such as employees, quality work, and eventually the entire production system (Schilling & Steensma, 2001).

The buffering concept has been expanded from focusing primarily on technical buffering (Thompson, 1967) to include institutional buffering (Meyer, Scott, & Deal, 1992). Institutional buffering protects the technical core from the demands and dynamics of less tangible external

elements such as general norms, rules and conceptions—still with a purpose of maintaining efficiency (Meyer & Rowan, 1977; Oliver, 1991).

Regarding technical buffering, the question of whether to use a large or small amount of buffering has evoked some debate. A "minimalist" buffering argument has developed, questioning the positive effects of sheltering the technical core from the environment (Borys & Jemison, 1986; Ettlie & Reza, 1992; Macduffie, 1995; Snow, Raymond, & Coleman, 1992). Conversely, maximum exposure to the environment and minimal buffering is recommended. The main arguments for this include that buffering increases costs (also noted by Thompson, 1967), weakens organizational change, and ignores technology developments that mitigate the extrinsic-intrinsic dilemma (Lynn, 2005). Responses to the minimalist arguments include organizational failure to achieve internal order due to chaotic exposure or overexposure to the environment, or provision of buffering that is insufficient to meet internal needs (e.g., Bourgeois, 1981; Damanpour, 1991; Mohr, 1992; Singh, 1986; Sorenson, 2003). Moreover, in a review of research on the effects of technical and institutional buffering in mature organizations, Lynn (2005) primarily found support for the positive effects of both forms, although tests of the former were few.

A rejection of the minimalist argument, however, does not automatically imply support of extensive buffering. Following Lynn (2005), the balancing act of buffering seeks to find an appropriate position between two commonly dysfunctional extremes: total uncertainty (due to no buffering) that harms efficiency, and total insulation (due to excessive buffering) where production is cut off from external change, damaging its ability to respond to environmental forces. Effective mature organizations, Lynn (2005) argues, use the minimum amount of buffering needed to reduce harmful uncertainty, and then reduce buffers when the organization's learning, technology and structure manage to catch up with external demands. In our study of BI buffering, we test whether additional protective support has positive effects on start-up performance, in line with the liability of newness argument (Brüderl & Schüssler, 1990; Shane, 2008; Stinchcombe, 1965).

A most valid question is to what extent the traditional buffering concept, developed for mature large organizations, applies to nascent firms? On the one hand, we have argued that the managerial need to mitigate the extrinsic/intrinsic dilemma represents a profound common organizational denominator regardless of life-cycle phase. The relatively long and early stage support of BIs, as pointed out above, make them suitable study objects when addressing buffering support of nascent organizations. On the other hand, there are significant differences between the traditional buffering concept, and buffering in entrepreneurship support. BI support, and entrepreneurship support at large, calls for an elaboration of the buffering concept.

The traditional buffering concept deals with managing the extrinsic/intrinsic dilemma of an individual organization – what we here refer to as intra-organizational buffering. Large mature organizations tend to be complex and inert, increasing the relevance of intra-organizational buffering (Thompson, 1967, Lynn 2005). Intra-organizational buffering may also be relevant to nascent organizations. Although typically flexible and financially weak, they may well protect their cores by storing input resources critical to production for example.

Proportionally more relevant to start-ups than intra-buffering, however, is the protective support from other organizations that they can be members of, such as BIs. Protective support also come from other organized forms than organizations (Ahrne & Brunsson 2019), such as alliances or networks that may have significant protective effects (Miner, Amburgey, & Stearns, 1990). We refer to organized protection extrinsic to the individual organization as *inter-organizational buffering*—and it may proceed in parallel with intra-organizational buffering activities. Large mature organizations are typically subject to inter-organizational buffering as well, from networks and alliances for example, and from being members of umbrella organizations such as industry associations protecting their interests (Greenwood, 2002, Jutterström 2004).

In addition to being relatively more important to nascent organizations than intra-buffering, inter-organizational buffering of nascent organizations has some specific characteristics, affecting the prerequisites for buffering. We use BI support to highlight three basic differences.

First the organizational prerequisites for BI buffering differ. In contrast to the original buffering concept, BIs seek to buffer other organizations, and are generally set up as umbrella organizations. Umbrella organizations tend to be more difficult to organize, as member-organizations tend to be more independent, resourceful and diverse than member-individuals (Jutterström, 2001, 2004, 2006, Ahrne & Brunsson 2008). However, start-ups are relatively smaller in relation to the BI, than are large mature organizations in relation to their umbrella organizations, affecting the balance of resources and power. Moreover, Thompson argues that large organizations would try to incorporate external activities that disturb their production under norms of rationality (1967, H:4.1). This would be more difficult for BIs as they face many different environments due to protecting many disparate start-ups simultaneously.

Second, the purpose of BI buffering differs. The main reason for buffering is to provide stability for the organizational core, at least short term. In the case of BI buffering the purpose is different: to offer nascent firms help and respite to develop their businesses and the resources they generally lack (organization, routines, a legitimate brand, incomes, knowledge, etc.). The more development during incubation the better. Consequently, BIs seek to buffer organizations that preferably are in fast transformation instead of relatively stable.

Third, the duration of buffering differs. The original concept implicitly assumes a permanent order. This also applies to most forms of inter-organizational buffering of mature organizations. BI support, however, implies a finite order. After a certain period of time, the start-up is supposed to leave the sheltering BI. Buffering support factors may also diminish within the process of incubation.[1] Due to the finite order of BI buffering, the technical cores for the BI to protect are recurrently exchanged, affecting the prerequisites for sheltering support.

[1] In an ongoing qualitative study (interviews and observations) of five BIs in Sweden, we find that start-ups tend to receive less coaching time in later incubation stages, and may also have to start paying a subsidized rent.

To sum up, as a prominent example of inter-organizational buffering, BI buffering has different and, in many respects, more demanding managerial prerequisites than those of intra-buffering in general, as members are organizations (with disparate cores and environments) instead of individuals, the demands for simultaneous protection and transformation is high, and the duration of membership is finite. On the other hand, BI buffering is facilitated by certain aspects. In comparison to buffering activities of mature organizations—irrespective of intra- or inter-organizational buffering—start-ups are less complex, less independent and more dynamic. Regardless of these specificities, the liability of newness (Stinchcombe, 1965) is still prevalent among nascent organizations, and we will develop our hypotheses in the direction that additional sheltering support improve start-up performance.

