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INNOVATION CAPACITY: A FIRM LEVEL RESPONSE TO SUBSIDY ACTIVITY IN A NATIONAL SETTING

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ABSTRACT

The purpose of this paper is to investigate the effect subsidies have on firm-level innovation across Eastern European and Central Asian countries and to assess if these effects move to increase firm-level capability. Specifically, we investigate the extent subsidy programs act to shape and guide firm-level innovative capabilities and how the presence of such capabilities affect operational performance. We employ a Probit model to investigate firm-level innovation and OLS regression to assess how subsidies, in association with the decision to adopt foreign technology and in-house research and development (R&D) affect firm productive capacity. Results suggest subsidies promote innovation and that when these subsidies are contemporaneously considered in the face of the decision to adopt foreign technologies and employ in-house R&D, firm-level capacity increases.

INTRODUCTION

The main purpose of this paper is to link the effect of state subsidies on firm-level innovation across Eastern European and Central Asian countries. Further, we investigate if these effects move to increase firm-level capability. Similar to Chinese firms, a distinguishing feature of these firms from Western firms is their access to state sponsored financial subsidies (Lee, Walker, & Zeng, 2014). As the economies in this region move from a state centrally planned market to a market-oriented economy, the various states in this region have provided subsidies to promote innovation and firm-level capability. Part of the tension surrounding this query concerns the role subsidies and related control systems play in providing information to guide firm-level innovation activities. Otley (2003) suggests control systems and their content may inhibit innovation, while others suggest it is not the content but rather, how the ensuing information is used that determines the extent a control system benefits firm-level operations (Simmons, 1995). O'Connor, Vera-Muñoz, & Chan (2011) tend to agree and find this relation is more acute for emerging-economy firms that seek a different type of information in order to grow, especially in relation to technology. Jugend, Fiorini, Armellini, & Ferrari (2020) reach the same conclusion.

Finally, Otley (2003) observes an under-explored perspective is to assess how control system information relates to local firm-level performance when the effects of national culture are included. O'Connor et al. (2011) move further and suggest gaining information about a

national culture/firm-level link via the use of a control system actually helps emerging-economy firms address the technology/innovation gap they have with more well developed firms. Martin & Scott (2000) agree and envision technological advance as the consequence of commercial innovative applications by firms. However, as innovation is an institutional process, more information is needed about how innovation is supported and what its inclusion creates. Kubeczko, Rametsteiner, & Weiss (2006) suggest this information is better obtained via a system that captures these effects.

This, however, may be an elusive task. Becheikh, Landry, & Amara (2006), for example, indicate that the growing importance contemporary companies place on innovation is hampered by a lack of prescriptive identification and analysis of data elements related to it. Through an analysis of the literature, we identify a series of variables that have been associated with innovative development. While our results are comprehensive, we advocate further work needs to be conducted to advance knowledge about innovative performance measurement. One of the specific options we propose is to link relationships between variables to gain an understanding of the management and use of the information provided. Collectively, this speaks to the need of a management control system which can be used to ensure a firm's actions are consistent with its objectives and strategies (Merchant & Van der Stede, 2007, p. 5). Such an effort, accordingly, begins with identifying, capturing, and interpreting information useful in guiding such objectives and strategies (Malmi & Brown, 2008).

Many research articles indicate that management control systems can play a beneficial role in innovation for firms. For example, Haustein, Luther, & Schuster (2014) prove this claim by dividing management control systems into two types and further divide each type into two categories (Direct control and indirect control). Direct control is divided into "Results control" and "Action control", while indirect control is divided into "Personnel control and Cultural control". They find that there is a greater positive connection between innovation and indirect control, while there is a negative connection between innovation and direct control. They conclude that firms should keep focusing on the indirect control because it has more potential to generate innovation in order to maintain, and support, flexibility and creativity.

Simons (1990) shows the use of management control systems encourages successful product innovation. Even though other researchers tried to test Simons (1990) methodology, their data shows no evidence to support Simons claim (Bisbe & Otley, 2004). On the other hand, Davila & Wouters (2004) predict that there are many factors that drive the use of various methods of cost management in product innovation to be more productive. Also, there are other factors than product cost and it is not an easy task to model the cost behavior. Therefore, firms can benefit from management control systems to be able to innovate in the future. Similarly, Davila (2000) reach a similar conclusion that one cannot ignore variables in the management control systems that may lead firms to be more innovative.

Constructing a reaction to these queries provides contributions on many levels. Our study reacts to these observations and focuses on the development of a framework of information thought valuable when assessing the capacity to innovate when national cultures and resource allocations are considered. In doing so, we respond to calls to develop control systems that focus

on the objectives, strategies, and informational flows that take place in a firm's internal and external environment (Berry, Coad, Harris, Otley, & Stringer, 2009).

Procedurally, we investigate how extent subsidy programs act to shape and guide firm-level innovative capabilities and how the presence of such capabilities affect operational performance. To do so, we draw on the theory of the firm which assumes firms represent a collective set of resources used by management to develop and sustain competitive advantage. We supplement these observations with tenets from the theory of absorptive capacity, which suggests a strategic combination of internal R&D and the use of technology obtained from sources external to the firm is most effective in creating and maintaining long-term competitive advantage (Cohen & Leventhal, 1989 and 1990; Atallah, 2019). Using this combined theoretical base, we provide traction to investigate the extent firm-level capabilities are heightened by an ability to exploit internal and external technology.

Operationally, we measure how the extent subsidies aid firms to innovate new products or improve existing technologies given their production functions and operating environments. Then, we assess the degree to which innovative capabilities *spurned on or promoted by subsidies* affect the ability of a firm to be more efficient as evidenced by an increase in excess resource capacity, in terms of capacity utilization. As our focus is to evaluate firm-level performance within an operating context that includes the presence of subsidies *and* their impacts, we provide insight about subsidy efficacy and its ability to improve firm-level productivity capacity. In addition, given our international setting, where we assess firm capability in emerging economies, we provide additional commentary to the observation that the development of firm-level competitive advantages can act to stimulate growth in modern economies (Hart, 1989), especially when such growth relies on the creation of new knowledge (Liebeskind, 1996). While Dai & Li (2020) suggest firm subsidies are controversial and vague.

We also respond to the query about the role innovation plays in promoting business growth development formerly hampered by social, political, and economic environments highly resistant to change (Lee & Peterson, 2000). In doing so, we offer insight about factors related to the global competitiveness of nations, and provide a rejoinder to the challenge noted to identify how emerging economies can overcome external and internal impediments to design and implement successful market-based strategies (Hoskisson, Eden, Lau, & Wright, 2000).

