BACKGROUND PAPER

Entrepreneurship as a Driver of Innovation in the Digital Age

Erkko Autio, Kun Fu, and Jonathan Levie

DISCLAIMER

ENTREPRENEURSHIP AS A DRIVER OF INNOVATION IN THE DIGITAL AGE

Erkko Autio
Professor, Imperial College Business School

Kun Fu
Lecturer, Loughborough University London

Jonathan Levie
Professor, National University of Ireland Galway

4 December 2019

CONTENTS

Tables

I. INTRODUCTION

Public media often assumes a positive association between entrepreneurship, innovation, and economic development. In reality, however, this association is more complex than often thought. There is plenty of evidence that (i) most 'entrepreneurs' are not innovative, (ii) most 'entrepreneurs' do not create new jobs in any significant number, and (iii) most 'entrepreneurs' lack the means to be productive. These facts have been so widely established by the world's largest comparative data collection effort on individual-level entrepreneurial activity, the Global Entrepreneurship Monitor (Reynolds, Bosma, and Autio 2005), that they can be safely regarded as 'stylized' (Levie, Autio, Acs, and Hart 2014).

The above does not mean, however, that there is no link between entrepreneurship, innovation, and economic development, only that the associations are complex. An equally wide body of evidence highlights another 'stylized fact' regarding entrepreneurship: 'entrepreneurs' are a highly heterogeneous group of individuals and teams, as are the new businesses they create. David Birch discovered that of all new firms, only a small minority – what he subsequently termed 'gazelles' – were responsible for a disproportionate share of employment generation in any cohort of new firms (Birch, Haggerty, and Parsons 1997). This finding has been independently confirmed by others, and also has been found not to be sector specific (Autio 2011 and Autio and Hoeltzl 2008). This observation is today considered as arguably the most robust and most generally (although not universally) applicable 'law' describing regularities in growth patterns in firm populations (Autio anbd Hoeltzl 2008; Coad, Daunfeldt, Hölzl, Johansson, and Nightingale 2014; Coad and Hölzl 2009; Decker, Haltiwanger, Jarmin, and Miranda 2015; Henrekson and Johansson 2010; and Mason and Brown 2013) [1]. In the European Union, this pattern was confirmed in the employment dynamic of European small and medium-sized enterprises (SMEs) after the 2008 financial downturn, as 11% of European SMEs created over half of the new jobs by SMEs in EU28 from 2008 to 2012 (Muller, Caliandro, Gagliardi, and Marzocchi 2015).

These observations underline a key insight: in entrepreneurship, quality matters. Not all new firms are born equal. Whereas some innovate, most do not. Whereas some use new technologies, most do not. Whereas some grow, most do not. Whereas some offer significant potential to contribute to total factor productivity (TFP), most do not. To illustrate these points, in our dataset of entrepreneurial start-ups from a set of regional member economies of the Asian Development Bank (ADB) shows that, although only 0.4% of the entrepreneurial new

[1] Note, however, that recent evidence claims that the contribution of high-growth firms to job creation seems to have attenuated in the United States since 2000 [Decker et al. 2015].

businesses had reached the size of 250+ employees by the age of 42 months, these accounted for 44% of new jobs created by this group. In contrast, new businesses that employed up to two people represented 54% of all new businesses, yet created only 9% of total jobs (Table 2). This raises obvious questions on what drives this heterogeneity and whether it is possible to design policy measures such that they better facilitate the productivity potential of new entrepreneurial firms, and thus better harness this potential for economic development.[2]

In this chapter, we address this question from several perspectives. First, we highlight the heterogeneity of new firm populations in terms of their productivity potential and discuss types of new and entrepreneurial firms against this lens. Second, we illustrate empirically the highly skewed distribution of this productivity potential in new firm populations using empirical data from ADB economies, as foreshadowed above. Third, we explore country-level and region-level reasons for this skewed distribution. We develop a framework that identifies two major regulators of entrepreneurs' productivity potential: country-level institutional conditions (including entry regulations) and regional resource and knowledge dynamics that operate in regional entrepreneurial ecosystems. We explore and illustrate the operation of the national-level dynamic using primary interview data from 17 ADB regional member economies. We illustrate the operation of the regional entrepreneurial ecosystem dynamic using primary data from two regional entrepreneurial ecosystems in Thailand: Bangkok and Chiang Mai. Finally, we discuss implications of the above for entrepreneurship policy in ADB regional member economies. Specifically, we address the regional entrepreneurial ecosystem aspect of the 'national system of entrepreneurship' and reveal its intimate connectivity with a global transformative trend – that of digitalization. Drawing on this, we present recommendations for entrepreneurship policy design in the digital age.

[2] We are not implying that small micro firms are not important. Although their job creation impact is limited, they nevertheless support an important number of jobs and livelihoods, particularly in situations where there might be few alternatives to the individual.

II. NEW ENTREPRENEURIAL FIRMS: A HETEROGENEOUS PHENOMENON

Entrepreneurial new firms are new firms started and owner-managed by individuals or groups of individuals. Such firms are a highly heterogeneous group that engage in a broad range of different activities. These activities differ in terms of their substantive content (i.e., what the business does), the location-specificity of the firm's activities and its customer demand, the dominant form of specialisation, and the dominant form of innovation (if any). Combined, these characteristics set up the productivity potential of the new business, i.e., its ability to contribute to economic development. To understand the entrepreneurial new firm sector, it is important to recognise major forms of this heterogeneity.

Firm-level *productivity* represents the efficiency with which it converts inputs (e.g., capital, labor) into value added (Gal 2013). By firm-level *productivity potential* we refer to the potential efficiency that is realistically achievable by a given firm. Whether the entrepreneurial firm actually fulfils this potential will depend on, e.g., resource availability and market environment. Firms efficient in converting inputs into value added will be more efficient in using their input resources, and they will also be more profitable relative to industry average. High aggregate firm-level productivity will contribute to a more effective country-level utilisation of capital and labour, thereby contributing to higher TFP and economic development at the country level.

New entrepreneurial firms can vary considerably in terms of their productivity potential, and even some categorization is possible on this basis. Generally speaking, by far the biggest group of new businesses is composed of self-employed small businesses, which provide employment for the owner(s) and possibly one or two employees. Such firms typically specialize in low-tech services such as food vendors, small shops, small restaurants, small repairs and handyman jobs, maintenance, and personal transportation services. Such businesses provide an important occupational outlet for low-skilled labor in the absence of alternative occupational opportunities. Another group in this category is composed of professional self-employed, such as freelancers, lawyers, consultants, and dentists, who provide knowledge-intensive services. For such businesses the potential productivity impact is greater, and some successful ones may well enter a rapid growth path if they discover a scalable concept that can be scaled, e.g., through franchising. Low-tech service businesses typically compete on the basis of personal and business reputation and relationships, drawing on local assets (e.g., business premises) to establish their presence in the local market and service local demand. While such businesses can be an important source of jobs in the local economy, their productivity potential is usually quite low.

Another prevalent type of entrepreneurial businesses (excluding agricultural ones) is composed of low- to medium-technology manufacturing SMEs. These typically inhabit industry clusters where they specialize in niches found in local supply chains. Characteristic of this kind of activity is localized co-specialization in the supply chain, as the businesses exploit co-location benefits to optimise their productive interactions (Malmberg and Maskell 2002 and Maskell 2001). As these interactions take place between suppliers and users, this activity encourages vertical networking (between firms in successive stages of the supply chain) among horizontally competing businesses—firms in the same stage of the supply chain being potential substitutes to one another (Autio, Nambisan, Thomas, and Wright 2018b). This networking pattern means that the opportunities tend to be niches within the local supply chain, with only the supply chain outputs potentially exported outside the region.

High-technology new ventures differ from low- to medium-technology SMEs by the patterns of innovative activity they exhibit. Whereas the dominant form of innovation in low- to medium-technology SMEs is process innovation (i.e., optimization of productive interactions between supply chain businesses) combined with limited product innovation, the dominant form of innovation in high-technology new ventures is technology-push product innovation. High-technology new ventures are mostly found in regional high-technology clusters where they translate advances in basic and applied research into innovative high-technology products. As high-technology new ventures create value through technology-based innovation, their productivity potential tends to be higher than that of low- to medium-tech SMEs.

One additional type of entrepreneurial businesses is worth mentioning here: digital new ventures. These come in two major forms: (i) new ventures that create software products and applications and software-based services delivered through the internet (i.e., software as a service, or SaaS); and (ii) new ventures that leverage the internet and digital resources obtainable therein to innovate new ways of creating, delivering, and capturing customer value. The first type of firms rely on digital software competences to code and offer various algorithmically-based functionalities (e.g., accounting software, gaming software). The second type leverages digital capabilities and digital infrastructures to reorganize and reinvent more conventional services (e.g., digital marketplaces; digitally organized personal transport services such as the Grab service; or digitally organized accommodation services such as the AirBnB). Although both types rely on digital capabilities, these represent the core competence for the first type and only a supporting competence for the second type. Whereas for the first type, the dominant pattern is software innovation (a form of technology-push innovation), for the second type the dominant form of innovation is business model innovation i.e., the innovative reorganization and coordination of activities for the creation, delivery, and capture of customer value (Autio et al. 2018b). This activity represents a form of combined process innovation (in

the form of reorganized and reconfigured service creation and delivery) and service innovation (in the form of new types of services such as mobility as a service (Maas) applications).

The different types of entrepreneurial and new businesses are summarized in Table 1. As can be seen, new and entrepreneurial businesses vary considerably in terms of their dominant activity, their patterns of innovative activity, the location specificity of their activities, resources, and demand, as well as in terms of their resulting productivity potential and ability to contribute to economic development. As is clear from Table 1, the different categories also differ in terms of their clustering patterns and the types of policy initiatives required for their facilitation. We will return to policy implications later in this chapter.