3.2 Hypotheses

3.2.1 Incubation Time

According to the minimalist argument of buffering, start-ups would benefit from a shorter incubation time, as it would make them more competitive once outside BIs. Another argument is that lengthy incubation spans keep firms alive artificially, regardless of their chances of survival (Hytti & Mäki, 2007). Further, the value of a short incubation time has been argued from a regional development perspective—the accelerated pace of each incubation period would allow a larger number of start-ups in a region to benefit from BI support (Thierstein & Wilhelm, 2001).

However, buffering theory applied to BIs implies that longer incubation times would benefit start-up performance, providing them with increased possibilities to develop their core technologies, innovate and prepare for uncertain environments. Rothaermel and Thursby (2005a, 2005b) studied the development of 79 start-ups from one university-affiliated BI in the USA (with a failure rate of 52 percent over a six-year period). They report that firms with longer incubation times generate higher revenues and are less likely to fail. Similar results are found by Steinkühler (1994), who reported significantly better performance for business firms that had longer stays in BIs. Following this line of argument, we pose the first hypothesis:

> *Hypothesis 1. The longer the incubation time, the higher the performance of the incubated firms.*

3.2.2 Financial Resources

Financial resources such as working capital, budgetary slack, and short-term credit tend to be essential to nascent organizations. Financial resources can be converted into other resources (Sapienza, Autio, George, & Zahra, 2006) and give new ventures respite from immediate external demands, enabling them to engage in innovation and other firm-developing activities (Bradley, Wiklund, & Shepherd, 2010).

Financial buffering implies that BIs help provide or ensure that member firms gain access to financial capital. This can be done directly, such as by the BI investing funds into the member firm. It can also be done indirectly, such as by the BI informing member firms about suitable external grants, subsidies and contact persons and by helping them in the process of submitting applications (Löfsten & Lindelöf, 2001; Mian 1997). Regardless of whether BIs provide financial support directly or indirectly, access to diverse financial resources buffer new ventures from outside forces. As the data set contains relevant data about direct financial support, but not about indirect financial support, we will test for the former. This leads to the following hypothesis:

> *Hypothesis 2. The greater the amount of financial capital provided by the business incubator, the higher the performance of the incubated firms.*

3.2.3 BI Legitimacy

Legitimacy, in terms of how well an organization meets external demands of what a "viable" or "real" organization is, implies an essential value to any organization (Brunsson, 1989; Czarniawska-Joerges & Sevón, 1996; Meyer & Rowan, 1977; Scott & Meyer, 1994). Under norms of rationality, organizations subject to competition will try to gain legitimacy (Thompson 1967). Stinchcombe (1965) observed that organizations are socially stratified, with new organizations typically occupying less attractive strata because of their lack of history and relationships with other organizations. However, start-up firms may use other organizations to gain legitimacy and thereby reduce the liability of newness (Ancona & Caldwell, 1988; Zahra & George, 2002).

BI legitimacy partly arises from the legitimacy of the incubator's affiliations or partners, such as a high-status university (Westhead & Batstone, 1998). As with organizations in general, managers could also potentially increase the BI legitimacy by presenting the BI in line with external demands and popular trends. If a BI has developed a high degree of legitimacy, reflected by a well-known, high-status brand, such a BI will protect the incubated firms with legitimacy that their own nascent brands yet lack (cf. Bradley, Wiklund, & Shepherd, 2011; Miner et al., 1990). There would also be a buffering "spillover" effect of BI legitimacy to the legitimacy of its incubated firms, as the latter could present themselves as part of a high-status BI. This leads to the following hypothesis:

> *Hypothesis 3. The higher the legitimacy of the BI, the higher the performance of the incubated firms.*

3.2.4 Coaching

As described above, business coaching is a standard offering of most BIs (Grimaldi & Grandi, 2005; Hackett & Dilts, 2004; Mian, 1996). Coaching refers to BI personnel interacting with the incubated firms, typically to give advice or to help entrepreneurs develop perspectives on problems and solutions. Coaching also includes a control mechanism of how activities and plans proceed. This support function implies that human capital resources are exposed to incubated firms in the form of the knowledge, creativity, and cognitive abilities embodied in the ability to perform social

behavior and labor to produce economic value (Becker, 1964/1993). Prior research is unclear about the relationship between coaching activities and their subsequent effects on incubated firms (Hackett & Dilts, 2004). However, some scholars suggest that counselling and interaction with incubator management has a positive effect (Hansen, Chesbrough, Nohria, & Sull, 2000), with the amount of coaching time, frequency and readiness of both parties influencing the degree of the success (Rice, 2002). Thus, more overall coaching would help start-ups to develop business and technical know-how, increasing their preparedness for dealing with demanding market environments and reducing their vulnerability. Accordingly, we pose the fourth hypothesis:

> *Hypothesis 4. The greater the amount of coaching provided by the business incubator, the higher the performance of the incubated firms.*

3.2.5 Extent of Overall Buffering

In most countries, not least in Sweden, BIs are typically funded by public-sector money (Lewis, 2001; OECD, 2010). How this funding is used tends to be regulated and monitored by the public-sector funders in Sweden and elsewhere. Due to this regulation and monitoring, we assume that the total funds spent by a BI are proportional to the amount of buffering support they offer their start-up firms (costs for bridging support are generally negligible in comparison). Some BI buffering services are costlier (such as direct financial support) compared to other services (such as coaching). Thus, finding the appropriate mix of buffering support forms is a challenge for BI management. If the overall logic holds that BI total costs reflect the amount of buffering offered to their incubated firms, and if BIs are able to develop the appropriate mix of buffering support, we would expect that BIs that spend more money will also, to a greater extent, buffer their firms from harmful external conditions (cf. Thompson, 1967). Accordingly, we offer the final hypothesis:

> *Hypothesis 5. The greater the total costs of the business incubator, the higher the performance of the incubated firms.*

4. RESEARCH SETTING AND METHOD

4.1 BIs in Sweden: Landscape and Data

Our data consist of the entire population of 1,956 graduated firms between 2005 and 2015. Information come from two different sources, the Vinnova database called “Focus analys”, and the Serrano database. Data regarding BI firms and buffering activities is provided by Vinnova, i.e., the Swedish Innovation Agency that analyzes the data all 50 BIs in Sweden provide annually. Our data include all BIs that were operative during the study period. Each BI as well as each start-up in a BI

has a special and mandatory organizational number, reported to Vinnova and to various governmental entities in Sweden. This 10-digit code makes it possible to track each firm in other data sources. In order to follow each start-up, we use the Serrano database. This is a unique database that aggregates annual data on all corporations in Sweden.[2] It allows us to follow each start-up over time until potentially disbanded. These two data sources allow us to combine data of BI buffering activities from Vinnova with data of subsequent firm development from various control variables like debt leverage, to revenue and job creation on an annual basis.