Data from the 2012 Business Environment and Enterprise Performance Survey (BEEPS) database were employed. Our study was constructed in two parts. First, we assess the impact of subsidies on firm innovation, where our variable of interest is the *subsidy*. Second, we determine the extent subsidies promote learning within a firm and hence, positively impact outcomes associated with innovation. We do so by isolating firms who have received subsidies *and* have also invested in internal (in-house) R&D, external (foreign) technologies, or both. This calibration isolates the effect that the *combination* of internal investment of R&D and the adoption of foreign technology has on firm-level capability.

Results obtained suggest subsidies promote innovation and that when these subsidies are contemporaneously considered in the face of the decision to adopt foreign technologies and employ in-house R&D, firm level capacity increases (see Greco, Grimald, & Cricelli, 2017). Collectively, our results provide insight into the types of information that would be included in a

control system to guide innovation and the ensuing firm-level operating performance in emerging economies.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

The theory of the firm observes firms exist to make decisions about a feasible set of production resources in order to create profit (Hart, 1995). Operationally, this occurs when firms strategically allocate resources that produce optimal outcomes (Penrose, 1959, p. 11). Strategic resource allocations should also consider internal and external operating environments. For example, moves to adopt allocations should assess how firm behavior is likely to react to change as well as how any change might affect the relationship the firm has with others (Holmstrom & Tirole, 1989, p. 63). Studying firm reactions in this manner provides an understanding of the central role firm's play, individually, in the growth of an economy (Holmstrom & Tirole 1989, p. 63-65).

Rubin (1973) extends this perspective to include insight about how firm reactions to strategic resource allocations affect growth capacity and suggests overall economic growth is related to how *particular* resources available to firms are employed to create change. As he further suggests, over time, as outputs from these resources grow because of both effectiveness and efficiency, the firm has more time and additional resources. Grant (1996) agrees and indicates an analysis of organizational capability and capacity brought on by the strategic view of firm resources allocation will create a competitive advantage.

Taipaleenmäki (2014) indicates that there is an absence in accounting systems to include innovative product and R&D in the accounting output. Taipaleenmäki's empirical findings show that management accounting (MA) drives innovation of new products. He also shows that there is a negative absence between management accounting and new product development and suggested that could be explained by a multitude of factors. Liebeskind (1996) suggests it is new knowledge, via innovations, that plays a critical role in moving both firms and the economies in which they operate forward. Pennings & Harianto (1992a) surmise that specific skills need to be present for an organization to implement innovation and that a firm will enjoy a major advantage if it can manage the flow of ideas that enter its boundaries.

Collectively, innovation is viewed as a significant force that drives the sustainable growth, competitiveness, and productivity of firms (Czarnitzki & Lopes-Bento, 2014). Moreover, innovation represents the adoption of a new idea, process, product or service developed internally or acquired from the external environment (Pennings & Harianto 1992b). As such, innovations can be thought of as concerned with the creation of new businesses or the renewal of ongoing businesses through developing new products, new manufacturing methods, or the discovery of new approaches to managing resources or operating activity (Slater, 1997). Technological innovations evolve from a firm's past accomplishments and in turn, furnish a new assortment of skills, including the ability to identify, absorb, and assimilate know-how generated from the outside (Nieto & Quevedo 2005). From this perspective, a key determinant of economic growth is technological progress developed through innovative activities (Cheng & Tao 1999). Ditillo (2012) suggested it is important to study exchanging new technology knowledge between

firms and even projects across countries, thus leading to an increased understanding of management controls as a "knowledge management mechanism." The role of government in moving from centrally planned markets to market-based economies is widely debated in the economic literature (Lee et al., 2014). Eastern European/Central Asian countries have followed an approach that reforms should be quickly carried out through mass privatization to exploit opportunity (see Balcerowicz & Gelb, 1995; Lipton & Sachs, 1990; Shleifer & Treisman, 2000). According to Hellman, Jones, Kaufmann, & Schankerman (2000), most such economies experience an initial drop in output, followed by a recovery at varying levels. This led to an expansion of accounting, management, information system, new products, and profitability that in turn caused an increase in consulting over financial reporting (Järvenpää, 2007). Järvenpää added that most of the accounting research concentrated on the accounting system operation and less attention has been paid to other factors, such as, accounting culture environment.

In this study, subsides are defined as state sponsored monetary or non-monetary financial aid/incentives freely obtained to support an enterprise from the government. For firms in these transitional economies, access to resources is critical. Subsidies from state agencies are an important resource for many firms. In addition, states may also provide subsidies to help firms overcome financial distress or capital constraints (Claro, 2006).

Firm-level innovation is a multi-faceted tool shaped and influenced by the intricate financial and uncertainty hurdles that characterize innovation projects. Individual firms are not always in a financial or operating positon to pursue innovation and consequently, firm innovation is often financed by subsidies. Various studies have explored the influence of innovation subsidies on firm growth (Lee, et al., 2014; Guoqing, Zhou, & Chunyu, 2014). To date, results are mixed as some studies observe innovaton subsidies enhance firm innovative ability (Kinoshita, 2000) where others suggest subsidies actually work to undermine firm growth (Haley & Haley, 2013). Relative to the positive effects of subsidies, Söderblom & Samuelsson (2013) note subsidies can act as triggers to motivate private research and support the development of new technologies. Subsidies also are thought to stimulate inter-organizational collaboration, promote team work, and enhance a sharing of knowledge (Keese, Philipp, & Rüffer, 2012). In this case, innovation subsidy policies stimulate collective learning that increases aggregate innovation performances.

Innovation subsidy policies are also thought to stimulate the access, adaption and application of skills and knowledge that are held by organizations external to the firm. The key is that innovation promotes an awareness of all types of technology, be it internal or external. Holmström & Mathiassen (2014) suggest as much and conclude the impacts of innovation subsidies on in-house R&D, in part, are captured in evidence of enhanced employment and collaboration that work to stimulate further innovation. The authors go on to note that this can occur with both the development of internal and use of external innovations.

Klette & Møen (2012) focus on the influence subsidies have on innovation efficiency via assessing the relationship between innovation output and innovation inputs. Results obtained observe innovation subsidies stimulate and even increase innovation efficiency. Given these results, it is apparent that firms must have *the capacity* to innovate when subsidies are put in place. At an initial pass, then, one has to consider the internal characteristics of the firm and how

those characteristics might affect innovative capacity. This analysis controls for how the production function and processes affect firm performance. In addition, one has to also account for external environmental factors. Sievers, Mokwa, & Keinenburg (2002) indicate that non-financial information could be very helpful in accounting information system as to increase the understanding of financial information. Collectively, then, one of the issues that surfaces is the extent to which a firm has the *capability* to innovate. Cohen & Levinthal (1989, 1990) indicate that capacity to innovate relies on capability or ability to learn. As the authors suggest, the ability to learn is manifested by working to develop and create in-house capabilities. This is usually in the form of in-house R&D. However, on a broader focus, the authors also observe in-house ability fosters the capacity to not only create new information, but to also enhance an ability to assimilate and exploit existing information. Thus, they contend one of the main reasons to invest in R&D is to be able to identify, assimilate, and exploit knowledge from the external environment. This skill, referred to as absorptive capacity, provides a dual role related to firm innovation; i.e., the ability to *learn* and ability to *exploit what is learned.*

Indeed, Zahra & George (2002) indicate that absorptive capacity pertains to knowledge creation and works to enhance a firm's ability to gain and sustain a competitive advantage via the strategic use of that knowledge. They expand the premise of absorptive capacity as a set of organizational routines and processes by which firms acquire, assimilate, transform, and exploit knowledge to produce a dynamic organizational capability. They suggest absorptive capacity is a multi-dimensional construct and that to improve the outcomes of its use, several dimensions of a firm's actions and abilities need to be considered relative to how they, together, improve firm performance via a heightened ability to learn. Interpretively, they suggest one way to evaluate the presence of absorptive capacity is to assess its impact on firm-level performances metrics associated with the creation of a competitive advantage.