Table 1: Categorisation of New and Entrepreneurial Businesses on the Basis of Their Productivity Potential

Type of business	Description of the business	Specialization and innovation drivers	Location specificity of activities	Location specificity of demand	Productivity potential
Local service businesses	Low-technology service providers such as personal services, cafes and restaurants, transport services, construction and maintenance services	Reputation based on service quality or price, location specificity, business premises, personal relationships, branding	Highly localized with local sourcing of resources and supplies	Highly localized	Low
Low- to medium-technology SMEs	Low- to medium-technology manufacturing businesses operating in supply chain niches or manufacturing specific	Mainly through process innovation in the form of specialized manufacturing assets and co-specialized investment in	Mainly localized supply chain relationships	Localized (for supply chain interactions), regional, national, and even international for specific products	Low to medium

	products (e.g., parts and component suppliers, furniture manufacturers, similar	user-supplier interactions; also through product innovation and branding			
High-technology new ventures	High-technology businesses that commercialise technology-based products	Mainly product innovation by translating advances in basic and applied research and development into new, innovative products	Typically depend on localized spill-over of knowledge from research-intensive activities and local specialized resources such as specialized human capital	Typically national and international, sometimes even global	High
Software businesses	Software development businesses who code useful functionalities in algorithmic form (e.g., accounting software, smartphone applications)	Product innovation in the form of codification of useful functionalities in software packages	Increasingly tapping non-localized spill-over of knowledge and ideas distributed through digital platforms. In addition, rely on regional specialized resources such as human capital and funding	National, international, and global, especially if software is offered through application software platforms such as Google Play	High
Digitally enhanced service businesses	Businesses that rely on digital technologies and infrastructures for the delivery and coordination of digital and non-	Business model innovation in the form of digitally enhanced, organised, and coordinated services	Tapping into partly localized insights regarding 'what works' in terms of digitally enhanced business	National, international, and global, depending on the type of service (typically need to connect with localized	Medium to high, depending on ability to establish platform leadership

	digital services (e.g., personal transportation and delivery websites, accommodation service websites, bookkeeping services)		model innovation derived from business model experiments. In addition, rely on regional specialized resources such as human capital, funding, new venture accelerators	resources such as cab drivers, physical accommodation providers, similar)	

Source: Author.

III. Firm-Level Productivity Potential in ADB Regional Member Economies: Illustrative Evidence

Many formulations exist for measuring firm-level productivity (Baily and Solow 2001 and Holl 2011). In practice, most measures require firm-level data that may not be widely enough available to enable comprehensive cross-country comparisons (Gal 2013), making it necessary to use appropriate proxies. In the following, we approximate firm-level productivity potential by focusing on its employment growth expectations and innovative activity. Employment growth expectations should reflect the firm's experience regarding its ability to generate returns from its labor, and innovative activity should reflect its ability to generate value added from its resource inputs.

We use data from the Global Entrepreneurship Monitor (GEM) to illustrate heterogeneity in firm-level productivity in a set of ADB regional member economies. Our dataset covers 200 335 interviews from ADB's 17 regional member economies for years 2006–2016[3]. The interviews were conducted among representative random samples of 16–64-year old individuals in the 17 economies and weighted so as to be representative of the working-age population in the economy.

In total, our sample includes 14 753 (population weighted) entrepreneurial businesses, owned and managed by individuals and teams of individuals, that had not paid salaries or wages to anyone for longer than 42 months. These we call 'baby businesses' so as to be consistent with the GEM terminology. In addition, our sample includes 21 570 (population weighted) established entrepreneurial businesses that had been operation (i.e., paid salaries or wages) for longer than 42 months.

Table 2 shows the employment size of both baby businesses and established businesses at the time of the interview. We can see that micro businesses in the smallest size category dominate both samples (i.e., baby businesses and established businesses): of the baby businesses, 53.7% qualified as micro businesses that employed at most two employees including the owner-manager(s). Of the established businesses, the corresponding share was 53.8% of the sample total. In contrast, entrepreneurial businesses with 250 or more employees represented only 0.4% of both baby businesses and established businesses in the sample. However, the contributions of these two categories to total employment generated by baby and established businesses in the sample were dramatically different. Whereas micro businesses had generated

[3] Our dataset covers all regional ADB member economies for which GEM data is available: Bangladesh; the People's Republic of China; Georgia; Hong Kong, China; India; Indonesia; Kazakhstan; Malaysia; Pakistan; the Philippines; Singapore; the Republic of Korea; Taipei,China; Thailand; Tonga; Vanuatu; and Viet Nam

8.8% and 8.7% of the total employment by baby and established businesses, respectively, baby and established businesses with over 250 employees had generated 44.1% and 43.1% of the total employment by the sample, respectively.[4]

Table 2: Current Employment in Baby Businesses and Established Businesses in 17 ADB Member Economies

	Baby businesses (up to 42 months old)				Established businesses (older than 42 months)			
Size (no. of employees)	No. of firms	% of firms	Total employment	% of employment	No. of firms	% of firms	Total employment	% of employment
0–2	7,922	53.7	11,139	8.8	11,615	53.8	15,722	8.7
3–9	5,486	37.2	23,984	19.0	7,956	36.9	35,288	19.5
10–49	1,108	7.5	19,348	15.3	1,661	7.7	29,251	16.1
50–249	183	1.2	16,313	12.9	254	1.2	22,927	12.6
250–	54	0.4	55,743	44.1	84	0.4	78,209	43.1
Total	**14,753**	100.0	**126,527**	**100.0**	**21,570**	**100.0**	**181,398**	**100.0**

Source: Author.

The same skewness applies when we look at the expected employment generation, i.e., the self-reported number of expected employees within five years' time. These are shown in Table 3. As can be seen, the same pattern holds as above; based on employment generation expectations, the group of micro businesses constitutes the largest group of both baby and established businesses, representing 44.3% and 46.8% of the sample totals, respectively. Baby and established businesses expecting to employ 250 or more people represented 0.9% and 0.6% of their respective sample totals. These totals are mirrored by the expected employment impact, with micro businesses expecting to generate 3.4% and 5.5% of the total employment by baby and established businesses, respectively, and businesses with 250 or more expected employees responsible for 56.9% and 46.7% of total employment by baby and established businesses, respectively. For expected employment generation, the distribution of baby businesses is more skewed towards the larger firm category than for established businesses, perhaps reflecting the greater optimism by these or, alternatively, the greater realism by established businesses.

[4] Note: data was winsorized with a maximum of 2,000 employees per business.

Table 3: Expected Number of Employees in Five Years' Time by a Sample of Baby Businesses and Established Businesses in 17 ADB Regional Member Economies

	Baby businesses (up to 42 months old)				Established businesses (older than 42 months)			
Size (no. of employees)	No. of firms	% of firms	Total employment	% of employment	No. of firms	% of firms	Total employment	% of employment
0–2	6,542	44.3	8,663	3.4	10,091	46.8	13,681	5.5
3–9	5,687	38.5	25,963	10.2	8,548	39.6	39,240	15.7
10–49	1,939	13.1	33,279	13.1	2,382	11.0	41,382	16.5
50–249	451	3.1	41,908	16.4	427	2.0	39,189	15.7
250–	135	0.9	145,150	56.9	122	0.6	116,831	46.7
Total	**14,753**	**100.0**	**254,961**	**100.0**	**21,570**	**100.0**	**250,324**	**100.0**

Source: Author.

Similar skewness is also visible in the use of new technologies by the sample firms. The respondents were required to indicate whether the technologies required by the products, services, and processes of their businesses had been available for less than 1 year, between 1 year and 5 years, or for longer than 5 years. While this question is necessarily more open ended, it nevertheless shows that firms using technologies that were less than 5 years old represented the majority of established businesses, with the pattern slightly more skewed towards new technology use for baby businesses, as seems natural.

Table 4: Use of New Technologies by a Sample of Baby Businesses and Established Businesses in 17 ADB Regional Member Economies

	For how many years have the technologies required by this product or service been available?			
	Baby businesses up to 42 months old		Established businesses older than 42 months	
	n	% total	n	% total
Less than a year	3,208	23.6	2,008	11
Between 1 and 5 years	3,997	29.4	2,756	15
More than 5 years	6,370	46.9	14,116	75
Total	**13,575**	**100.0**	**18,880**	**100.0**

Source: Author.

The same pattern also shows for entrepreneurial businesses that offer new products that are unfamiliar to all or some of the customers. Of the baby businesses, 16.8% indicated that their product or service was new and unfamiliar to all of their customers. For established businesses, this percentage was 14.4%. Of the baby businesses, 34.2% indicated their product or service was new and unfamiliar for 34.2%; for established businesses the corresponding figure was 25.0%. For roughly half of baby businesses and 61% of established businesses, none of their customers found their product or service new or unfamiliar.

Table 5: Unfamiliarity of the Firm's Product or Service for Customers in a Sample of Entrepreneurial Businesses in 17 ADB Regional Member Economies

	Do all, some, or none of your customers consider your product or service to be new and unfamiliar?			
	Baby businesses up to 42 months old		Established businesses older than 42 months	
	n	% total	n	% total
All	2,268	16.4	2,757	14.4
Some	4,730	34.2	4,785	25.0
None	6,816	49.3	11,583	60.6
Total	**13,814**	**100.0**	**19,125**	**100.0**

Source: Author

Tables 4 and 5 confirm that most new businesses are neither innovative or use new technologies. Note that the threshold for qualifying as 'product innovator' or 'new technology user' in this case was quite low, as it did not require, e.g., patenting activity or formal investment in research and development (R&D). Combined, Tables 2–5 confirm that, while most new and entrepreneurial businesses do not meet even relatively soft criteria for innovativeness, the growth impact of new firms tends to be highly skewed within any given cohort of new businesses.

These observations are not unique to ADB regional member economies only. In fact, they resonate well with stylised facts formulated based on data derived from other countries. In their review of European Union evidence, and subsequently closely echoed by Coad et al. (2014). Autio and Hoeltzl (2008) summarized their conclusions in the form of the following

stylized facts regarding 'high-impact' firms (i.e., ones that make a difference for economic development, therefore exhibiting high realized productivity potential):

(i) High-impact firms matter: studies suggest that anything from between 3% and 10% of any new cohort of firms will end up delivering from 50% to up to 80% of the aggregate economic impact of the cohort over its lifetime (Acs, Parsons, and Tracy 2008; Audretsch 2002; Autio 2007; Birch et al. 1997; Henrekson and Johansson 2008; Hölzl 2006; and Storey 1994).