The average acceptance rate, the number of accepted firms in relation to the total number of applications, is 31 percent (Table 1). Our final panel data consist of 11 cohorts with approximately 178 firms in each, which we follow over time on an annual basis. For example, the 2005 cohort have revenue data from 2006 to 2017 and the 2010 cohort have revenue data from 2011 to 2017 and so on. Our performance data range from 2005 to 2017 with approximately 11,000 observations across the studied period.

In addition, our data allow us to perform a semi-controlled experiment with a twin control group to be able to test an overall buffering effect from BIs. We were able to identify 929 BI start-ups with on average the same starting values as 929 start-ups from the general populations during the time frame. It gives us an opportunity to investigate if the startups graduating from BIs perform better or worse compared to similar firms, started in the same year, with the same initial values in sales, number of employees. BIs typically target innovative firms, and therefore we also used R&D spending and Patent and licenses expenditure the first year. It will not prove that there is a buffering effect however but give an indication on whether there is an overall BI effect on subsequent firm performance or not. We now turn to our variables and measures.

[2] The Serrano database is an aggregation of data from Statistics Sweden, the Swedish Companies Registration Office, and the Swedish Patent and Registration Office. It is mandatory for all Swedish firms to annually report information about performance, etc.

Table 1. Descriptive data population of business incubators in Sweden

Incubator (Anonymous)	Number of accepted firms	Disbanded	Graduated	Average days in IB	Accept rate
1	3	1	2	716	0.70
2	53	19	43	1179	0.30
3	13	9	10	851	0.15
4	74	13	55	897	0.44
5	81	31	75	877	0.16
6	7	1	6	1016	0.25
7	27	0	26	420	0.17
8	107	34	92	647	0.24
9	92	31	67	837	0.14
10	39	4	35	981	0.96
11	2	2	2	623	0.16
12	2	2	2	558	0.23
13	30	5	24	682	0.15
14	41	5	35	576	0.15
15	57	8	44	908	0.38
16	46	8	37	1393	0.35
17	81	5	76	655	0.13
18	97	1	96	628	0.13
19	53	22	29	797	0.20
20	43	5	35	1060	0.39
21	54	5	46	787	0.09
22	51	8	39	785	0.45
23	28	0	28	498	0.11
24	57	13	41	848	0.25
25	17	2	13	1440	0.26
26	22	4	5	368	0.18
27	89	19	63	924	0.12
28	22	1	16	604	0.28
29	19	1	13	996	0.13
30	105	11	94	601	0.90
31	61	35	23	634	0.13
32	25	1	9	684	0.37
33	18	4	14	625	0.61
34	36	10	19	1129	0.33
35	27	5	20	407	0.10
36	94	22	69	870	0.12
37	13	2	1	826	0.19
38	33	6	20	1138	0.47
39	25	1	24	226	0.41
40	63	14	49	1055	0.29
41	53	8	42	904	0.13
42	152	20	120	449	0.14
43	40	3	35	397	0.16
44	6	0	6	86	0.28
45	4	1	0	287	0.25
46	23	2	16	914	1.62
47	124	12	101	950	0.25
48	223	25	189	440	0.13
49	7	0	6	376	0.45
Total	2439	441	1956	746	0.31

Includes all that started in the BI both disbanded and graduated.

4.2 Variables and Measures

4.2.1 Dependent Variables

The first dependent variable is annual *Revenue* (mean 2355.1 TSEK, Std. Dev. 9105.6 TSEK) (Amezcua, 2010; Dettwiler, Lindelöf, & Löfsten, 2006; Lindelöf & Löfsten, 2002; Mian, 1997) reported annually from 2005 to 2017 in thousands of Swedish Krona[3] (TSEK). The second is annual *Job creation* (mean 2.6 full time employees, Std. Dev. 7.5) (Amezcua, 2010; Dettwiler et al., 2006; Lindelöf & Löfsten, 2002; Mian, 1997; Udell, 1990). The data consist of the annual number of full-time employees from 2005 to 2017. Revenues and job creation are measures that correspond well with how start-up firms develop—individually or collectively—as they capture wealth creation, economic development, and market acceptance (Barbero, Cassillas, Ramos, & Guitar, 2012; Mian 1997). Accordingly, they provide relevant indicators of how the BI firms we study are performing. We do not include firm survival, as it has been criticized as a performance measure (Siegel, Westhead, & Wright, 2003).

4.2.2 Independent Variables

The literature review gives support for a conceptual buffering effect; however, it lacks in previous and well-tested empirical measurements of various forms of buffering. We therefore develop a range of proxies, based on previous research, seeking to capture various dimensions of buffering as described above. Our first variable is *Time buffering (Tim_buf).* It captures the length of the time period which the incubated firms spend under the protective wing of the BI. Each BI report accepts dates and graduation dates. We use the average number of days (mean 731.2 days, Std. Dev. 528.8) in each incubator as a proxy for time buffering (cf. Rothaermel & Thursby, 2005a, 2005b). The second independent variable captures *financial buffering (Fin_buf)*, i.e., the protection of incubated firms from their environments, by injecting funding from the BI into incubated firms (mean 9701.4 TSEK, Std. Dev. 15531.9 TSEK). Third, *Legitimacy buffering (Leg_buf)* is captured through the annual average percentage of accepted projects out of the total annual number of applications to the BI. The more applicants, the higher the legitimacy of the BI, and thereby the greater the degree of protection (buffering) for the incubated firms and their nascent brands (mean 0.277, Std. Dev 0.817). Fourth, coaching and *coach buffering (Coa_buf)* represent a core organizational task of a BI. It is related to how organizational members perceive the viability of their collective tasks, as well as the procedural and technological complexity of completing collective tasks (Campbell, Borge, & Olen, 1988). We use the average number of full-time equivalent coaches per BI as a proxy for coach buffering (mean 4.12 coaches, Std. Dev. 3.09). The final independent variable captures the overall amount of BI resources, *total cost buffering (Cos_buf)*. We use the *average annual cost* of each BI to test for this. Greater overall costs would reflect that the BI provides more (or economically more highly valued) coaching activities, offices and office equipment, brand-building activities and other related areas of support (Evans & Davis, 2005; March & Sutton, 1997). A high correspondence between costs and amount of direct support would typically be the case when BIs are not run on a for-profit basis but must balance incomes and costs, as is almost

[3] 10 SEK is approximately equivalent to 1 EUR, about the average rate during the studied timespan.

exclusively the case in Sweden. Each BI reported the total annual costs in thousands of Swedish Krona (TSEK) (mean 7931.2 TSEK, Std. Dev. 4776.8 TSEK).