Griffith, Redding, & Van Reenen (2003) agree and suggest that R&D related absorptive capacity impounds in firm profit. Jaffe (1986) provides additional support in that he observes that the use of a firm's own R&D, as well as the use of R&D related to others, could allow an adopting firm to achieve greater measurable results; it is this measurable outcome that provides evidence of the benefits of absorptive capacity. Thus, it may be that the key to assessing resource allocations in the face of R&D and subsidies may be how they are evaluated relative to their use in creating a competitive advantage. Indeed, Griffith, et al. (2004) agree and suggest absorptive capacity can be a potential source of productivity growth when all of these factors are considered.

Based on the above literature we hypothesize the following:

H1: Governmental subsidies promote firm innovation.
H2a: Investment in R&D leads to greater firm productivity.
H2b: Investment in foreign technology leads to greater firm productivity.
H2c: Investment in both R&D and foreign technology will lead to greater firm productivity.

RESEARCH DESIGN AND MODEL DEVELOPMENT

The purpose of this paper is to assess the effect subsidies have on firm-level innovation across Eastern European and Central Asian countries and to determine if these effects impound in firm-level capabilities given the subsidies. Specifically, we investigate the extent subsidy programs act to shape and guide firm-level innovative capabilities and how the presence of such capabilities affect performance meaningful to organizational prosperity and sustainability. In doing so, our focus is to add additional commentary of the roles innovation and subsidies play in enhancing firm performance. We also look to provide insight about how the development of a management control system framework that is designed to capture information may prove useful to firm operations. This latter observation is particularly important for firms in emerging markets who often have little insight about operating activities that add value.

Our study is constructed at two levels. The first (Level 1) is where we assess the impact of subsidies on innovation where our variable of interest is the *subsidy*. To evaluate the impact of subsidies on firm-level innovation we include country, computation, tax rate, tax administrations, political instability, regulations, education and work force, labor, ownership, and firm size as control variables. Our second level (Level 2) seeks to determine the extent subsidies promote learning and hence positively impact the outcomes associated with innovation. This approach adopts a two-step methodology. First, we identify those firms who have received subsidies and include them in our sample. Second, within our sample, we identify those firms who have invested in internal research development, external (foreign) technologies, or both. Our objective is to isolate the effect that the combination (interaction) of investments in R&D and foreign technology have on a performance measure (excess production capacity) associated with the presence of innovation. Accordingly, our variable of interest is the *interaction* of the presence of firm level research development and the use of external technology.

Level 1 Approach

Level 1 seeks to assess the impact of *subsidies* on innovation where our variable of interest is subsidies. To do so, we follow the framework developed by Ljiljana & Valerija (2011) using the data from 2012 Business Environment and Enterprise Performance Survey (BEEPS). BEEPS is a survey collected by the European Bank for Reconstruction and Development (EBRD) and the World Bank.[3] The 2012 survey covered enterprises in 30 countries.

The dependent variable for the Level 1 analysis is a dichotomous variable equal to 1 if during the last three years an establishment introduced a new or significantly improved product or service and 0 otherwise. Since the dependent variable is binary, we make use of a binary probit model, where the dependent variable reflects a dichotomous scenario of an event or condition either occurring or not occurring; in essence, the dependent variable is not continuous

[3] All of the data were obtained from the 2012 BEEP survey series. The 2012 survey is the first to include countries from Eastern Europe and Central Asia, and was the first to include an Innovation module that covered various aspects of firm-level innovation. As such, the 2012 BEEP is uniquely qualified for use relative to assessing the role of innovation in emerging economies.

but rather is associated with two qualitative choices. The probit model is appropriate because of the ordinal nature of the dependent variable (Maher, 1987). The objectives of this kind of model are usually to identify factors that significantly influence choice and to predict the likelihood that an event will occur for given values of the explanatory (independent) variables (Herring & Roy, 2007).

Our model specification for Level 1 is as follows:

$$INNO_i = \alpha + \beta_1 SUB_i + \beta_2 LOGE_i + \beta_3 PART_i + \beta_4 OWNERF_i + \beta_5 OWNERG_i + \beta_6 COMPi + \beta_7 INTERNET_i + \beta_8 AccF_i + \beta_9 TAXR_i + \beta_{10} TAXA_i + \beta_{11} PINS_i + \beta_{12} CORR_i + \beta_{13} LABR_i + \beta_{14} LICENS_i + \beta_{15} CUST_i + \beta_{16} INWORK_i + \varepsilon_i > 0;\ 0 \text{ otherwise} \quad (1)$$

Where:

$INNO_i$ = Dichotomous variable equal to 1 if during the last three years establishment introduced a new or significantly improved product or service and 0 otherwise.

SUB_i = SUB_i being a dichotomous variable equal to 1 if during the last three years the establishment received any subsidies from national, regional or local government or European Union sources (i.e., products or services) and 0 otherwise.

$LOGE_i$ = Represents a continuous variable for the number of employment available for each of the establishments over time.

$PART_i$ = Represents is a dichotomous variable equal to 1 if establishment is part of a large firm and 0 otherwise.

$OWNERF_i$ = Represents the % ownership of Private Foreign types available for the establishments over time.

$OWNERG_i$ = Represents the % ownership of Government types available for the establishments over time.

COMPi = Represents a continuous variable for the main market in which this establishment sold its main product, how many competitors did this establishment's main product face.

$INTERNET_i$ = Represents a dichotomous variable equal to 1 if establishment has a high speed internet connection on its premises and 0 otherwise.

$AccF_i$ = Represents a dichotomous variable equal to 1 if establishment faces access to finance which form an obstacle to current operations and 0 otherwise.

$TAXR_i$ = Represents a dichotomous variable equal to 1 if establishment faces tax rates which form an obstacle to current operations and 0 otherwise.

$TAXA_i$ = Represents a dichotomous variable equal to 1 if establishment faces tax administration which form an obstacle to current operations and 0 otherwise.