(ii) High-impact firms are rare. A direct corollary of the above is that high-impact firms are rare, implying that directly targeted policy measures should be selective, at least in principle (Autio and Rannikko 2016).

(iii) High-impact firms can be found everywhere. The review conducted by the European Union 'Gazelles' panel confirmed findings from earlier reviews that high-impact firms are not confined to high-technology sectors only. Instead, firm growth distributions exhibit remarkable similarly across countries and industry sectors (Hölzl and Friesenbichler 2008).

(iv) High-impact firms innovate. Although formal R&D and product innovation is not a requirement for achieving high growth, studies suggest that high-impact firms are nevertheless innovative, and this innovation may come in many forms (e.g., service innovation, new business concepts, and innovative business models).

In addition to the above, perhaps a bit frustrating stylized fact is that high-impact firms tend to be difficult to identify before the fact. Whereas it is easier to identify businesses that are not likely to deliver any meaningful economic impact, 'picking winners' can be fiendishly difficult even for venture capital professionals (Autio and Rannikko 2016). Combined with the above stylized facts, this presents a dilemma for policy: given that high-impact firms are difficult to identify ex ante; that they can be found in virtually any sector; that they innovate; and they are relatively rare, what kinds of policy interventions would be best suited to support them?

On the surface, the above dilemma seems to suggest several specific insights. We lay these out here and return to them at the end of this chapter:

(i) First, sector-specific initiatives may not be entirely efficient in nurturing high-impact entrepreneurial firms, given that these can be found in virtually any sector. Effective nurturing of entrepreneurial firms' productivity potential would likely work better by focusing on systemic conditions that affect new entrepreneurial firms regardless of their sector context.

(ii) Second, effective nurturing of new entrepreneurial firms' productivity potential

will need to facilitate innovation by these firms, in addition to their growth.

(iii) Third, trying to 'pick winners' may not be an effective approach, at least if implemented mechanistically (i.e., targeting promising candidates for support and then following these until the end of the support initiative). Indeed, Autio and Rannikko (2016) demonstrated that a 'retaining winners' approach might work better, where a stage-gate approach involving extensive public–private collaboration applied, with the requirement that the firms meet regularly reviewed milestones in order to be retained in the support initiative.

In the empirical analysis that follows, we build on the above three insights to explore systemic influences upon new entrepreneurial firms' productivity potential. Specifically, we draw on the concept of 'national systems of entrepreneurship' to elaborate a two-level model that captures such influences (Acs, Autio, and Szerb 2014). National systems of entrepreneurship are institutional and resource conditions that prevail in the country and influence the quality of the country's entrepreneurial dynamic, its productivity potential in particular. In our framework that guides our empirical analysis, we distinguish between two levels of conditions that we expect to conform with the three insights highlighted above.

First, we look at the effect of institutional conditions that prevail within the country, defined as the quality and structural composition of the country's institutional framework (Acemoglu and Robinson 2012; Baumol 1996; and Djankov, Glaeser, La Porta, Lopez-de-Silanes, and Shleifer 2003). A country's institutional framework includes both formal institutional arrangements such as the country's law-making, regulatory, and law-enforcing systems, as well as informal institutions such as culture and social norms (Baumol 1996). At the country level, institutional conditions influence the economic and social trade-offs individuals face when deciding whether or not to pursue opportunities for entrepreneurship (Autio, Pathak, and Wennberg 2013), as well as their post-entry growth intentions and aspirations (Autio and Acs 2010). Thus, a country's institutional conditions influence *who* becomes entrepreneur (for example, an entrepreneur's human capital has been shown to exercise an important influence on the productivity potential of his or her venture) and what kinds of decisions they pursue after they have started their business (e.g., whether to pursue innovation and growth). Importantly, these conditions tend to influence virtually all existing and potential entrepreneurs (thereby sidestepping the 'picking winners' dilemma), regardless of industry sector (thereby being sector agnostic).

As the second level of our framework, we explore the impact of regional-level knowledge and resource dynamics, building on recent theorising on the emergent phenomenon of entrepreneurial ecosystems (Autio et al. 2018b). Since mid-2000s, entrepreneurial ecosystems

have emerged and multiplied all over the globe as novel type of regional cluster to exploit entrepreneurial opportunities opened up by the global trend of digital transformation. This transformation is driven by relentless advances in digital technologies and infrastructures (notably, the internet), which keep creating opportunities to rethink societal, economic, and organizational processes and arrangements for the (co-)creation, delivery, capture, and distribution of economic and societal value (Autio, Szerb, Komlósi, and Tiszberger 2018c). In addition to its distinctive structural elements and its distinctive organization and coordination of resources around the processes of entrepreneurial stand-up, start-up, and scale-up, entrepreneurial ecosystems are distinguished from conventional clusters by the nature of their shared knowledge base (Autio et al. 2018b). Regional entrepreneurial ecosystems cultivate a shared knowledge base composed of experience-based information regarding 'what works' in terms of harnessing advances in digital technologies and the internet for business model innovation, i.e., radical rethink of how firms organize for the creation, delivery, and capture of customer and stakeholder value. We will explore how related knowledge dynamics pan out in regional entrepreneurial ecosystems in the ADB region. With reference to the three policy insights listed above, these dynamics drive an important form of innovation, are sector agnostic, and involve intense private sector participation that drives stage-gate retention of those entrepreneurial ventures that keep proving their productivity potential.

IV. Country- and Regional-Level Regulators of Firm-Level Productivity Potential: Some Empirical Evidence

We consider both country-level and regional determinants of the productivity potential of entrepreneurial ecosystems both at country and regional levels. An important thesis in our discussion above has been that different forms of entrepreneurial activity vary significantly in their economic impact, and the productivity potential of entrepreneurial action, as such, is shaped by both the national and the regional context within which it takes place. At the national level, we consider the hypothesis that country-level institutional conditions shape the productivity potential of new entrepreneurial firms through their impact on individual-level entry decisions and their impact of post-entry choices regarding whether or not to pursue innovation and growth. We use GEM data from 17 ADB regional member economies to explore this hypothesis.

At the regional level, we consider the impact of the quality of the regional entrepreneurial ecosystem on the innovativeness of the entrepreneurial firm's business models. We explore the hypothesis that the more sophisticated a given region's entrepreneurial ecosystem, the more sophisticated this knowledge base should be and, therefore, the more innovative should be the business models of the new ventures that emerge from that ecosystem. We use case studies of entrepreneurial ecosystems from Thailand to explore this hypothesis.

A. Institutional Conditions, Entry Regulations and Informal Entrepreneurship

We conduct two country-level analyses exploring the effect of an economy's institutional conditions and entry regulations on the productivity potential of new entrepreneurial firms, using the formal registration status of the firm as a proxy of this potential. In the first, country-level analysis we explore country-level institutional determinants of informal entrepreneurial activity, i.e., the creation of new firms that do not register with relevant business registers. Using the formal–informal status as a proxy of the productivity potential of entrepreneurial activity, we explore which institutional conditions are the most strongly associated with the choice of whether or not to register a new business. Informality provides a good proxy of the productivity potential of entrepreneurial action because informal businesses are less likely to accumulate property and invest in innovation and to grow their operation.

As our second country-level analysis, we explore cross-level effects of an economy's density of informal entries, its institutional conditions and entry regulations on the propensity of individual-level entrepreneurial action to innovate, use new technologies, export, and grow their employment size. In addition to the effect of institutional conditions and entry

regulations, we hypothesize that the density of informal entrepreneurial entries constitutes a negative externality and a source of unfair competition which, in itself, reduces the willingness of formal- and informal-sector entrepreneurs to innovate and grow their businesses.

Combined, the two analyses constitute evidence (although not conclusive) of a causal link between the quality of a country's institutions and its productivity potential, as operated through the quality of the country's entrepreneurial dynamic. We next elaborate on our theoretical reasoning, our empirical sample, and our analysis methods.

1. Institutional Conditions and Informal Entrepreneurial Entry

A country's formal institutions constitute an important regulator of the entrepreneurial choice (Levie et al. 2014), including the decision of whether or not the register the new business with official trade and employment registries (De Soto 1989 and Thai and Turkina 2014). This choice is likely to have an important effect on the productivity potential of the entrepreneurial business (Autio and Fu 2015; Djankov, La Porta, Lopez-de-Silanes, and Shleifer 2002a; and Williams and Nadin 2010). If the entrepreneur registers his or her business, it gains a status as a legal and judicial entity. This status enables the entrepreneurial business to enter into contractual relationships, to own and accumulate property, to invest, and to enforce contracts by judicial means. A registered status also makes it easier to share ownership and thus limit individual-level liability. As the business is able to accumulate property and its owners are less exposed to potential downside risks, it should be better able to invest in risky activities such as the pursuit of innovation and growth.

These benefits do not automatically follow the formal status, nor is this status necessarily without risks, however. First, with legal status also come responsibilities, such as liability to pay taxes and license fees and the liability to comply with business regulations. A registered status makes the firm's operations more visible and transparent, therefore reducing its ability to escape such costs. Second, if the country's institutional conditions are weak, the act of registering the business may expose it to unwanted attention by officials and politically connected competitors who may exploit institutional voids extract disproportionate fees and prevent unwanted competition. Thus, especially in countries where institutional conditions are deficient, many entrepreneurs may choose to 'fly under the radar' by not registering their businesses.

There is considerable empirical evidence to highlight the association between a country's institutional conditions and the relative size of its informal economy (Joo 2011). International Labour Organization (2011) found that the informal sector provided almost 40% of non-agriculture employment across low- and middle-income countries, including 58% of non-

agricultural employment in South Asia and East Asia. However, much of this evidence relates to informal economy in general and not informal entrepreneurship in particular, and direct evidence on informal sector entrepreneurship remains surprisingly lacking (Desai 2011 and Williams and Nadin 2010).

We produce such evidence drawing on empirical data from ADB's 17 regional member economies. We first update and extend the analysis by Autio and Fu (2015), who demonstrated that the quality of a country's political and economic institutions constituted an important regulator of formal and informal activity. In this chapter, we update and extend the analysis by extending the time series, including new economies, and by exploring the impact of specific institutional arrangements. We also extend the analysis beyond country level and consider the influence of country-level institutional conditions on the innovativeness, export orientation, and growth orientation of individual-level entrepreneurial efforts.