4.3 Controls

Our data provide us with a limited set of controls. However, we included the following controls: *Industry (Ind_1-Ind_12)* included a dummy coded industry variable with the 13th category as the hold out category (using "Statistics Sweden 13" overall industry classification) 1 = Energy & Environment, 2 = Materials, 3 = Industrial goods, 4 = Construction industry, 5 = Shopping goods, 6 = Convenience goods, 7 = Health & Education, 8 = Finance & Real estate , 9 = IT & Electronics, 10 = Corporate services, 11 = Other, 12 = SNI07 missing. We also used *Graduation year (Gra_year)* (mean 2012.6, Std. Dev. 3.0) to control for firm age in the regression models. Then we controlled for origin of the venture opportunity. The literature has related the presence of universities to the activities of proximate BIs (Ratinho & Henriques, 2010; Rothschild & Darr, 2005). Universities and other research institutions may offer incubatees access to advanced technology laboratories and other technical resources, and may also offer access to talent such as faculty, staff and students (Hackett & Dilts, 2004; Koh, Koh, & Tschang, 2005; Phan et al., 2005; Phillips 2002). We therefore controlled for the origin of the business idea of the incubated firms in our data with three dummy variables: *Research based ideas (Res_ori), Student generated ideas (Stu_ori)* and *Ideas coming from the business community (Bus_ori).* The hold out group is *other*. Further, we controlled for firm level factors that may influence firm performance. *Leverage ratio (Lev_rat)*, measured as the ratio between debt and total assets, was included to control for firm debt level (mean 3.9, Std. Dev. 21.7) and *Liquid assets (Lic_ss)* captured as cash and cash equivalents divided by current liabilities (mean 4.6, Std. Dev. 18.3). We also controlled for innovativeness through *R&D spending (R&D_spe)* (mean 700.2, Std. Dev. 3894.4 TSEK) and spending on *Patents and licenses (Pat_lic)* (mean 134.1, Std. Dev. 1353.3 TSEK).

4.4 Analyses

We suspect that differences across individual firms may have an influence on firm performance over time. Based on this we use a set of hierarchical generalized least squares (GLS) random effect models starting with our baseline control model, then adding explanatory variables in subsequent models. This was also supported by a Breusch-Pagan Lagrange multiplier (LM) (Prob>chi2 = 0.000) and a Hausman test that resulted in a Prob>chi2 = 0.233 which suggests a random effect model vs. the alternative fixed effects (see Greene, 2008). Descriptive results in Table 3 indicate a correlation between Coach buffering and Total cost buffering. We therefore chose to use a stepwise approach where we included each independent variable one by one. As we use population data, we only report the true value of the unstandardized Coefficients together with Robust Standard Errors.

5. RESULTS

Table 2 presents descriptive results and Table 3 correlations.

Table 2. Descriptive population results, observations, mean, standard deviation, min and max

Variable	Obs	Mean	Std. Dev.	Min	Max
Revenue	20,992	2,355.12	9,105.59	0.00	46,0419.00
Employees	21,981	2.60	7.54	0.00	264.00
Tim_buf	28,800	731.02	528.77	14.00	3,987.00
Fin_buf	13,691	9,701.38	15,531.92	0.00	145,898.00
Leg_buf	14,987	0.28	0.82	0.01	0.96
Coa_buf	31,847	4.12	3.09	0.00	9.00
Cos_buf	31,929	7,931.18	4,776.75	0.00	34,400.00
Gra_year	27,600	2,012.63	2.98	2005.00	2,015.00
ind1	92	1.00	0.00	0.00	1.00
ind2	216	1.00	0.00	0.00	1.00
ind3	1,695	1.00	0.00	0.00	1.00
ind4	2,297	1.00	0.00	0.00	1.00
ind5	363	1.00	0.00	0.00	1.00
ind6	3,820	1.00	0.00	0.00	1.00
ind7	336	1.00	0.00	0.00	1.00
ind8	5,098	1.00	0.00	0.00	1.00
ind9	1,107	1.00	0.00	0.00	1.00
ind10	5,915	1.00	0.00	0.00	1.00
ind11	492	1.00	0.00	0.00	1.00
ind12	176	1.00	0.00	0.00	1.00
Res_ori	34,488	0.21	0.40	0.00	1.00
Stu_ori	34,488	0.11	0.31	0.00	1.00
Bus_ori	34,488	0.56	0.50	0.00	1.00
Lev_rat	19,142	3.90	21.75	-1.00	1,450.00
Liq_ss	20,148	4.55	18.31	-3.28	1,168.67
RnD_spe	20,950	700.33	3,894.41	-165.00	166,562.00
Pat_lic	20,952	134.07	1,353.33	0.00	113,135.00