$PINS_i$	=	Represents a dichotomous variable equal to 1 if establishment faces political instability which form an obstacle to current operations and 0 otherwise.
CORRi	=	Represents a dichotomous variable equal to 1 if establishment faces corruption which form an obstacle to current operations and 0 otherwise.
$LABR_i$	=	Represents *a* dichotomous variable equal to 1 if establishment faces labor regulation which form an obstacle to current operations and 0 otherwise.
$LICENS_i$	=	Represents a dichotomous variable equal to 1 if establishment faces a business licensing and permits which forms an obstacle to current operations and 0 otherwise.
$CUST_i$	=	Represents a dichotomous variable equal to 1 if establishment faces a customs and trade regulations which forms an obstacle to current operations and 0 otherwise.
$INWORK_i$	=	Represents a dichotomous variable equal to 1 if establishment faces an inadequately educated force labor which forms an obstacle to current operations and 0 otherwise.

Level 1 is conducted for three groups.[4] The first group is composed of all countries (All Countries). The second group is for the fourteen former Soviet Union countries (FUSSR). The final group is for the seven former Socialist Federal Republic of Yugoslavia countries (FSFRY). Table 1 one provides a list of the countries included in the study.

An important observation needs to be made relative to how we proxy for subsidies. Specifically, we allow the receipt from national, regional or local government or European Union sources to be defined as a subsidy. Evidence in the literature provides support for such an approach. For instance, as noted by Lach (2002), a wide variety of instruments are used by governments to foster technological change within firms; for example, such instruments as tax cuts, and the formation of consortia and laboratories are routinely adopted. Indeed, there is considerable evidence that all types of instruments are being used to support firm innovative capacity (Bérubé & Mohnen, 2009). However, according to Schwartz & Clements (1999, p.120),

[4] An emerging economy can be thought of as a country that faces a rapid pace of economic development in the presence of government policies that favor economic liberalization (Hoskisson et al., 2000). With the collapse of communism in 1989, newly emerging economies formerly associated with this political structure sought to encourage and stabilize private enterprise but the size of economic growth across these emerging markets was not uniform (Hoskisson et al., 2000). Lee & Peterson (2000) suggest entrepreneurial orientation is critical to the economic growth of companies and that innovation is at the center of this orientation. Further, as noted by Hoskisson et al. (2000), while all former communist-based or affected economies face pressure to improve their transitioning business activities, Lee & Peterson (2000) observe the former Soviet economies are those most likely to encourage a de-emphasis of independent thinking, initiative and innovation by firms. Former Yugoslavian country firms while also under a communist regime, are likely to vary from former Soviets country firms. In an attempt to capture the differing effects with our sample, we segregate and conduct analysis across three sets; all firms; former Soviet firms; and former Yugoslavian firms.

the concept of a subsidy is elusive and as such, they noted subsidies should be thought of in more general terms as *any government assistance* that (1) allows consumers to purchase goods and services at prices lower than those offered by a perfectly competitive sector, or (2) raises producers' incomes beyond those that would be earned without this intervention.

Table 1
List of Countries Included in the Study
N=30

FUSSR Countries N=14	FRFRY Countries N=7	Other Countries N=9
Armenia	Bosnia and Herzegovina	Albania
Azerbaijan	Croatia	Bulgaria
Belarus	Macedonia	Czech Republic
Estonia	Kosovo	Hungary
Georgia	Montenegro	Mongolia
Kazakhstan	Serbia	Poland
Kyrgyz Republic	Slovenia	Romania
Latvia		Slovak Republic
Lithuania		Turkey
Moldova		
Russia		
Tajikistan		
Ukraine		
Uzbekistan		

This table presents the 30 Eastern European and Central Asia countries included in the study grouped by FUSSR (i.e., former Soviet Union); FSFRY (i.e., former Socialist Federal Republic of Yugoslavia); and Other (i.e., all other countries) that were included in the 2012 BEEPS survey

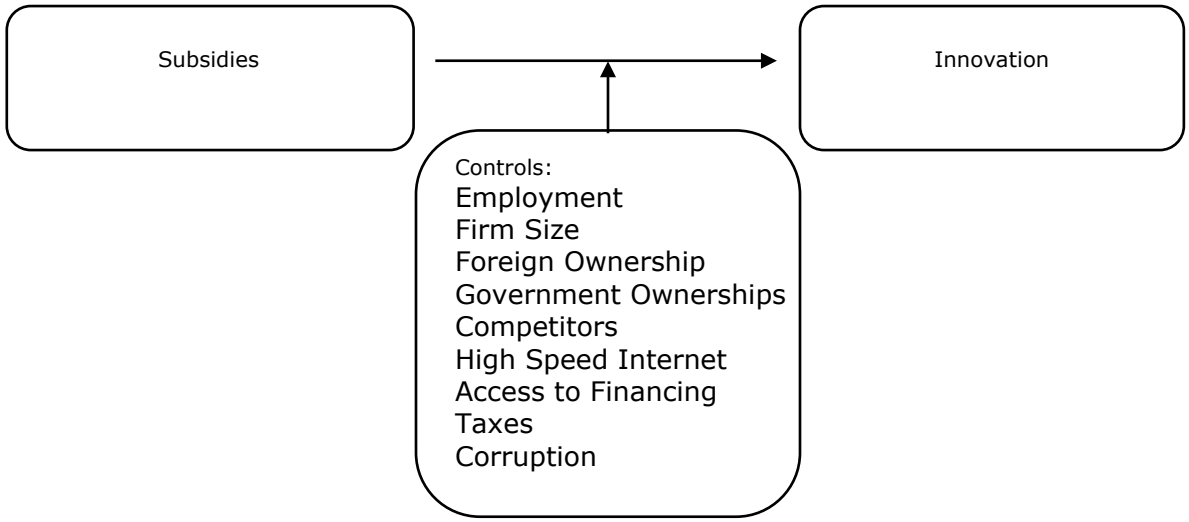
The authors go on to note this definition extends beyond the traditional narrow subsidy concepts and leaves room for a wide range of government activities to be defined as subsidies. For example, it recognizes that strict definitions of subsidies into specific categories may not reflect that the categories are not homogenous and that subsidies can take on different forms and can thus belong to different categories at the same time. In addition, they assert that a more general view of subsidies leaves ample room for measurement issues that are hard to overcome or eliminate. The authors indicate their general definition necessarily captures both the explicit and implicit subsidy elements that are contained in different forms of government intervention. Levén, Holmstrom, & Mathiassen (2014) agree and indicate observations noted by Schwartz & Clements (1999) allow one to focus on assessing the differential impact of the presence or receipt of *any* government assistance.

Bérubé and Mohnen (2009) seem to support this view and indicate that, in terms of research, assessing the incremental contribution or isolating the benefit of selecting one type of policy measure over another depends on factual situations and industry context. As such, based on a review of the literature, they observe it is really not possible to conclude in favor of one instrument over another, at least, not in any obvious way.