We model the choice whether or not to register a new business as an individual-level occupational choice whose opportunity costs are regulated by the country's institutional framework. For the individual, the allocation of one's human capital and effort into entrepreneurship comes with significant trade-offs (O'Brien, Folta, and Johnson 2003). Because individuals only have limited resources to allocate when making occupational choices (e.g., human, financial, and social resources of their own), and assuming individuals seek to maximize the return on their occupational investment, we can assume that entrepreneurs choose to register their business based on their calculations of the balance of anticipated costs and benefits associated with this choice (Autio and Acs 2010 and Autio and Fu 2015). When the perceived benefits and costs of the informal option outweigh those associated with formal entrepreneurship, we can expect to see a larger number of informal enterprises, and vice versa.

We suggest that three sets of institutional conditions are particularly relevant for the new business registration decision: a country's rule of law, the strength of its property rights regime, and the country's procedures required for registering a new business. A country's rule of law regime reflects the degree to which the government and private actors are accountable under the law; the degree to which laws are impartial, public, and stable; the degree to which the legislative process is open and transparent; and the degree to which legal disputes can be resolved justly and impartially in courts of justice. A strong rule of law regime ensures the enforceability of contracts and property rights and deters corrupt misappropriation of corporate property, thereby encouraging new businesses to register. A country's property rights regime defines the degree to which titles to both physical and intellectual property are transparent, enforceable, and protected under the country's established system of laws and regulations. A strong property rights regime allows businesses to accumulate property and

enforce associated rights, thereby protecting them against unfair misappropriation. Strong rule of law and property rights protection regimes should encourage the registration of new businesses and discourage informal operation.

In addition to legal institutions, also entry regulations should influence trade-offs associated with the decision to register a new business. Whereas the rule of law and property protection regimes operate through the better reinforcement of legal rights of a new business, entry regulations have a direct impact upon the ease of actually registering the business. Onerous entry regulations make it both costly and time consuming to register the new business, creating an incentive to save time and money by sidestepping these. In addition, onerous entry regulations create opportunities for corrupt officials to profit at the expense of the new business, either by offering shortcuts in return for financial favors, or by offering opportunities to fine the business for claimed conflicts with entry regulations. In our analysis, we specifically focus on three categories of entry regulation: (i) the number of procedures required to register a new business; (ii) the cost of registering (as a percentage of gropss domestic product (GDP) per capita); and (iii) minimum paid-in capital requirements (as percentage of GDP per capita). We elaborate on the data sources in the methods section. The considerations above lead us to formulate the following hypotheses for empirical testing:

H1 *The stronger a country's rule of law regime, the higher should be the entry density of formally registered businesses and the lower the entry density of informal businesses*

H2 *The stronger a country's property protection regime, the higher should be the entry density of formally registered businesses and the lower the entry density of informal businesses*

H3a *The greater the number of procedures required to register a new business, the lower should the entry density of formally registered businesses and the higher the entry density of informal businesses*

H3b *The greater the cost of registering a new business, the lower should be the entry density of formally registered businesses and the higher the entry density of informal businesses*

H3c *The greater the minimum required paid-in capital, the lower should be the entry density of formally registered business and the higher the entry density of informal businesses*

2. Data

We use publicly available data from GEM dataset to conduct our analysis (Reynolds et al. 2005). Specifically, we use GEM data from 2006 to 2016 for all ADB regional member economies for which this data is available. Our dataset covers a total of 200 335 (unweighted) interviews among working-age individuals (16–654 years old) for the following 17 ADB regional member economies: Bangladesh; the Republic of China; Georgia; Hong Kong, China; India; Indonesia; Kazakhstan; Malaysia; Pakistan; the Philippines; Singapore; the Republic of Korea; Taipei,China; Thailand; Tonga; Vanuatu; and Viet Nam. The sizes of economy samples per year are shown in Table 6.

Table 6: Economy-Year Samples in the Dataset

	Year survey was administered												
Country	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**Total**	**% total**
Bangladesh						2,000						**2,000**	1.0
People's Republic of China	2,399	2,666		3,608	3,677	3,690	3,684	3,634	3,647	3,822	3,974	**34,801**	17.4
Georgia									2,016		2,016	**4,032**	2.0
Hong Kong, China		2,058		2,000							2,027	**6,085**	3.0
India	1,999	1,662	2,032				2,700	3,000	3,360	3,413	3,400	**21,566**	10.8
Indonesia	2,000							4,500	5,520	5,620	3,480	**21,120**	10.5
Kazakhstan		2,000							2,099	2,106	2,100	**8,305**	4.1
Malaysia	2,005			2,002	2,010	2,053	2,006	2,000	2,000	2,000	2,005	**18,081**	9.0
Pakistan					2,007	2,002	2,000					**6,009**	3.0
Philippines	2,000							2,500	2,000	2,000		**8,500**	4.2
Singapore	4,011					2,000	2,001	2,000	2,006			**12,018**	6.0
Republic of Korea			2,000	2,000	2,001	2,001	2,000	2,000		2,000	2,000	**16,002**	8.0
Taipei,China					2,001	2,012	2,009	2,007	2,000	2,000	2,000	**14,029**	7.0
Thailand	2,000	2,000				2,000	3,000	2,362	2,059	3,000	3,000	**19,421**	9.7
Tonga Islands				1,184								**1,184**	0.6
Vanuatu					1,182							**1,182**	0.6
Viet Nam								2,000	2,000	2,000		**6,000**	3.0
Total	**16,414**	**10,386**	**4,032**	**10,794**	**12,878**	**17,758**	**19,400**	**26,003**	**28,707**	**27,961**	**26,002**	**200,335**	**100.0**

Source: Author.

GEM defines entrepreneurship as any attempt to create a new business, by individuals, including self-employment. More specifically, GEM qualifies an individual a 'new entrepreneur' if the person is an owner-manager of a new business that has paid salaries for at least some employees (including the owner-manager(s)) for longer than 3 months but no longer than 42 months. We call the businesses started by new entrepreneurs as 'baby businesses'. Further, GEM qualifies a person an 'established entrepreneur' if the person is an active owner-manager in an independent business that has paid salaries for someone for longer than 42 months. We call the businesses started by established entrepreneurs as 'established businesses'. The numbers of baby businesses and established businesses per economy are shown in Table 7.

Table 7: Numbers of Baby Businesses and Established Businesses in the Economy Samples

Economy	Baby businesses	% total	Established businesses	% total
Bangladesh	133	0.9	231	1.1
People's Republic of China	3,264	22.3	3,624	16.8
Georgia	132	0.9	292	1.3
Hong Kong, China	205	1.4	279	1.3
India	876	6.0	1,448	6.7
Indonesia	2,738	18.7	3,339	15.4
Kazakhstan	358	2.4	380	1.8
Malaysia	674	4.6	1,254	5.8
Pakistan	147	1.0	246	1.1
Philippines	950	6.5	915	4.2
Singapore	408	2.8	388	1.8
Republic of Korea	733	5.0	1,547	7.2
Taipei,China	625	4.3	1,239	5.7
Thailand	2,203	15.0	4,939	22.8
Tonga Islands	124	0.8	42	0.2
Vanuatu	326	2.2	311	1.4
Viet Nam	748	5.1	1,161	5.4
Total	**14,644**	**100**	**21,635**	**100**

Source: Author.

GEM applies harmonized data collection methods across the participating economies (Reynolds et al. 2005). Over 70% of the data have been collected by telephone surveys. These are complemented by face-to-face interviews using multistage randomized cluster sampling designs. As GEM samples from adult-age population and does not consider the entrepreneurial firm's registration status; it provides information on the economy's overall entry density, including both formal and informal entrepreneurial businesses.

We combine GEM data with World Bank Group Entrepreneurship Survey (WBGES) data to construct our country-level estimates for formal and informal entry density. The WBGES is a cross-national comparable dataset, available from 2004 onwards, which provides population-adjusted density of new business registrations in an economy, based on information from the official business registrars. Data collection for the WBGES is done primarily through telephone interviews and correspondence with participating business registries.

3. Variables

We have two dependent variables. The prevalence rate of *formal entrepreneurship* is the population density of the working-age population who has registered a new business in the current year. This measure was computed using new business registration data from the WBGES dataset. The prevalence rate of *informal entrepreneurship* is the population density of new firms that were not registered with authorities in the current year.

We use three measures of *entry regulations*: (i) number of procedures required to register and launch a new business, (ii) cost of new business registration (as percentage of GDP per capita purchasing power parity [PPP]), and (iii) paid-in minimum capital for new business registration (as percentage of GDP per capita PPP). All three measures are taken from the World Bank Doing Business database (Djankov, La Porta, Lopez-de-Silanes, and Shleifer 2002b). A procedure is defined as any interaction with external parties during the new business registration process (e.g., government agencies, lawyers, auditors, or notaries). The cost of registration covers all official fees and fees for legal or professional services if required by law, and is measured as a percentage of per capita GDP. Minimum capital is the amount that the entrepreneur needs to deposit in a bank or with a notary before registration and up to 3 months following incorporation, and is measured as a percentage of per-capita GDP.

Property rights protection reflects the ability of individuals to accumulate private property, secured by laws that are fully enforced by the state. It also assesses the risk that private property will be expropriated, the independence of the judiciary, and the existence of corruption within the judiciary. We use the index for protection of property rights from the Economic Freedom of the World Index, reported annually by the Fraser Institute (Gwartney, Lawson, and Hall 2012).[5] The index ranges from 0 to 10, with higher values indicating stronger property protection.

Rule of law reflects the strength and impartiality of the legal system of a society, the extent to which it is respected, and the quality of its enforcement (Gwartney et al. 2012). We adopted the index of "legal system integrity" from the annual report of the Fraser Institute. This index is based on the "law and order" component of the PRS Group's International Country Risk Guide's (ICRG) Political Risk indicator, which includes two parts. The "law" sub-component assesses the strength and impartiality of the legal system, and the "order" sub-component assesses popular observance of the law (Howell 2011).The index ranges from 0 to 10, with higher value indicating

[5] As a robustness check, we also ran our analysis using the property rights index from the Heritage Foundation and achieved similar results. Although the Heritage Foundation has a political agenda, the quality of its index data is widely acknowledged, particularly for politics–neutral aspects such as property protection.

stronger rule of law.