Table 3. Descriptive results, correlations

	Variable	1	2	3	4	5	6	7	8	9	10	12	13	14
1	Revenue													
2	Employees	0.56												
3	Lev_rat	0.01	0.02											
4	Liq_ss	-0.04	-0.04	-0.02										
5	RnD_spe	0.06	0.13	0.01	-0.03									
6	Pat_lic	-0.01	0.08	0.00	0.00	0.05								
7	Tim_buf	-0.11	-0.09	-0.03	-0.02	0.03	0.00							
8	Res_ori	-0.03	-0.06	-0.02	0.03	0.05	0.03	0.12						
9	Stu_ori	-0.06	-0.03	-0.02	0.05	-0.01	-0.01	-0.02	-0.15					
10	Bus_ori	0.04	0.03	0.00	0.00	0.01	-0.04	-0.13	0.01	-0.03				
11	Coa_buf	-0.07	-0.07	0.01	0.03	0.02	0.00	0.31	0.04	0.03	-0.02			
12	Cos_buf	-0.08	-0.05	0.00	0.00	0.03	0.01	0.46	0.08	0.03	0.00	0.62		
13	Leg_buf	0.00	0.00	-0.01	-0.01	-0.01	-0.01	0.00	-0.01	0.00	-0.03	0.11	-0.10	
14	Fin_buf	-0.04	-0.01	0.06	0.00	0.05	0.01	0.15	0.03	0.05	0.03	0.25	0.44	-0.03
15	Gra_year	0.05	-0.06	0.00	0.03	-0.13	-0.01	0.31	0.05	-0.04	-0.04	0.14	0.11	-0.01
16	Ind 1	-0.02	-0.01	-0.01	0.01	0.09	0.00	-0.05	-0.02	0.04	0.03	-0.02	-0.03	-0.01
17	Ind 2	0.03	0.01	-0.01	0.00	0.10	0.00	0.00	0.02	-0.01	0.02	0.01	0.00	-0.01
18	Ind 3	0.05	0.02	0.05	-0.02	0.06	0.09	-0.01	-0.06	-0.03	0.04	-0.02	-0.03	0.00
19	Ind 4	-0.02	-0.03	0.05	-0.02	-0.07	-0.01	-0.07	-0.10	0.00	0.08	0.02	-0.03	0.02
20	Ind 5	-0.02	-0.03	0.00	0.13	-0.03	-0.01	0.00	0.01	-0.02	0.02	0.02	-0.01	-0.01
21	Ind 6	0.04	0.03	0.00	0.03	0.01	0.04	0.13	0.28	-0.11	-0.16	0.03	0.04	0.01
22	Ind 7	-0.03	-0.04	0.00	-0.01	-0.01	0.00	0.00	-0.03	0.04	0.00	-0.01	0.00	-0.01
23	Ind 8	0.00	0.03	-0.01	0.00	0.06	-0.03	0.01	-0.02	-0.01	0.01	-0.04	0.02	0.00
24	Ind 9	-0.01	-0.01	-0.01	0.00	-0.04	-0.02	0.00	-0.08	0.10	0.05	-0.04	-0.02	-0.01
25	Ind 10	-0.04	-0.03	-0.03	-0.02	-0.05	-0.03	-0.02	-0.07	0.06	0.02	0.04	0.03	0.00
26	Ind 11	-0.03	-0.03	-0.01	0.00	-0.03	-0.01	-0.04	-0.03	0.04	0.00	-0.03	-0.03	-0.01
27	Ind 12	-0.02	-0.03	-0.01	0.00	-0.02	0.00	-0.02	0.04	0.00	0.00	0.01	0.00	-0.01

		15	16	17	18	19	20	21	22	23	24	26	27
16	Gra_year	0.03											
17	Ind 1	-0.02	-0.07										
18	Ind 2	-0.01	-0.02	-0.01									
19	Ind 3	0.01	0.07	-0.02	-0.03								
20	Ind 4	-0.02	0.02	-0.03	-0.04	-0.09							
21	Ind 5	-0.02	0.02	-0.01	-0.01	-0.03	-0.03						
22	Ind 6	0.01	0.01	-0.04	-0.05	-0.13	-0.14	-0.05					
23	Ind 7	-0.02	0.03	-0.01	-0.01	-0.04	-0.04	-0.01	-0.06				
24	Ind 8	0.01	-0.13	-0.05	-0.07	-0.17	-0.18	-0.06	-0.27	-0.07			
25	Ind 9	-0.02	0.05	-0.02	-0.02	-0.05	-0.06	-0.02	-0.09	-0.02	-0.11		
26	Ind 10	0.02	0.02	-0.05	-0.07	-0.18	-0.20	-0.07	-0.30	-0.08	-0.37		
27	Ind 11	-0.02	-0.02	-0.01	-0.02	-0.04	-0.04	-0.01	-0.07	-0.02	-0.08	-0.09	
28	Ind 12	0.03	0.00	-0.01	-0.01	-0.02	-0.02	-0.01	-0.03	-0.01	-0.04	-0.04	-0.01

To test the hypotheses, we turn to the results of our random regression results, exhibited in Table 4. Model 1–6 in Table 4 utilizes *revenue* (in thousand SEK, i.e. TSEK) as the dependent performance variable. Model 1 is our baseline model with control variables. Largest effects are found for industry 3, industrial goods, that have positive effects on revenue (Coef=4606.17). Student and research-based firms generate lower levels of revenue across time and business-based firms generate higher levels of revenue across time. Quick ratio (Lic_ss) has a negative effect on revenue and R&D-spending has a positive effect on revenue.

Model 2 reports a small negative effect (Coef=-0.11) from time buffering. One more day in the incubator leads to 0.11 TSEK less revenues per start-up and year, implying that a month longer incubation time would decrease annual revenues with 3.3 TSEK— we classify this as a neutral (close to zero) effect of additional time buffering. Similarly, Model 3 reports that there is no effect from additional financial buffering (Coef=0.00). Model 4 reports a positive effect of additional legitimacy buffering on subsequent start-up revenue (Coef=28.66). The correlation implies that accepting a larger share of the applicants into the BI (reflecting a lower competition to get accepted, and thereby a lower BI legitimacy) has a positive effect on the subsequent start-up revenue of 28.66 TSEK per year. This way of testing additional legitimacy explains the positive coefficient. Model 5 reports a positive effect of more coach buffering (Coef=56.12). Increasing the number of one full-time employed coach by one increases the annual subsequent firm revenue with 56.12 TSEK. Model 6 shows a positive effect of more cost buffering (Coef=0.11). This implies that if a BI increases its overall costs with 500 TSEK (equivalent to 50,000 EUR) per year—about a six percent cost increase of the annual mean per BI in our population—it would increase subsequent annual revenues with 55.0 TSEK per start-up.

Table 5 reports Model 7–12 with *number of employees* as the dependent variable. Model 7 is our baseline model for the control variables and shows results like Model 1. Student and research-based firms have a negative effect on the number of employees, and business-oriented firms have a positive effect. Some of the industry variables also have a positive effect, for example, industry 3 (Coef=1.95).

The results in Table 5 strengthen the over-arching pattern of results from Table 4, although the estimates are much lower in Table 5 due to the dependent variable range. Model 8 and 9 report that additional Time buffering, and Financial buffering have no effect in our model on job creation. Model 10 shows that additional Legitimacy buffering has an effect close to zero on job creation (Coef=0.006), we assess this as a negligible positive effect. Model 11 reports a positive effect of additional Coach buffering (Coef=0.062), one more full-time BI coach equivalent increases subsequent start-up performance with 0.062 jobs per year. Finally, Model 12 reports that additional total cost buffering has a close to zero effect on subsequent job creation.