Evidence does exist that adopting a holistic approach to developing an overall proxy for a subsidy has merit. For example, Almus & Czarntitzki (2003) sought to assess the extent to which any subsidies received by public authorities affect firm-level innovation capacity. In doing so, they assert that adopting a collective measure of subsidy activity in order to control for any possible effects of all publicly funded research is of value. In addition, while they note that part of the decision to do so was because they were not able to track or assign specific types of support, the presence of the receipt of resources is evidence of a treatment that can be used to assess a difference.

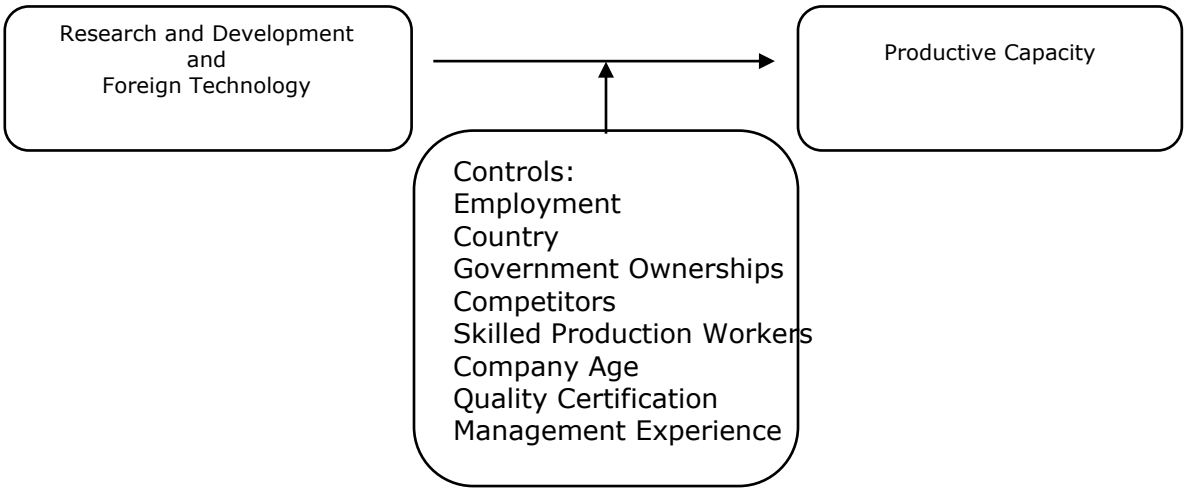
Finally, the use of a composite or single nature proxy for subsidies appears to have traction. For example, Zhang, Li, Zhou, & Zhou (2014) examine the use of subsidies in China based on the sum all subsidiary activity together, rather than classifying activities individually. González, Jaumandreu, & Pazó (2005) follow suit in that they explore the effects of subsidies based on the total amount of support received. Finally, Giardino-Karlinger (2010), via the use of a dichotomous variable, assign a value of 1 to capture whether a firm received a subsidy from any sources, or 0 otherwise[5]. Given this collective evidence, we deem our subsidiary proxy appropriate.

Figure 1
Model Diagram – Level 1 Approach



[5] It is interesting to note that, similar to our study, Giardino-Karlinger (2010) make use of BEEP data.

Figure 2
Model Diagram – Level 2 Approach



Level 2 Approach

Level 2 of our analysis seeks to determine the extent subsidies promote learning[6] and hence positively impact outcomes associated with innovation. As such, in this component of our study, only firms receiving subsidies will be included. This approach adopts a two-step methodology.

First, we identify firms who have received subsidies and include them in our sample. Second, within this sample, we identify those firms who have invested in internal R&D, external (foreign) technologies, or both. Our objective is to isolate the effect that the *combination* or interaction of a firm's own investments in R&D and the adoption of foreign technology have on a firm-level performance measure associated with the presence of innovation. Accordingly, our variable of interest is the *interaction* of firm-level research development and the use of external technology.

The approach of the second component of our study makes use of a theory constructed by Cohen & Leventhal (1989; 1990) that suggests the combination of internal R&D and the use of technology external to the firm will promote long term competitive advantage. This theory assumes that this combination, known as absorptive capacity, will be impounded in firm-level performance measures. Estimating the effects of resource allocation decisions and associating those decisions with R&D and external technology opportunities has been investigated from a multi-faceted perspective.

Indeed, Hagedoorn & Cloodt (2003) suggest there is a long history of struggling with the measurement of innovative performance and the outcomes it produces in firms. Moreover,

[6] Under this rubric, learning refers to both the ability to learn as well as to exploit or use that which has been learned to create advantage.

Griffith et al. (2003), in a review of the effects of absorptive capacity, find that an assessment of productivity growth and productivity convergence varies across economic foundations and suggest that a wide range of different economic specifications in the face of stable control variables is likely to provide value adding insight about the role one's own as well as others R&D activities have on productivity.

Finally, Jaffe (1986) assesses that the effects of internal R&D and external technological opportunities may be affected by the characteristics of the technology or the state of exogenous scientific knowledge present at the time. In addition, Jaffe (1986) notes that observing the actual effects may be difficult, and that the economic manifestations of a firm's decision to employ a full set of R&D activities (i.e., the construction of one's own R&D and the adoption of others) may be obscured. As such, the author opts to use multiple firm-level performance indicators (i.e., patents, profit, and the market value) to assess firm-level productivity in the face of an adoption of a firm's own R&D and external technological opportunities on firm productivity. Our dependent variable is the level of excess productive capacity of a firm in the presence of this interaction.[7] We make use of ordinary least squares to investigate the Level 2 query.

Our Level 2 model specification is as follows:

$$PROD_i = \propto + \beta_1 LOGE_i + \beta_2 COUNTRY_i + \beta_3 OWNERG_i + \beta_4 COMP_i + \beta_5 LOGS_i + \beta_6 AGE_i + \beta_7 CERTi + \beta_8 AccF_i + \beta_9 MANEX_i + \beta_{10} FT_i + \beta_{11} R\&D_i + \beta_{12} FT * R\&D_i + \varepsilon_{i_i} \quad (2)$$

Where:

$PROD_i$	=	Represents firm level excess productive capacity as (1- Capacity Utilization).
$LOGE_i$	=	Represents the number of employment available for each of the establishments over time.
$COUNTRY_i$	=	Represents country dummy variables.
$OWNERG_i$	=	Represents the % ownership of *Government* types available for the establishments over time.
$COMP_i$	=	Number of competitor establishment faces.
$LOGS_i$	=	Number of Skilled production workers.
AGE	=	Age of enterprise
$CERT_i$	=	Represents a dichotomous variable equal to 1 if the establishment has an internationally-recognized quality certification and 0 otherwise
$AccF_i$	=	Represents a dichotomous variable equal to 1 if establishment faces access to finance which form an obstacle to current operations and 0 otherwise.