A number of macroeconomic factors have been shown to be associated with entrepreneurship. A country's economic growth rate and general level of development has shown to be positively associated with the entry of new firms (Kawai and Urata 2002and Lee, Yamakawa, Peng, and Barney 2011). We therefore control for *economic growth* using annual GDP growth. We control for *economic development* using per capita GDP (United States dollar billions) in an economy, adjusted for PPP. To address potential multicollinearity between per capita GDP and institutional variables (as more developed economies also tend to have higher-quality institutions), we followed Estrin, Korosteleva, and Mickiewicz (2012) and used dummy variables indicating five quintiles of per capita GDP distribution. The data for both is taken from the World Bank.

Population size and *population growth* of a country reflect the size and growth of the market, and are measured by counting all residents regardless of legal status or citizenship and the population's annual percentage growth rate. The data for both measures come from the World Bank. We also control for the rate of *established entrepreneurship,* taken from GEM, which reflects the population prevalence of owner-mangers of new firms older than 42 months.

In the analysis, the continuous dependent, independent, and control variables were all standardized to a mean of zero and a standard deviation of 1, in order to increase comparability of the estimated coefficients and make the interpretation of regression results easier.

We calculate our *estimate of informal entrepreneurship* using GEM and WBGES data. We use the GEM estimate of the population prevalence of new entrepreneurs (i.e., owner-managers of new, operating entrepreneurial businesses less than 42 months old) and the WBES count of new business registrations. We estimated yearly rates of overall entry into entrepreneurship (i.e., total entrepreneurship) 'x' by assuming the following:

(i) The total entry rate of new entrepreneurial ventures 'x' is constant over the past 3.5 years for a given economy.

(ii) The survival rate over time takes an exponential form: $e^{\lambda t}$, in which 't' refers to the age of the firm in the year of observation. 'λ' refers to the rate parameter of the exponential distribution.

(iii) The survival rate of year of observation is 0.5 years (data collection in June, no exit is assumed within the first 0.5 years).

We solve two simultaneous equations below in order to get 'x' and 'λ':

$$\begin{cases} y_{new} = x * (0.5 + \sum_{t=1}^{3} e^{-\lambda t_{-1}}) \\ y_{estab} = \int_{3}^{+\infty} e^{-\lambda t_{-1}} \end{cases}$$, in which

- 'y_{new}' is the density of new entrepreneurs, measured as the population prevalence of owner-managers of new businesses that have paid any salaries, wages, or other payments to the owners for up to 42 months.
- 'y_{estab}' is the population density of established entrepreneurs, i.e., owner-managers of new businesses older than 42 months.
- 'x'[6] is total entry density of new entrepreneurs in a given year of observation.
- 'λ' is the rate parameter of the exponential distribution of the survival rate.

The WBGES dataset provided the entry density of incorporated (i.e., registered) businesses within the working-age population (indicated as 'z'). The unit of observation in the GEM data is an individual (indicated as 'x'). To harmonize these datasets, we obtained total entry of entrepreneurship – i.e., 'x''', by dividing 'x' by the average number of owners of a new venture on an economy-year basis. This data is from GEM. With this harmonization, the unit of 'x''' became the new venture, and thus, consistent with WBES data. Finally, the entry density of informal entrepreneurship was calculated by subtracting the entry density of registered businesses ('z') from the total entry density of new entrepreneurial ventures ('x''').

4. Method

We tested the hypotheses 1, 2, and 3 regarding the impact of institutions on entry into formal and informal entrepreneurship using panel regression. If country-level variables change little or not at all over time, this could undermine the use of panel regression techniques and suggest the use of Ordinary Least Squares (OLS) regressions in a pooled dataset instead. Therefore, we computed the ratio between the range of country-level time series and the range of the entire dataset for the same variable, to show the extent to which a given variable varied at the country-level, relative to the overall variance in the dataset (Levie and Autio 2011). The results indicated significant variance for all institutional variables, and thus supported the use of panel regressions.[7] As an additional check, the Hausman test suggested strong preference for a random effects specification over fixed effects. Random effects specification is more efficient when there is no systematic difference in the coefficients estimated from both models. Therefore, we adopted random effects model using maximum likelihood estimation. Finally, we

[6] We focus on actual new ventures: 'x' therefore excludes nascent entrepreneurs. We also distinguish self-employed entrepreneurs from new ventures with more than one employee when testing our hypotheses.

[7] We also performed pooled OLS regressions to check the robustness of our findings. This change did not materially affect our findings.

checked variance inflation factors for all variables; all were well within allowed ranges.

5. Findings

The findings of the country-level panel regression are shown in Table 8. Formal entrepreneurship (FE) indicates the population density of formal business registrations. Informal entrepreneurship (IE) indicates the population density of informal business entries. The first model shows the effect of entry regulations on both FE and IE (hypothesis 3). The second model shows the effect of property right protections on FE and IE. The third model shows the effect of rule of law on both FE and IE. The final model is the full model with all variables included.

As we can see in the first model, regulation of entry did not seem to have much effect in our sample. Only one statistically significant effect is shown: a negative association between the number of registration procedures and FE, indicating that onerous entry regulations may inhibit FE, without necessarily rechannelling this entrepreneurial effort into the informal economy, as we did not see a corresponding increase in IE. The cost of registration and paid-in minimum capital did not show statistically significant associations with either FE or IE.

The second model supports our second hypothesis: the stronger the property rights protection regime, the lower will be the population density of informal entrepreneurial entries. However, we could not observe a statistically significant corresponding positive effect on formal entries. The effect is thus asymmetric. It may be that although stronger property protection attenuates the need to go informal, the positive unmeasured effects on the formal sector may be large enough to absorb potential informal entrepreneurs as employees rather than de novo formal entries.

The third model supports our first hypothesis: the stronger the rule of law, the lower will be the population density of informal entries. Also, a noticeable positive association was found for formal entry density, which, although not statistically significant due to sample size, was indicated at about half the effect size relative to the effect on informal entries.

Table 8: Institutional Influences on Formal and Informal Entrepreneurship Density Rates

Variable	FE	IE	FE	IE	FE	IE	FE	IE
Starting a business: number of procedures	-0.285**	0.120					-0.279**	0.284
	(0.102)	(0.251)					(0.103)	(0.185)
Starting a business: registration cost	0.002	-0.104					0.007	-0.137
(% per capita income)	(0.039)	(0.114)					(0.041)	(0.105)
Starting a business: paid-in minimum capital	0.016	-0.042					0.003	0.129
(% per capita income)	(0.039)	(0.112)					(0.043)	(0.115)
Property right protection			0.052	-0.345**			0.067	-0.346**
			(0.076)	(0.117)			(0.080)	(0.115)
Rule of law					0.216	-0.401*	0.242	-0.415**
					(0.183)	(0.182)	(0.177)	(0.159)
Population size	-0.058	-0.120	-0.241	-0.125	-0.378	0.006	-0.087	-0.021
	(0.392)	(0.186)	(0.323)	(0.124)	(0.289)	(0.172)	(0.355)	(0.137)
Population growth (%)	-0.082	0.123	-0.154*	0.230*	-0.133*	0.139	-0.086	0.190+
	(0.060)	(0.127)	(0.063)	(0.107)	(0.062)	(0.115)	(0.063)	(0.101)
Development stage	0.030	0.584+	0.039	0.906**	-0.013	0.682*	-0.019	0.923***
(second quintile of GDP per capita at PPP)	(0.137)	(0.311)	(0.146)	(0.292)	(0.152)	(0.294)	(0.144)	(0.277)
Development stage	-0.090	-0.662+	0.104	-0.444	0.034	-0.333	-0.107	0.079
(third quintile of GDP per capita at PPP)	(0.180)	(0.391)	(0.185)	(0.354)	(0.187)	(0.396)	(0.188)	(0.390)
Development stage	-0.281	-0.573	0.080	-0.224	0.038	-0.093	-0.275	0.589
(fourth quintile of GDP per capita at PPP)	(0.228)	(0.465)	(0.210)	(0.375)	(0.209)	(0.436)	(0.232)	(0.485)
Development stage	-0.453	-0.831	0.232	-0.254	0.185	-0.226	-0.453	1.123
(fifth quintile of GDP per capita at PPP)	(0.327)	(0.615)	(0.251)	(0.462)	(0.250)	(0.529)	(0.330)	(0.689)
GDP growth (%)	-0.023	0.026	-0.023	0.070	-0.030	0.029	-0.036	0.067
	(0.026)	(0.084)	(0.029)	(0.086)	(0.030)	(0.082)	(0.028)	(0.080)
Established firm rate (%)	0.022	0.416**	0.017	0.365***	0.000	0.270*	0.022	0.254*
	(0.060)	(0.130)	(0.066)	(0.109)	(0.066)	(0.134)	(0.062)	(0.117)
Constant	0.294	0.316	0.049	-0.009	0.095	0.008	0.345	-0.541+
	(0.390)	(0.312)	(0.347)	(0.271)	(0.326)	(0.296)	(0.337)	(0.327)
Observations	58	58	58	58	58	58	58	58
Number of country	11	11	11	11	11	11	11	11

FE – formal entrepreneurship. IE – informal entrepreneurship.
Standard errors in parentheses
*** p<0.001, ** p<0.01, * p<0.05, + p<0.10

Source: Author.

6. Discussion

Above, we investigated the effects of an economy's institutional conditions, specifically entry regulation, property rights protections, and the rule of law, formal and informal entrepreneurship. Entry regulation (e.g., Djankov et al. 2002b), property rights (e.g., Autio and Acs 2010), and rule of law (e.g., Kus 2010 and Levie and Autio 2011) have been shown to regulate the level and quality of *overall* entrepreneurial activity. However, empirical findings have not been consistent and patterns observed have been sometimes challenging to explain. For example, Aidis, Estrin, and Mickiewicz (2009) demonstrated that rule of law was an important determinant of entrepreneurial entry, but its importance was moderated by the country's level of economic development. In contrast, Hartog, Stel, and Storey (2010) reported

that countries with a stronger rule of law exhibited lower levels of business ownership rates. Klapper, Laeven, and Rajan (2006) showed that costly regulations hampered the creation of new firms, forced new entrants to be larger, and prompted incumbent firms to grow more slowly. In a later study by Klapper, Lewin, and Delgado (2009), cheaper and more efficient business registration procedures were associated with higher levels of entrepreneurial activity. In contrast, Capelleras et al. (2007) compared Spain and the United Kingdom and found some evidence that fewer value-added tax registered new firms were started in heavily regulated Spain. However, when both value-added tax registered and other firms were included, these differences disappeared.