Our regression results (Table 4 and 5) indicate that additional time in the incubator has negligible effects on both revenues and job creation. Thus, we reject *Hypothesis 1*. The same pattern holds for financial buffering; there is a close to zero effect of additional financial buffering on revenues and job creation. Accordingly, *Hypothesis 2* is rejected. Regarding legitimacy, there is a positive

effect of additional legitimacy buffering on revenues, and a neutral (close to zero) effect on job creation. Thus, we find no support for *Hypothesis 3*[4]. However, we find empirical support for *Hypothesis 4*. More coaches have a substantial positive effect on subsequent firm revenue, and a small positive effect on job creation. And last, we find mixed support for *Hypothesis 5*. Increasing overall BI costs—implying a more resource-rich setting for the incubated start-ups under norms of rationality—has a positive effect on revenues, but no effect on job creation.

All in all, the results highlight that buffering factors affect subsequent start-up performance diversely, and that additional buffering has different effects on different goals. Overall, our results range from substantially positive to neutral effects of additional buffering.

Table 4. Random effect model, Revenue

	Base Model		Time Buffering		Financial Buffering		Legitimacy Buffering		Coach Buffering		Total Cost Buffering	
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Ind 1	2405.41	2616.74	2420.37	2616.36	2038.24	1714.54	1609.29	1460.56	1295.14	2335.31	1181.21	2315.50
Ind 2	1652.47	2089.42	1663.58	2086.96	1746.45	790.38	1538.64	765.29	550.96	1766.67	508.13	1744.35
Ind 3	4606.17	2691.52	4601.57	2691.60	2612.68	1048.16	3347.37	1405.83	4473.45	2661.94	4520.95	2651.70
Ind 4	959.04	2133.85	959.67	2133.02	713.99	586.42	617.93	562.73	-150.93	1800.84	-183.75	1775.74
Ind 5	490.71	2082.04	485.02	2082.81	547.31	588.87	402.18	560.38	-706.83	1742.37	-769.46	1719.64
Ind 6	724.38	2028.85	741.92	2025.68	1735.67	681.45	1473.15	627.15	-359.34	1697.79	-443.13	1673.24
Ind 7	119.30	2039.99	115.05	2040.22	249.20	595.00	120.80	575.46	-948.21	1691.54	-992.51	1668.86
Ind 8	578.02	2117.75	582.42	2115.85	1209.54	596.84	1120.83	577.68	-490.84	1703.86	-535.22	1680.13
Ind 9	724.16	2117.54	731.75	2114.01	1300.89	801.44	1199.73	789.37	-871.04	1709.20	-944.92	1685.42
Ind 10	961.24	2074.54	969.04	2071.81	862.44	555.27	753.38	536.87	-573.80	1701.26	-609.21	1677.68
Ind 11	-301.12	2044.83	-297.34	2043.19	552.32	580.47	445.52	559.70	-1336.31	1704.56	-1411.87	1682.44
Ind 12	-625.70	2063.18	-630.17	2063.73	116.05	615.49	-55.20	584.37	-1767.83	1701.34	-1777.78	1680.10
Gra_year	-86.42	52.58	-83.73	52.15	48.47	92.53	40.04	88.67	-113.47	49.21	-131.86	51.46
Stu_ori	-686.85	373.44	-684.51	372.80	-826.47	223.48	-760.26	219.95	-819.97	243.54	-889.54	249.27
Res_ori	-973.31	292.81	-957.74	293.76	-794.74	360.01	-767.52	346.88	-864.39	253.25	-895.56	256.56
Bus_ori	658.64	301.68	650.60	304.73	437.66	315.21	400.77	306.70	304.16	230.15	293.02	230.59
Lev_rat	1.73	4.32	1.72	4.32	-2.29	2.72	-2.77	2.71	1.48	4.31	1.50	4.28
Liq_ss	-6.21	2.30	-6.23	2.31	-4.03	2.06	-4.17	2.04	-6.01	2.32	-5.88	2.36
RnD_spe	0.12	0.05	0.12	0.05	0.35	0.18	0.33	0.17	0.11	0.05	0.11	0.05
Pat_lic	0.88	0.86	0.88	0.86	-0.02	0.03	0.02	0.07	0.03	0.02	0.02	0.02
Tim_buf			-0.112	0.220								
Fin_buf					-0.002	0.002						
Leg_buf							28.660	26.126				
Coa_buf									56.118	26.764		
Cos_buf											0.108	0.029

[4] The results suggest that BIs that accept a higher rate of applicants have a positive effect on firm performance.

Obs	12,012	12,010	3,479	3,768	10,953	11,005
N	1,956	1,956	1,050	1,105	1,912	1,912
R-sq:	0.026	0.026	0.024	0.023	0.023	0.021

Table 5 Random effect model, Employment

	Base Model		Time Buffering		Financial Buffering		Legitimacy Buffering		Coach Buffering		Total Cost Buffering	
	Model 7		Model 8		Model 9		Model 10		Model 11		Model 12	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Ind 1	0.71	1.50	0.73	1.50	0.08	0.59	0.29	0.48	0.68	1.50	0.60	1.49
Ind 2	0.20	0.91	0.22	0.91	1.58	0.60	1.46	0.55	0.04	0.90	0.01	0.89
Ind 3	1.95	1.36	1.95	1.36	2.85	1.05	2.91	1.05	2.61	1.48	2.64	1.46
Ind 4	-0.32	0.81	-0.32	0.81	0.67	0.40	0.72	0.40	-0.36	0.79	-0.38	0.77
Ind 5	0.61	0.86	0.62	0.86	0.36	0.48	0.38	0.46	0.68	0.86	-0.73	0.84
Ind 6	-0.21	0.86	-0.23	0.87	1.56	0.73	1.37	0.68	-0.12	0.86	0.06	0.84
Ind 7	-0.42	0.78	-0.43	0.78	0.16	0.45	0.12	0.44	-0.43	0.76	-0.47	0.74
Ind 8	0.10	0.79	0.11	0.79	1.63	0.43	1.65	0.43	0.21	0.76	0.19	0.74
Ind 9	-0.16	0.83	-0.17	0.83	1.40	0.50	1.46	0.50	-0.03	0.80	-0.04	0.77
Ind 10	-0.09	0.82	-0.08	0.82	0.84	0.43	0.90	0.42	-0.29	0.79	-0.31	0.77
Ind 11	-1.16	0.81	-1.16	0.81	0.37	0.45	0.32	0.43	-1.22	0.79	-1.27	0.78
Ind 12	-1.76	0.78	-1.77	0.78	-0.61	0.45	-0.58	0.44	-1.76	0.77	-1.78	0.75
Gra_year	-0.15	0.06	-0.15	0.06	-0.13	0.08	-0.12	0.08	-0.18	0.07	-0.19	0.07
Stu_ori	-0.18	0.27	-0.17	0.27	-0.35	0.30	-0.26	0.30	-0.26	0.26	-0.32	0.27
Res_ori	0.78	0.32	0.76	0.29	-0.95	0.40	-0.90	0.38	0.76	0.33	-0.79	0.33
Bus_ori	0.30	0.31	0.29	0.31	0.48	0.37	0.44	0.35	0.22	0.31	0.21	0.31
Lev_rat	-0.01	0.00	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.01	0.00
Liq_ss	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.01	0.00	-0.01	0.00
RnD_spe	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pat_lic	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Tim_buf			-0.000	0.000								
Fin_buf					0.000	0.000						
Leg_buf							0.006	0.013				
Coa_buf									0.062	0.026		
Cos_buf											0.000	0.000
Obs.	12,012		12,012		3,480		3,769		10,955		11,007	
N	1,956		1,956		1,050		1,105		1,912		1,912	
R-sq:	0.049		0.050		0.040		0.049		0.048		0.046	