[7] As denoted on the model below, mathematically excess capacity for a firm ($PROD_i$) is computed as 1- the reported capacity utilization of a firm. According the BEEPS data, and as supported by Ayyagari, Demirgüç-Kunt, & Maksimovic (2011), Capacity utilization is defined as the amount of output actually produced relative to the maximum amount that could be produced with the firm's existing machinery, equipment, and regular shifts.

$MANEX_i$	=	Number of years top managers have experiences.
FT_i	=	Represents a dichotomous variable equal to 1 if the firm uses technology licensed from a foreign-owned company, excluding office software and 0 otherwise.
$R\&D_i$	=	Represents a dichotomous variable equal to 1 if the firm has invested in R&D activities, either in-house or contracted with other companies or 0 otherwise
FT*R&D	=	Represents a dichotomous variable equal to 1 if the firm uses technology licensed from a foreign-owned company, excluding office software AND the firm has invested in R&D activities, either in-house or contracted with other companies or 0 otherwise.

RESULTS

Level 1 Analysis and Discussion

Our results of the Probit regression are presented in Table 2 for the three groups (i.e., all countries, FUSSR countries and FSFRY countries). Collectively, our results show that across two groups, subsidies promote innovation in transition economies, thereby supporting H1. Specifically, Table 2 shows that in the all country sample, which includes 6,921 firms, the SUB coefficient (0.298) is significant at the $p<0.01$ level. In addition, the coefficients of variables of LOGE (0.109), OWNERF (0.002), INTERNET (0.398), AccF (0.138), CORR (0.179), CUST (0.254) and INWORK (0.124) are also all significant at the $p<0.01$ level of significance. Finally, the coefficient of PINS (0.08) is significant at the $p<0.10$ level of significance.

Table 2
Probit Regression Analysis: Impact of Subsidies on Innovation
Dependent Variable: $INNO_i$

Variable	Est. Coeff. (Std. Error)	Marginal Effect	Est. Coeff. (Std. Error)	Marginal Effect	Est. Coeff. (Std. Error)	Marginal Effect
SUB	0.298***	0.092	0.052	0.015	0.320***	0.112
	(0.057)		(0.099)		(0.103)	
LOGE	0.109***	0.034	0.164***	0.048	0.030	0.010
	(0.014)		(0.019)		(0.032)	
PART	0.002	0.001	0.038	0.011	(0.166)	-0.027
	(0.061)		(0.078)			
OWNERF	0.002***	0.001	0.004***	0.001	0.001	0.000
	(0.001)		(0.001)		(0.002)	
OWNERG	-0.002	-0.001	0.000	0.000	-0.011	-0.003
	(0.002)		(0.003)		(0.011)	
COMP	-0.002	-0.001	-0.000	-0.000	-0.003	-0.001
	(0.001)		(0.002)		(0.002)	
INTERNET	0.398***	0.123	0.327***	0.096	0.628***	0.219
	(0.054)		(0.071)		(0.142)	
AccF	0.138***	0.043	0.232***	0.068	0.011	0.003
	(0.045)		(0.060)		(0.092)	
TAXR	0.065	0.020	0.011	0.003	-0.019	-0.006
	(0.042)		(0.054)		(0.098)	
TAXA	-0.054	-0.016	-0.114	-0.033	0.110	0.038
	(0.054)		(0.076)		(0.114)	
PINS	0.082*	0.025	0.116*	0.033	-0.021	-0.007
	(0.044)		(0.059)		(0.090)	
CORR	0.179***	0.055	0.148**	0.043	0.208**	0.072
	(0.046)		(0.061)		(0.100)	
LABR	-0.061	-0.018	-0.024	-0.006	-0.055	-0.019
	(0.073)		(0.116)		(0.138)	
LICENS	0.031	0.009	0.077	0.022	-0.018	-0.006
	(0.062)		(0.077)		(0.159)	
CUST	0.254***	0.078	0.320***	0.094	0.278**	0.097
	(0.057)		(0.072)		(0.129)	
INWORK	0.124***	0.038	0.100*	0.029	0.248*	0.086
	(0.047)		(0.060)		(0.127)	
Intercept	-1.407***		-1.521***		-1.048***	
	(0.074)		(0.095)		(0.177)	
Observations	6,921		3,883		1,360	
Pseudo R^2	0.088		0.094		0.062	

***, **, * Denote statistical significance at the 0.01, 0.05, and 0.01 levels respectively, based on two-tailed test. This table presents the results of subsidy affected innovation using probit estimation. Marginal effects are also presented. Variables are defined at Model [1] description.

For the 14 FUSSR countries, which includes 3,883 firms, the SUB coefficient (0.052) is not significant. However, LOGE (0.164), OWNERF (0.004), INTERNET (0.327), AccF

(0.232), and CUST (0.320) are all significant at the p<0.01 level. The CORR coefficient (0.148) is significant at the p<0.05 level, while the coefficients for both PINS (0.116) and INWORK (0.100) are significant at the p<0.1 level. For the 7 FSFRY countries, which includes 1,360 firms, the SUB coefficient (0.320), our variable of interest, is significant at the p<0.01 level, as is INTERNET (0.628). The CORR coefficient (0.208) and CUST coefficient (0.278) are significant at the p<0.05 level. Finally, the INWORK coefficient (0.248) is significant at the p<010 level.

Table 2 provides insight into the effects that various variables have on the capacity to innovate. Based in a review of those variables that were significant, we find that INTERNET; CORP; CUST; INWORK, are significant across all three groups. The positive significance of the internet may be an indication that a broad sense or need for communication is required to both understand, adopt, and make use of innovation. In general, we surmise these results indicate that as long as firms have the ability to access knowledge and skills from the internet, they will improve their capacity to innovate (Pagani, 2005). The level of corruption is also found to have a positive effect on the capacity to innovate. Research indicates that the presence of corruption spurs the ability to think of new ways to produce (Vieites & Calvo, 2011). Respectively, then, a high level of corruption might imbue higher thinking capacity within a country as its spurs one to think outside the box. It could also make it easier for firms to think about how to overcome traditional thoughts related to production and the use of resources.

Tilman (1968) refer to corruption as being like two sides of a coin, where there are both negative and positive outcomes. He argues that it can be adding another dimension that he refers to as "patrimonial-bureaucratic systems". And suggests that rational bureaucracy can hurt the growth of groups or firms in an area. Seyf (2001) discuses that under some conditions corruption may enhance efficiency, especially if kept within limits. He also refers to corruption as the oil that lubricates the wheels of the bureaucratic administrations, it will enhance the decision making process which will lead to substantial savings for firms. Other researcher argues that corruption improves the productive efficiency of bureaucratic decisions. (Alam, 1990). Leff (1964) argues that the concerns of corruption for developing countries are not as serious as is generally assumed. He argues that it may perhaps have important positive effects that are often ignored.