We suspect that some of the inconsistencies in received literature may be because of received studies failing to distinguish between nuances like registered and unregistered forms of entry. This is an important omission, given the high variance in the density of informal entries, and also, in the ratio between formal (i.e., registered) and informal entries. Our empirical analysis supports our theoretical model to a large extent: the weaker the protection of property, and the weaker the rule of law, the more likely entrepreneurs will choose the option of informal entrepreneurship. Among the three key dimensions of entry regulation, the number of registration procedures exhibited a significant effect on formal registrations, but did not show a corresponding effect on informal entries. It is notable that these effects showed up in a relatively small country sample, our analysis focusing on ADB regional member economies. Together with the strong influence of property rights protection and the rule of law, we thus have evidence suggesting that 'rules of the game' matter for the allocation of entrepreneurial effort and, therefore, for the productivity potential of resulting new entrepreneurial businesses (Baumol 1996; and Murphy, Schleifer, and Vishny 1991).

B. Informal Entrepreneurship: Effects on Firm-Level Innovativeness and Growth

We next consider the potential effect of informal entry density and institutional conditions on firm-level productivity potential. We consider three country-level influences: the possible negative externality created by high informal entry density, property protection, and entry regulations. We use the same country-level data as above, with the difference that, whereas the above analysis aggregated individual-level data for estimates of country-level entry density, the analysis presented in this section performs a cross-level analysis that combines country-level data with individual-level data.

We approximate firm-level productivity potential with data describing firm-level innovativeness and growth aspirations. As proxies for innovativeness, we use product innovation, new technologies, and export activity. These proxies were taken from the GEM dataset and are

explained in section 3 of this chapter. As a measure of growth aspiration we use the firm's expected number of employees in 5 years' time. We measure the effects separately for baby businesses (entrepreneurial businesses less than 42 months old, indicated as 'babybuso') and established businesses (older than 42 months, indicated as 'estbbuso').

1. Expected effects

A high density of informal entries may operate as a negative externality that inhibits the productivity potential of formal and informal entries alike. At high levels of informal entrepreneurship, its consequences become part of the institutional environment in an economy, which can shape individual behaviours such an entrepreneurs' innovative activities and growth aspirations. This can happen because informal ventures can avoid paying tax and social security expenses, as well as laws specifying minimum salary levels (Webb, Tihanyi, Ireland, and Sirmon 2009), in addition to avoiding costs of compliance (e.g., hiring a lawyer, accountant, or allocating the entrepreneur's time to compliance activities). Because they can avoid taxes and compliance costs, informal entrepreneurs may gain unfair advantage in competition against registered businesses in the sectors where they operate (Estrin and Mickiewicz 2012). It is harder for formal ventures to "fly under the radar" (Godfrey 2011 and Levie and Autio 2011). Therefore, as the prevalence of informal entrepreneurship in a country grows, both formal and informal entrepreneurs alike may be less likely to invest in innovation and growth (Bu and Cuervo-Cazurra 2019). We therefore expect:

H4 *Country-level entry density of informal entrepreneurs will be negatively associated with individual entrepreneurs' product innovation, use of new technologies, and export activities*.

H5 *Country-level entry density of informal entrepreneurs will be negatively associated with individual entrepreneurs' growth aspirations*.

Similar to reasoning above, we also expect that entry regulations will exercise a negative influence on firm-level innovativeness:

H6a *The number of procedures required for starting a business, the cost of registering a new business, and the size of required paid-in minimum capital will be negatively associated with individual entrepreneurs' product innovation, use of new technologies, and export activities*.

H6b *The number of procedures required for starting a business, the cost of registering a new business, and the size of required paid-in minimum capital will be negatively associated with individual entrepreneurs' growth aspirations*.

Finally, as laid out above, we expect an economy's property right protection regime to influence the productivity potential of new entrepreneurial businesses:

H7a *The strength of an economy's property protection regime will be positively associated with individual entrepreneurs' product innovation, use of new technologies, and export activities*.

H7b *The strength of an economy's property protection regime will be positively associated with individual entrepreneurs' growth aspirations*.

2. Data and Analysis

We used the same predictor variables as in the previous analysis. Given that we are conducting a multi-level analysis, the control variables needed to be amended to cover individual-level demographics commonly associated with entrepreneurs' innovative and growth orientation. We controlled for the respondent's gender with a dummy (male = 1, female = 2). We also controlled the respondent's age (years) and household income level relative to economy average (three tiers: lower, middle, and upper 33% tier, with lower tier as the baseline). Given that human capital is associated with entrepreneurs' innovativeness, we controlled for entrepreneurs' education level (five levels: primary, some secondary, secondary, post-secondary, graduate experience, with primary as the base level). We also controlled the entrepreneurs' risk-taking with a dummy (yes = 1 to the question: 'would fear of failure prevent you from starting your own business?').

As country-level controls we used population size and growth and the economy's GDP per capita at purchasing power parity (five quntiles, the lowest quintile as base).

To estimate the impact of informal entrepreneurship in an economy on entrepreneurs' growth aspirations, we adopted multilevel regression technique to predict the growth aspirations of individuals. We first verified that there existed a sufficient amount of variance in the level of entrepreneurial growth aspiration between economies by calculating the intraclass correlation coefficient. We then specified and tested a set of two-level models with random intercepts and slopes, which allowed both the individual-level factors (level-1) and country-level factors (level-2) to affect innovative activity and growth aspirations of individual entrepreneurs, accounting for variation in growth patterns across economies. We used maximum likelihood algorithms for fitting the model.

3. Findings

The results of this analysis are shown in Table 9. First, looking at control variables, we observed that gender was associated with baby business owners' growth use of new technologies (higher

for women) and negatively associated with established business owners' expor activities (higher for men). We also observed that the individual's age was negatively associated with product innovation and new technology use, and increases in household income were positively associated with new product innovation and export activity but negatively associated with new technology use. Education level was positively associated with innovation variables, and the highest level of education was also positively associated with growth orientation. Regarding country-level controls, population size was positively associated with new product innovation and technology use in baby businesses. Development stage was—surprisingly—negatively associated with product innovation among established entrepreneurs, generally positively associated with technology use among both baby businesses and established businesses, and generally negatively associated with export activity. Development stage was also positively associated with baby business growth orientation. Finally, GDP growth was negatively associated with product innovation and technology use.

We then have a look at the findings. First, we observe that informal entry density is negatively associated with new product development among both baby businesses and established businesses. Informal entry density also suppresses new technology use among established businesses, export activity among baby businesses, and growth aspirations among established entrepreneurial businesses. The patterns are negative throughout, although not all associations are statistically significant, possibly due to sample limitations.

For regulations of entry, we find number of procedures required to start a business to exhibit a positive association with new product innovation among established businesses, a negative association with new technology use among established businesses (borderline significant for baby businesses), and a negative association with export activity among baby businesses. The cost of registering a new business exhibits a negative association with product innovation and export activity among established businesses. Minimum paid-in capital requirement exhibits a negative association with new product innovation and export activity for both baby businesses and established businesses. Property right protectio exhibits a positive association with both new product innovation and new technology use for both baby and established businesses, but a negative association with growth aspirations among baby businesses.

We can thus conclude that:

(i) Informal entry density appears to have a broadly general negative association with both innovative activity and growth orientation among new entrepreneurial firms.
(ii) Entry regulations broadly exhibit negative associations with innovativeness but not with growth orientation; however, the number of required entry procedures deviates from this pattern.

Table 9: Cross-Level Effects on Entrepreneurs' Innovativeness and Growth Aspirations