6. CONCLUSION AND DISCUSSION

Theorizing around business incubators and their internal managerial processes has recently gained momentum. In order to contribute to literature on the effects of BI support, we have investigated how various BI basic support forms affect subsequent start-up performance. The studied support forms share the basic fundament of the original concept of buffering (Lynn, 2005; Thompson, 1967)—they shelter nascent and vulnerable firms from demanding, changing and potentially harmful environments. In the remainder of this article, we offer conclusions and discuss our two suggested contributions from the study. The first pertains to the directions and differences in how various BI buffering support forms affect subsequent firm performance, in terms of revenues and job creation. The second pertains to our proposed development of the buffering concept, contributing to literature on organizational buffering.

6.1 Buffering: mainly positive or neutral effects

As described in the theory section, the effects of buffering have been debated. The use of buffering (Thompson, 1967) has met substantial criticism, with the counterproposal of minimizing buffering and maximizing exposure. While studies of buffering effects remain scarce, there is, however, some support for the positive effects of buffering (Lynn, 2005), also in nascent organization stages (e.g., Rothaermel & Thursby, 2005a, 2005b; Steinkühler, 1994). Overall, the results of our study point in the same direction. Additional amounts of some buffering factors increased subsequent firm performance, but we found only one reversed effect of more buffering. This study thereby generally *disagrees* with the minimalist buffering argument in the case of nascent firms. Importantly, however, increased amounts of certain buffering factors had neutral (close to zero) effects on start-up performance, relevant results as well. (In our discussion of the results (6.3), we will address the variety of effects further with an additional aggregate test).

To reflect the variety of effects, our results can be classified in different effect sizes or "magnitudes". A *first magnitude* results include that additional coach buffering and total cost buffering both have a positive effect on subsequent firm revenues. Here we also include additional legitimacy buffering that also has a positive effect on subsequent firm revenues. Our *second magnitude* results include that additional coach buffering has a smaller positive effect on subsequent job creation. Here we also include the buffering factors where additional amounts of support have close to zero effects on firm performance—additional time in the incubator and additional financing have negligible effects on both revenues and job creation, and increased legitimacy and increased total costs have a close to zero effect on job creation. Altogether, additional support had more substantial effects on start-up revenues than on job creation.

The different effects of buffering support forms stress the relevance of a BI management perspective. Managers not only have to distinguish between functional and dysfunctional buffering

(Lynn, 2005) but also between functional buffering forms. These trade-offs not only affect the incubated firms but also the individual BIs. As stated, BIs tend to be evaluated on the performance of their start-ups, and often invest in them as well. A relatively nuanced management perspective on BI support—our ambition with this paper—contrasts with organizational literature that axiomatically stresses positive effects of resource-rich environments on start-up performance (e.g., Castrigiovanni, 1996; Starbuck, 1976). Buffering is a complex issue, meriting increased theoretical and managerial understanding of its forms and mechanisms. In this respect, our study of how BI buffering types affect start-up performance complements previous studies of how BI buffering effects depend on external contingencies (Amezcua et al., 2013).

6.2 Buffering: From Mature to Nascent Stages of Organizations

Compared to mature organizations, buffering of nascent organizations is significantly different. In this paper, we have identified a need to expand the traditional buffering concept in order to help distinguish the specificities of start-up support—suggestively by including and discussing the dimensions of mature firms vs. nascent firms, and of intra- vs. inter-organizational buffering. BIs seem to have generic characteristics that differ from intra-buffering, and partly also from mature organizations. In an initial attempt to address such differences we have argued that they include: the *organizational prerequisites* for buffering, the *purpose* of buffering, the *duration* of buffering, and the *comparative relevance* of intra-buffering vs. inter-buffering. As pointed out, these differences seem to restrict and complicate BI buffering of nascent firms, in relation to the original concept (Thompson, 1967).

The "liability of newness" is a widespread problem faced by nascent organizations in contemporary society (Brüderl & Schüssler, 1990; Shane, 2008; Stinchcombe, 1965; Zacharakis et al., 1999). The now globally diffused BI model of start-up support represents an organized response to this challenge. It is not just a resource-rich response with binary effects, but a response where managerial diversity count. By distinguishing and testing different BI buffering forms, we have displayed some of the substantial managerial decisions that can be considered, including both technical (Thompson, 1967) and institutional buffering (Meyer & Rowan, 1977; Meyer et al., 1992).

6.3 Discussion – and an additional test

Although overall in the positive direction, the demonstrated variety of effects of different BI buffering forms calls for further discussion. Due to these differences in effects in our study, we included a posterior analysis where we compare our sample of BI firms with a sample of Swedish firms not being part of a BI program. Accordingly, we added an aggregated binary approach for testing the value of BI support of nascent firms, i.e. the approach we initially diverged from with the differentiated study of this article.

The aggregated value of BI buffering was tested on the same dependent variables: subsequent start-up revenues and job creation. Our control group includes firms that started in the same year, outside of any BI. In addition, we matched these firms on annual revenue (Thousand SEK), number of full-time jobs, R&D spending (Thousand SEK) and patent value (Thousand SEK) during the starting year. We are not able to match the factors exactly due to minor differences in relation to results. For example, table 6 shows that we were not able to find an exact match of the 63 KSEK as no other firm in the population starting that year had the exact same revenue. In those cases, we took the closest value in the population. We found no statistical difference between the two groups (BI group n=923, Control group n=923) in starting values. We then compared the development of the firms over a 10-year period to investigate if there is an aggregate BI effect on firm performance across time.