In our study, custom, trade and regulation represents the presence of custom and trade regulations which forms an obstacle to current operations. These regulations are important because they form the environment in which the firm operates. Our findings are in line with others who suggest that strict regulations can spur management to think about how to work within the confines of an operating environment to produce viable, innovative, and more production outputs and outcomes (Hitt, Hoskisson, & Ireland, 1994)

Finally, we find that the lack of adequate workers has a positive relation with respect to creating the capacity to innovate within a firm. This may be representative of the view that educated workers try to move to more advanced and technological astute economies in order to receive higher pay and/or better opportunities (Horvat, 2004). Moreover, it could be that the shortage of educated labor can affect innovation as countries in these conditions are forced to pay more attention on how to innovate and how innovation can be used to improve both the

incidence and use of human capital. Indeed, as denoted by Ljiljana & Valerija (2011), the brain drain of educated individuals out of a country may spur firms to seek ways to innovate.

There were other variables that were significant across at least two groups. The size variables, LOGE, has positive and significant relation with innovation in the all countries and FUSSR countries groups, but no relation with the third group (FSFRY). This may be interpreted to mean that bigger firms have the ability to innovate as they have more resources, most of the countries in the FSFRY were relatively small and an incidence or more internal conflict. As such, as denoted by Collier (2003), this effect could remain over time, especially in relation to emerging or transitioning economies.

OWNERF is significant for all countries and the FUSSR groups, but like LOGE, is not significant for the FSFRY group. Our analysis of this outcome is that, in general, firms with foreign ownership are more apt to innovate as external ownership is likely to bring an appreciation of the search for and use of new ideas or technology to use in the firm. This association is true for the all countries and the FUSSR groups as further analysis reveals those groups are likely to be more stable and thus, more apt to attract and use foreign investments (Meyer & Pind, 1999).

Access to the finance have significant affect in the all countries and FUSSR countries, but have no effect in the FSFRY countries. From this perspective it may be that financial institutions are more likely to lend to firms that are able to pay back their loan (Bellucci, Borisov, & Zazzaro, 2010). Our previous evidence suggests that as FSFRY countries are small and less stable, both of which affect their capacity to obtain financing.

PINS it has significant results at the all countries and FUSSR countries, but has no effect on the FSFRY countries. Thus, it may be that political instability creates the move to innovate. This may be due to the fact that political instability creates incentives to in improve (Zahra & Hansen, 2000). As such, creating new product or services may be the outcome of such a condition. Upon reflection, political instability works to produce an incentive to create inventive product or services (Michael & David, 1986), in part, because firms are forced to take a broad view of firm operations.

Finally, PART, OWNERG, COMP, TAXR, TAXA, LABOR, and LICENS have no effect on the innovation activity in all the three groups. Thus, being part of a larger firm appears to have no impact on innovation activity. The same holds true when a firm is owned by government. It is our view, upon reflections of the literature, that governmental ownership is less likely to promote innovation because the focus of governmental entities is to produce but not always in effective manner and, as such, innovations in these types of firms may not be encouraged (Baldridge & Burnham, 1975; Qian, Liu, & Wang, 2018).

Likewise, the level of competitors has no significantly effect on innovations. This may be the case because competitive markets have not truly emerged in transition economies (Masso & Vahter, 2008). Tax rate and tax administration have no effect on innovation activity in all three groups, which may indicate a viable tax system is absent (Gentry and Hubbard, 2004). Labor Regulation and business licensing and permits do are not significant for any groups. This lack of significance could be caused by the fact that these groups may not have infrastructures in

place to attend to these activities (South Sudan Country Profile, 2014). Ultimately, we surmise that subsidies do appear to promote innovation.

Level 2 Analysis and Discussion

Our analysis seeks to determine the extent subsidies promote learning and hence positively impact outcomes associated with innovation. As such, in this component of our study, only firms receiving subsidies will be included. This approach adopts a two-step methodology. First, we identify firms who have received subsidies and include them in our sample. Second, within this sample, we identify those firms who have invested in internal research development, external (foreign) technologies, or both. Our objective is to isolate the effect that the *combination* or interaction of a firm's own investments in R&D and the adoption of foreign technology have on a measure firm-level performance measures associated with the presence of innovation. Accordingly, our variable of interest, then, is the *interaction* of firm-level R&D and the use of foreign technology.

Our study makes use of ordinary least squares regression to investigate our query. Our productivity measure is PROD which is 1 minus the current capacity utilization of the firm; in essence, it reflects the level of excess resources available to a firm once its current operating activities, including the adoption of R&D and foreign technologies, have been taken into consideration. In the literature, capacity utilization has been used as a proxy to assess the effects of innovation on firm-level performance and can be thought of as a predictor of outcomes when both innovation and an assessment of learning is considered (Gorodnichenko & Schnitzer, 2013; Ayyagari, Demirgüç-Kunt, & Maksimovic, 2011; and Ghosal & Loungani, 1996). As such, it appears reasonable to adopt this proxy for our study.

Table 3 and 4 reflect two estimation techniques based on Model 2. The first, as reflected in Table 3, is our original estimation depicted in Model 2 that captures the activity of the subsidized firms. Estimation 2, as captured in Table 4, reflects the application of Model 2 for those firms that received no subsidy. Approaching our analysis in this manner provides additional insight about the impact of subsidies.

As reflected in Table 3, based on the full model that included FT, R&D, and FT*R&D, we find that the coefficients of our variables of interest are positive and significant. Specifically, the FT coefficient (16.52) finds significance at the $p<0.10$ level, while both R&D (19.86) and FT*R&D (11.07) are significant at the $p<0.05$ level. H2a, H2b and H2c are supported, in that foreign technology and R&D lead to greater productivity. Additionally, we find the coefficients of the control variables LOGS (4.07) and OWNERG (-0.191) are significant at the $p<0.10$ level.

Table 3
OLS Regression Analysis: Impact Foreign Technology and Research and Development on Capacity
Subsidized Firms
Dependent Variable: $PROD_i$

Variable	Control Mode Est. Coeff. (Std. Error)	Full Model Est. Coeff. (Std. Error)
LOGE	4.591*	4.074*
	(2.483)	(2.498)
COUNTRY	0.095	0.111
	(0.151)	(0.152)
OWNERG	-0.184*	-0.191*
	(0.101)	(0.102)
COMP	0.103	0.086
	(0.071)	(0.072)
LOGS	-5.902***	-5.372**
	(2.241)	(2.259)
AGE	0.015	0.012
	(0.066)	(0.066)
CERT	-3.008	-2.593
	(2.509)	(2.606)
AccF	3.471	3.207
	(3.178)	(3.189)
MANEX	0.062	0.054
	(0.105)	(0.105)
FT		16.952*
		(9.465)
R&D		19.861**
		(9.526)
FT*R&D		11.071**
		(5.529)
Intercept	-76.846***	-119.935***
	(4.740)	(21.970)
Observations	324	324
Adj R^2	0.03	0.04

***, **, * Denote statistical significance at the 0.01, 0.05, and 0.01 levels respectively, based on two-tailed test. This table presents the results of foreign technology and R&D affected firm capacity for subsidized firms using OLS regression. Variables are defined at Model [2] description.