	Baby business	Established business	Baby business	Established business	Baby business	Established business	Baby business	Established business
	New product		New tech		Export		Growth	
Informal entrepreneurship	**-0.137****	**-0.158*****	-0.015	**-0.336*****	**-0.200***	-0.000	-0.027	**-0.032***
(entry density per 1000 adults 16-64 yrs)	(0.045)	(0.035)	(0.064)	(0.079)	(0.084)	(0.070)	(0.021)	(0.015)
Entry regulations								
Starting a business: number of procedures	0.162+	**0.184***	-0.219+	**-0.461*****	**0.268***	0.144	-0.024	-0.050+
	(0.098)	(0.079)	(0.129)	(0.105)	(0.116)	(0.088)	(0.043)	(0.027)
Starting a business: registration cost	-0.045	**-0.467*****	0.059	0.072	-0.107	**-0.410*****	0.022	0.019
(% per capita income)	(0.046)	(0.078)	(0.059)	(0.045)	(0.068)	(0.118)	(0.021)	(0.022)
Starting a business: paid-in minimum capital	**-0.182*****	**-0.118****	-0.036	0.036	**-0.241*****	**-0.161*****	0.033+	-0.023
(% per capita income)	(0.038)	(0.041)	(0.046)	(0.051)	(0.045)	(0.042)	(0.018)	(0.015)
Country institutions								
Property right protection	**0.110+**	**0.339*****	**0.305*****	**0.645*****	0.010	-0.074	**-0.112*****	-0.017
	(0.060)	(0.052)	(0.074)	(0.091)	(0.101)	(0.082)	(0.027)	(0.020)
Individual-level controls								
Gender (Male=1, Female=2)	0.028	0.049	0.149**	0.050	-0.047	-0.150*	-0.013	-0.025
	(0.047)	(0.040)	(0.057)	(0.049)	(0.067)	(0.059)	(0.022)	(0.018)
Age	-0.065**	-0.027	-0.143***	-0.155***	-0.016	-0.024	0.005	-0.013
	(0.024)	(0.021)	(0.028)	(0.025)	(0.033)	(0.030)	(0.011)	(0.009)
Income1 (Middle 33% tier)	-0.062	0.101*	-0.020	-0.026	-0.012	0.017	-0.021	0.009
	(0.059)	(0.051)	(0.073)	(0.061)	(0.088)	(0.075)	(0.028)	(0.022)
Income2 (Upper 33% tier)	0.076	0.184***	-0.197**	-0.024	0.377***	0.215**	0.035	0.023
	(0.063)	(0.054)	(0.076)	(0.065)	(0.087)	(0.076)	(0.030)	(0.024)
Education1 (some secondary)	0.014	0.078	-0.131	-0.095	0.190	-0.012	0.047	0.002
	(0.093)	(0.068)	(0.112)	(0.081)	(0.148)	(0.106)	(0.043)	(0.029)
Education2 (secondary)	0.214*	0.247***	0.111	0.144+	0.444**	0.316**	0.046	0.002
	(0.085)	(0.063)	(0.103)	(0.076)	(0.138)	(0.100)	(0.039)	(0.027)
Education3 (post-secondary)	0.386***	0.423***	-0.019	0.198*	0.625***	0.421***	0.080+	0.017
	(0.090)	(0.069)	(0.105)	(0.084)	(0.140)	(0.104)	(0.042)	(0.030)
Education4 (graduate experience)	0.632***	0.551***	0.373*	0.188	0.784***	0.892***	0.156*	0.107*
	(0.139)	(0.117)	(0.157)	(0.150)	(0.193)	(0.151)	(0.065)	(0.051)
Fear of Failure (yes=1)	0.147**	-0.002	0.028	-0.047	0.039	-0.027	0.004	-0.017
	(0.047)	(0.040)	(0.057)	(0.049)	(0.067)	(0.057)	(0.022)	(0.018)
Country-level controls								
Population size	0.423*	1.309	1.415**	0.767	0.402	-1.303+	-0.013	0.017
	(0.170)	(0.951)	(0.462)	(0.507)	(0.436)	(0.737)	(0.062)	(0.044)
Population growth (%)	0.115	0.218*	-0.102	0.238*	-0.011	0.358***	0.082*	0.141***
	(0.076)	(0.104)	(0.084)	(0.113)	(0.106)	(0.108)	(0.033)	(0.027)
Development stage	-0.187	-1.888***	0.800***	0.451*	-0.367+	-3.394***	0.270***	0.110
(second quintile of GDP per capita at PPP)	(0.159)	(0.311)	(0.203)	(0.208)	(0.216)	(0.576)	(0.074)	(0.110)
Development stage	0.191	-1.883***	1.633***	1.217***	-1.859***	-3.195***	0.289***	0.119
(third quintile of GDP per capita at PPP)	(0.185)	(0.321)	(0.310)	(0.212)	(0.318)	(0.614)	(0.085)	(0.111)
Development stage	-0.098	-2.405***	1.196***	0.688**	-0.799*	-3.017***	0.179+	0.108
(fourth quintile of GDP per capita at PPP)	(0.222)	(0.334)	(0.337)	(0.223)	(0.397)	(0.643)	(0.098)	(0.116)
Development stage	-0.291	-2.603***	1.867***	0.699*	-0.573	-2.701***	0.283*	0.165
(fifth quintile of GDP per capita at PPP)	(0.302)	(0.403)	(0.411)	(0.296)	(0.469)	(0.716)	(0.126)	(0.137)
GDP growth (%)	-0.084**	-0.222***	-0.042	-0.112***	-0.047	-0.045	0.023	0.012
	(0.032)	(0.027)	(0.035)	(0.033)	(0.041)	(0.034)	(0.015)	(0.011)
Constant	-0.685**	-0.184	-1.319*	-2.583***	-0.946+	0.103	-0.176+	-0.081
	(0.237)	(0.579)	(0.531)	(0.619)	(0.503)	(0.717)	(0.097)	(0.092)
Observations	8,514	12,808	8,116	12,365	8,500	12,759	8,794	14,062
Number of groups	12	12	12	12	12	12	12	12
Observations per group: min	100	140	92	146	97	145	102	178
Observations per group: avg	709.5	1067.3	676.3	1030.4	708.3	1063.3	732.8	171.8
Observations per group: max	2567	4689	2469	4618	2626	4711	2671	4822
Wald Chi^2	223.11***	385.28***	220.12***	435.22***	207.11***	238.37***	49.83***	56.23***
Degree of freedom	21	21	21	21	21	21	21	21
Log pseudolikelihood	-5563.57	-7898.70	-4046.32	-5820.35	-3222.42	-4555.47	-12433.48	-19882.22
Random-effects parameters								
Variance (cons)	0.294+	3.446	2.694*	4.194*	2.022+	4.670+	0.038	0.018
Variance (residual)	3.29	3.29	3.29	3.29	3.29	3.29	0.986	0.988

Standard errors in parentheses

*** p<0.001, ** p<0.01, * p<0.05, + p<0.10

Source: Author.

(iii) Property rights protection exhibits positive associations with new product innovation and new technology use but a surprising negative association with baby business growth expectations.

4. Discussion

The findings of our cross-level analysis broadly confirm that an economy's institutional conditions regulate the productivity potential of new entrepreneurial firms, and that the economy's entry density of informal entrepreneurs constitutes a broad negative externality that dampens both innovative activity and growth orientation. Our analysis provides one of the first direct evidence of cross-level effects of this density at the firm level. While the broad associations confirm the importance of institutional conditions in shaping the productivity potential of new entrepreneurial ventures, the patterns revealed are not entirely consistent and point to the need for a more fine-grained analysis, with larger sample sizes and better firm-level control over registration status. The key policy message is that both institutional conditions and entry regulations matter and should be carefully addressed by governments wanting to enhance their country-level entrepreneurial dynamic and enhance the productivity potential of their populations of entrepreneurial new firms.

C. Entrepreneurial Ecosystem Quality and Business Model Innovation

As highlighted previously, countries' national systems of entrepreneurship comprise two levels: national and regional (Acs et al. 2014 and Autio et al. 2018b). Wheras the national dimension predominantly sets country-level 'rules of the game' through regulations and national institutional structures, thereby shaping new firms' productivity potential entrepreneurs' entry decisions and post-entry strategic choices, the key dynamics impacting new entrepreneurial firms' *realization* of this potential mainly operate at the regional level. Country-level institutional conditions tend to shape social and economic trade-offs concerning who becomes an entrepreneur in the first place (individuals with greater human capital tending to create new businesses with a greater productivity potential as seen in the analysis above) and what strategic goals they decide to pursue through their ventures. However, the ability of entrepreneurs to *reach* those goals is very much affected by the resource and learning dynamic that operates in regional entrepreneurial communities, which recently have been taken to be labelled as 'entrepreneurial ecosystems' (Feld 2012). These are regional-level communities of entrepreneurs, resource providers, new venture accelerators, advisors, service providers, and other stakeholders of the regional entrepreneurial dynamic.

1. Regional Entrepreneurial Ecosystems: The Concept

The regional dynamic supplies new entrepreneurial businesses with three types of capital to boost their productivity potential: financial capital, human capital, and knowledge capital. Of these, particularly the knowledge capital component has been fundamentally transformed by digitalization, as has the process of entrepreneurial opportunity pursuit and growth itself (Autio et al. 2018b). Combined, these effects are so transformative that the world has wittnessed the emergence of a novel type of regional cluster since mid-2000s onwards: the entrepreneurial ecosystem. We first elaborate on this novel phenomenon before providing an empirical illustration of their knowledge dynamics.

As such, the regional dimension of economic activity has been studied for well over a century, through conceptual lenses such as industrial districts, clusters, innovative milieus, regional and national innovation systems, and knowledge clusters (Crevoisier 2004; Delgado, Porter, and Stern 2010; Marshall 1920; Maskell 2001; and Piore and Sabel 1984). Common to these all is the notion that spatial proximity accords businesses with resource and learning benefits as firms can observe and learn from one another and communicate more easily and frequently. Thanks to such interactions, virtually all clusters and agglomerations documented to date feature some kind of shared knowledge base: cumulative set of insights, experiences, and lessons shared by most participants of the regional community and shared through direct interactions among these. In virtually all clusters documented in the literature, this knowledge is technical in nature, e.g., there might be a furniture cluster specialising in designing and manufacturing furniture and sharing associated techniques. Or there might be a biotechnology cluster that would share insights and advances regarding this generic technology.

In entrepreneurial ecosystems, this knowledge dynamic is different, as entrepreneurial ecosystems do not so much facilitate a shared knowledge base regarding industrial techniques and designs or generic technologies as they do regarding insights into ‘what works’ in harnessing advances in the internet and associated digital technologies for business model innovation. A business model defines how a given business organizes its productive upstream activities (or ‘value creation activities’), its customer-facing downstream activities (or ‘value delivery activities’) and its cost and revenue models. A business model defines how an entrepreneurial business creates, delivers, and captures value (Amit and Zott 2012). This form of innovation differs significantly from the more conventional forms of innovation, such as technology-push innovation (i.e., commercialization of advances in R&D), product innovation, or process innovation.

Business model innovation is central for entrepreneurial ecosystems because of rapid advances in digitalization. Harnessing advances in the internet and associated digital technologies, entrepreneurial new firms are able to rethink how they organize their value creation, delivery,

and capture activities. As an example, the Grab taxi harnesses the internet to rethink how taxi cab and food delivery services could be organized, thereby reinventing these businesses. Airbnb and similar sites have done the same for the hotel and accommodation business. These business models would not have been invented by established incumbents (e.g., hotel chains), since they are already invested in hotel buildings. For these reasons, entrepreneurs are at the forefront of business model innovation, and entrepreneurial ecosystems are a special form of cluster that has emerged to support this dynamic.

Before we move to testing the above insights empirically, we should note that digitally enhanced business model innovation is not limited to 'digital businesses' alone: this is a much more encompassing phenomenon, which affects all kinds of new businesses in virtually all industry sectors. Further, digital business model innovation is not limited to rich countries alone. As a pointed example, the first modern-type new venture accelerator, Y-Combinator, started its operations in US Silicon Valley on 2005. Only some 10 years later, there were over 10 such incubators in the Indian city of Bangalore alone (Goswami, Mitchell, and Bhagavatula 2018). Digital transformation is a global phenomenon, and therefore it is important for policy-makers to address the entrepreneurial ecosystem phenomenon seriously, also in the ADB region.