Figure 1 and figure 2 describe the development across time. We can see that there is a substantial positive BI effect on subsequent firm performance (IBO) in comparison to non-BI firms (Control), both in terms of revenue and job creation across time.

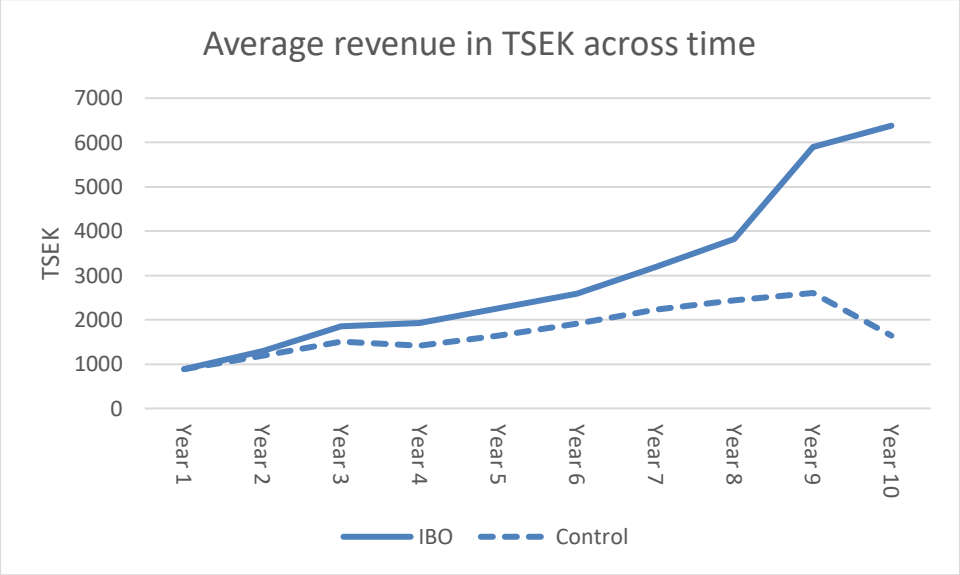

Figure 1. Comparing IB startups growth in revenue across time with non-BI startups.

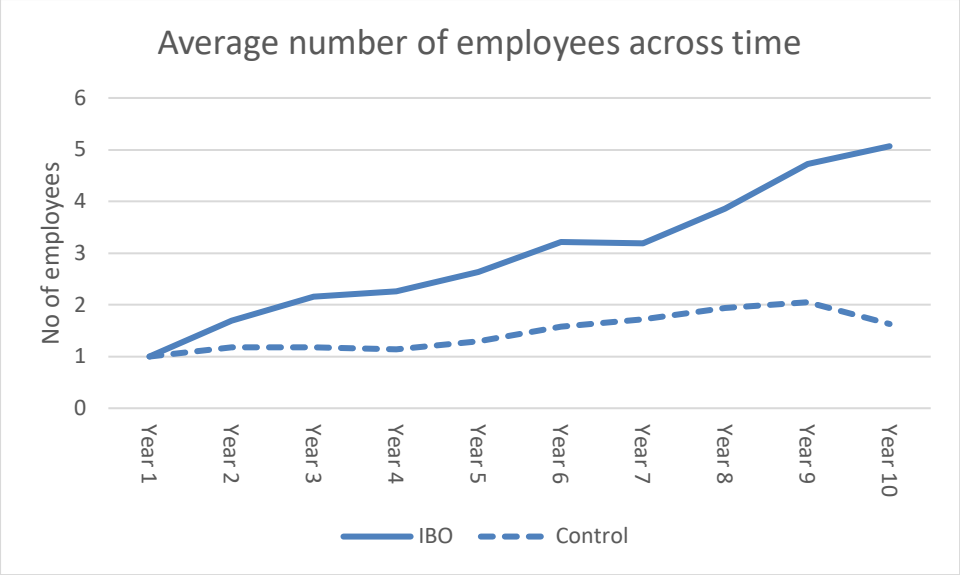

Figure 2. Comparing IB startups growth in number of full-time employees across time with non-BI startups.

Over time, the data demonstrate that BI firms in Sweden grow significantly more compared to the control group, in terms of revenues and number of employees. An average revenue around 6.3 MSEK per year, and an average of five employees after 10 years indicate a substantial positive effect of BIs. Again, we see a substantial positive effect of BI buffering, reflecting the main part of BI support activities. Notably, with this additional binary test, we cannot separate the effects of bridging activities, i.e. activities that helps connect the incubated firms to their environments (Amezcua et al 2013), from buffering effects. Moreover, we do not extend the discussion into an overall evaluation of BIs based on their total benefits and costs—the value of BIs on a societal level is, to our view, a complex and different discussion.

6.4 Limitations and Further Research

The massive expansion of organized support forms for start-ups has substantially changed the prerequisites for numerous entrepreneurs worldwide. The support forms differ in terms of organization and management, calling for further studies of this diversity including its explanations and effects. Although we have studied the entire population of BIs in Sweden, and the subsequent performance of all their graduated firms, the study is geographically limited. Similar studies in other countries and areas with different cultures (Hofstede, 1997) would be interesting points of comparison. Further, the effects of BI buffering support could potentially vary due to the line of business. Although BIs in Sweden to date typically have had a technology focus, there are other types of start-ups within BIs in Sweden that may be used for comparison—for example, addressing

the question of whether high-tech start-ups need longer incubation time than other lines of business to increase subsequent performance. We can only agree that true causality in social sciences is very hard to reach except in a controlled highly delimited experiment. However, we tried to isolate the effects through our population study, we introduced and controlled for a set of alternative explanations, and we relied on an established theory foundation to derive our hypotheses.

Moreover, the mainly modest buffering effects on job creation in the study deserve a comment. Swedish BIs do not create a massive amount of jobs *within* their firms in the studied time span, and we suppose the situation is similar in other countries. This could depend on an outsourcing, networking and partnership tendency of start-ups to manage expansion. But it could also be an opportunity for more open questions and future research to address. Similarly, the differences between technological and institutional buffering effects are, to our view, somewhat surprising, and could be subject for further inquiry. Concerning our second suggested contribution—on the expansion of the buffering concept to identify the specificities of nascent firm support—we see potential for further development and discussion. Relevant topics to address include the relative importance of intra- vs. inter-organizational buffering, as well as comparisons of different buffering forms and their effects on start-ups.

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