Table 4 captures the results of analyzing the effects of FT and R&D on non-subsidized firms.[8] At the outset, we see that the coefficients of our three variables of interest, namely FT

[8] We are conducting this robust test in order to add additional evidence that the presence of a subsidy affects the productivity when foreign technology and research and development are present.

(3.87), R&D (6.76), and FT*R&D (2.18) are not significant. We do find, however, that the coefficient of LOGS (-3.51), like that of subsidized firms is significant (at the p<0.01 level). Moreover, relative to non-subsidized firms, we find that the coefficients of Country (0.174), AGE (0.101), CERT (-2.532), and AccF (7.589) are significant at p<0.01, p<0.01, p<0.05, p<0.05, and p<0.01, respectively.

Table 4
OLS Regression Analysis: Impact Foreign Technology and Research and Development on Capacity
Non-Subsidized Firms
Dependent Variable: $PROD_i$

Variable	Control Model Est. Coeff. (Std. Error)	Full Model Est. Coeff. (Std. Error)
LOGE	1.123	1.020
	(0.992)	(0.994)
COUNTRY	0.175***	0.174***
	(0.062)	(0.062)
OWNERG	0.060	0.068
	(0.072)	(0.072)
COMP	0.087**	0.086**
	(0.037)	(0.037)
LOGS	-3.533***	-3.519***
	(0.911)	(0.911)
AGE	0.099**	0.101**
	(0.044)	(0.044)
CERT	-2.180*	-2.532**
	(1.189)	(1.218)
AccF	7.739***	7.589***
	(1.230)	(1.231)
MANEX	-0.020	-0.024
	(0.049)	(0.049)
FT		3.878
		(5.819)
R&D		6.762
		(5.819)
FT*R&D		2.183
		(3.198)
Intercept	-70.378***	-79.031***
	(2.124)	(12.887)
Observations	2,276	2,276
Adj R^2	0.04	0.04

***, **, * Denote statistical significance at the 0.01, 0.05, and 0.01 levels respectively, based on two-tailed test. This table presents the results of foreign technology and R&D affected firm capacity for non-subsidized firms using OLS regression. Variables are defined at Model [2] description.

In general, our variables of interest are positively significant in the presence of a subsidy. In essence, we find that foreign technology, R&D and, more importantly, their interactions, positively affect the ability of the firm to produce excess capacity. Thus, in line with the theory of absorptive capacity, we find R&D, either created internally or obtained from external sources, allow a firm to operate more efficiently and, consequently, provide additional resources available for firm use. We find that when firms are involved in R&D that it will lead to an increase in excess capacity of the firm in the near future. Such an outcome is viewed as value adding because under general cost accounting theory, released capacity can be used for other profitable purposes (Horngren et al., 2010, p. 401; He, Gan, & Xiao, 2021)

LIMITATIONS OF THE STUDY

We construct the initial phase of our study to assess the extent the presence of subsides promote firm level innovation. The basis of our observation of the presence of a subsidy is whether, in the last three years, firms received subsides from local, national or European Union governmental entities. The presence of a subsidy is also a seminal component of the second phase of our study.

Admittedly, in constructing a link between subsidies and innovation, many researchers have specified the *type* of subsidy granted. Our efforts have taken a more generalized approach in that we merely rely on the presence of a subsidy to assess innovative capacity. Our decision to do so is partly related to the limitation of our data; specifically, the BEEPS database only reveals that a subsidy is received. This data limitation is also present in the literature (see Branstetter & Sakakibara, 1998), where they concentrated their analysis of the effects of subsidies to the presence of the subsidy.

Our review of the literature provides additional evidence that our approach has traction. For example, Levén et al. (2014) indicate that a subsidy in the broadest sense, can be *any* government assistance. Dai & Cheng (2015), in their analysis of the role of subsidies on R&D, opt to not focus on type of subsidy. Instead, they look at the magnitude of the subsidy to evaluate subsidy effectiveness. Finally, Schwartz & Clements (1999) indicate that when assessing the role of subsidies in a firm, a broad definition of subsidies may be necessary to capture both the explicit and implicit elements associated with government interventions. They take this view given the observation that subsidy classifications may be too narrow and can overlap. Notwithstanding the above, we do acknowledge the inherent limitation of our proxy. Hence, it is important to take the likely endogeneity concern of the subsidy variables into account. Since some firms who receive a subsidy may fail to innovate and others who did not receive a subsidy successfully innovate.

SUMMARY AND CONCLUSIONS

This paper has two levels of analysis. The first investigates the effect subsidies have on firm level innovation and the extent subsidies promote learning and hence positively impact outcomes associated with innovation. The second measures firm productivity when the adoption

of foreign technology and in-house R&D is considered. Our results suggest subsidies promote innovation and that when these subsidies are contemporaneously considered in the face of the decision to adopt foreign technologies and employ R&D, firm-level capacity increases.

Our work also identifies components found to be important determinants of innovation and improved firm performance when a strategic decision to employ R&D activities and external technology with subsidies are considered. Our results, capture the interactive effects of a decision to manage both resources and environments when adopting a strategy. This offers insight into the development of management control systems that include both management and strategic control. According to Merchant & Van der Stede (2007, p. 7), this consideration creates a management control system that is cybernetic and proactive, rather than merely reactive. It is this type of design that Abernethy & Lillis (1995) allude to as most likely to create the type of flexibility needed to improve performance. It does so because it links manufacturing strategy with control system design.

Our results also provide insight into the relation between management control and organizational capacity. Specifically, as articulated by Henri (2006), understanding the source of competitive advantage is an influential ingredient to creating firm-level value. By identifying these sources in the face of both internal and external environments, Henri suggests a management control system is developed that makes managers aware of the drivers of value in organizations and the causal relationships critical to drive that value. Our results capture such relationships.

An implication of our research is the suggestion that if a developing country wants to improve productivity, then they should provide subsidies that encourage companies to invest in R&D and foreign technology. We believe this conjecture leads to an additional question that must be addressed in future research: If government agencies keep increasing subsidies, will this lead to new products or will that destroy the competitive market? As well as our paper finds a strong connection between innovation and subsidies in most developing nations, will this lead to developed nations using the same model? Also, we believe there is a need for more research to compare developed nations and developing nations on the module that we use to see if subsidies can prompt innovations.

Finally, our results also contribute to the on-going debate as to whether the collection and use of data via a management control system is relevant for top management regarding its ability to implement successful product innovation. Specifically, through our analysis of contextual environments, we offer that information will emerge about innovation, especially when subsidies and access to technology are considered. In doing so, we provide support of the considerable importance of formal management control systems in the pursuit of innovations that will successfully translate into improved long-term performance.

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