2. Entrepreneurial Ecosystem Knowledge Dynamic: A Case Study

To illustrate the knowledge dynamic in operation in regional entrepreneurial ecosystems, we cite an example of a comparative study of Bangkok and Chiang Mai entrepreneurial ecosystems in Thailand (Autio, Cao, Chumjit, Kaensup, and Temsiripoj 2019 and Autio et al. 2018a). To assess the maturity of the entrepreneurial ecosystems in each region, we developed an easy-to-use policy tool designed to support regional policy-makers to monitor the health and development stage of regional entrepreneurial ecosystems. This policy tool—labelled as the Entrepreneurial Ecosystem Maturity Framework—measured four relevant dimensions of regional entrepreneurial ecosystems: general framework conditions, ecosystem community structure and richness, ecosystem resource dynamic, and ecosystem knowledge dynamic. In total, the policy tool was composed of over 40 items. The tool was designed not only to support the assessment and monitoring of the regional ecosystem health, but also to highlight bottlenecks so as to support better targeted policy interventions. As expected, the tool suggested that the Bangkok entrepreneurial ecosystem was clearly more developed than the Chiang Mai regional ecosystem, yet it had much catching up to do to reach the level of, e.g., Singapore's entrepreneurial ecosystem.

We then developed and tested our theoretical model. Given that insights into 'what works' in terms of harnessing digital advances for business model innovation is an experimentation-

driven process, our model emphasised the importance of ecosystem-specific interactions and associated knowledge spillovers among these. The more entrepreneurs residing in a given entrepreneurial ecosystem interact with one another, the more likely they are to share their insights, thereby enabling all ecosystem participants to become more effective business model innovators. To test our hypotheses, we conducted a series of regression analyses, using firm-level business model digital innovativeness as the dependent variable, the intensity of interactions with other ecosystem stakeholders and other entrepreneurs as the independent variables, and knowledge spillovers as the mediator. The variables were operationalized as follows.

3. Variables

Business model digital innovativeness was measured using interview surveys of start-up founders in the two ecosystems. Our operationalization measured the degree to which the start-ups harnessed digital technologies in their internal operations, marketing and sales, interaction with customer involvement, employees, and international sales (12 items in total). A first-order factor analysis with the 12 items showed that the majority of items loaded on one single factor (eigenvalue 3.16, 74.9% of the total variance); this factor was retained. *Intensity of interactions with other ecosystem stakeholders* was measured as the intensity of interactions with other ecosystem stakeholders with a five-step scale ranging from 1 (none at all) to 5 (very intense). The overall intensity of interactions was then measured as the average of stakeholder-specific interactions. *Intensity of interactions with other entrepreneurs* was measured as specific to other entrepreneurs using the same approach.

Knowledge spillovers from other entrepreneurs was measured as entrepreneurs' perceived learning from other entrepreneurs in the ecosystem across ten learning categories (e.g., technical know-how to develop new products and services, understanding a given market, identifying new clients, learning how to design a winning business model). The level of knowledge spillovers from other entrepreneurs for each participant was measured as the average response across the 10 categories.

As *control variables*, we used firm age (years), firm size (employees), mentorships, entrepreneurs' work experience, serial entrepreneur status, returnee entrepreneurship status, education level, family experience in entrepreneurship, information and communication technology competencies, and the degree of the venture's internationalization.

4. Data and Analysis

Our database consisted of a list of start-ups in Bangkok and Chiang Mai participating in the 2017 Startup Thailand exhibition (244) and in the Stock Exchange of Thailand's New Economic

Warriors database (181), as well as the list of IT companies in Chiang Mai (90). In total, we identified 515 start-up companies in Bangkok and Chiang Mai as our target population. Most of the population were approached for a face-to-face interview. The interviews were conducted in Thai language. Data collection resulted in a sample of 180 start-up companies, of which 155 companies were from Bangkok (86 %), and the rest from Chiang Mai (14 %).

OLS regression was used to the relationships. These are shown in Table 10. Overall, we found full support for our theoretical conjectures. First, we found that the intensity of interactions with other ecosystem stakeholders was positively related to the firm-level business model digital innovativeness (β=.57, p<.01; model 1). We also expected that knowledge spillovers would mediate the relationship between interaction intensity with other entrepreneurs and business model digital innovativeness (Baron and Kenny 1986). As shown in model 2, the interaction intensity with other entrepreneurs was significantly related to business model digital innovativeness (β=.14, p<.10). Model 3 shows a significant positive association between interaction intensity with other entrepreneurs and the level of knowledge spillovers (β=.29, p<.01). Finally, as shown in model 4, we found that the previously significant relationship between the interaction intensity with other entrepreneurs and the level of business model digital innovativeness was no longer significant and the effect shrank (β=.08) when the knowledge spillover variable was added to the equation. However, knowledge spillovers remained significantly related to the level of business model digital innovativeness (β=.20, p<.01). This demonstrated that the effect of interactions on business model innovation was fully mediated by the resulting knowledge spillovers. This inference was confirmed in Sobel test (*p*<.05) (Sobel 1982). The squared association index—Eta-squared (η^2)—showed that the intensity of interactions with other ecosystem stakeholders explained about 9% of the variance unexplained by other items (Ferguson 2009).

Table 10: Drivers of Business Model Innovation in Entrepreneurial Ecosystems

	Model 1: Business Model Digital Innovativeness		Model 2: Business Model Digital Innovativeness		Model 3: Knowledge Spillovers		Model 4: Business Model Digital Innovativeness		Sobel Test
Variables	**β**	***t***	**β**	***T***	**β**	***t***	**β**	***t***	
Interaction intensity with other ecosystem stakeholders	.57	4.23**							
Firm age	-.02	-1.02	-.01	-0.37	.03	0.86	-.01	-0.66	
Firm size	.00	1.74†	.00	1.42	.00	-0.06	.00	1.50	
Mentorship	.06	0.45	.27	2.01*	.58	2.88**	.15	1.17	
Work experiences	.02	1.73†	.01	1.49	-.01	-0.84	.02	1.82*	

Serial entrepreneurs	.12	0.89	.10	0.71	-.52	2.53*	.20	1.51	
Education	-.12	-1.02	-.14	-1.21	-.15	-0.84	-.11	-1.00	
Family entrepreneurship history	-.06	-0.45	-.03	-0.24	-.17	-0.82	.00	0.01	
Information and communication technologyeducation	.15	0.73	.22	1.07	.58	1.83 †	-.11	0.54	
Internationalization	.00	1.32	.00	1.03	.01	1.31 †	.00	0.67	
Interaction intensity with other entrepreneurs			.14	1.84*	.29	2.63**	.08	1.07	2.24*
Knowledge spillovers							.20	4.32**	
Adjusted R^2	.11		.04		.11		.12		
F	3.40**		1.84*		3.56**		3.52**		

[b] n=180. The sample consists 155 Bangkok start-ups (86.1 per cent) and 25 Chiang Mai companies (13.9 per cent).
† $p < .10$, * $p < .05$, ** $p < .01$.
Source: Autio, Cao, Chumjit, Kaensup, and Temsiripoj 2019

To minimize common method bias, we employed commonly used approaches in designing the survey (Podsakoff, MacKenzie, Lee, and Podsakoff 2003). We also performed Harman's one-factor test, which did not flag concerns for common method bias (Podsakoff and Organ 1986).

5. Discussion

Our analysis above highlights both the importance of digitalisation for entrepreneurial ecosystems, as well as the pertinent ecosystem interactions that drive new entrepreneurial firms' business model innovativeness. Given that business model innovation has emerged as a key determinant of new entrepreneurial firms' productivity potential in the digital age, facilitating related knowledge interactions has rapidly emerged as a key challenge for entrepreneurship policy. We next summarize our conclusions and discuss challenges for digital-era entrepreneurship policy in ADB member economies.

V. FACILITATING THE PRODUCTIVITY POTENTIAL OF NEW ENTREPRENEURIAL FIRMS IN THE DIGITAL ERA: CONCLUSIONS AND POLICY CHALLENGES

In this chapter, we set out to explore economy- and regional-level determinants of the productivity potential of new entrepreneurial firms, using data from ADB member economies. Our key messages have been that new entrepreneurial firms constitute a highly heterogeneous group in terms of their productivity potential and that this potential is shaped by the economy's national system of entrepreneurship. This system consists of both national-level institutional conditions, as well as the resource and knowledge dynamics that operate at the level of regional entrepreneurial ecosystems. National-level institutional conditions shape the productivity potential of the country's population of new entrepreneurial firms through their effect on who chooses to become an entrepreneur and what strategic goals the resulting new firms decide and are able to pursue. The regional-level entrepreneurial dynamics condition the extent to which new entrepreneurial ventures are able to realize this potential through business model innovation. This recognition is important because it suggests that to be effective, a country's entrepreneurship policy framework needs to address both national-level institutional conditions as well as regional-level entrepreneurial ecosystem dynamics. The two call for different policy approaches and present distinctive challenges.

As such, the importance of high-quality institutions and effective entry regulation is already widely recognized and relatively well understood. To encourage investment in innovation by entrepreneurs, governments need to nurture effective and high-quality institutions that support effective protection of property and sound rule of law: a high quality of both of these factors ensures that more entrepreneurs enter the formal sector and are able and willing to invest in innovation and growth. High-quality institutions need to be supported by efficient regulation of entrepreneurial firm entry procedures so as to minimise costs of entry and compliance and encourage formal-sector activity. Our economy- and cross-level analyses have illustrated the operation of these important national-level determinants of entrepreneurs' productivity potential.

National-level policies need to be combined with effective regional-level policies, particularly ones that facilitate the recent, yet global phenomenon of entrepreneurial ecosystems. This is a novel, regional-level phenomenon that presents novel and distinctive challenges for policy, ones that are far less well understood relative to national-level policies. Yet, it is the effectiveness of regional-level entrepreneurial ecosystem policies that ultimately determines the success of the national-level entrepreneurship policy framework in nurturing and unlocking the productivity potential of entrepreneurs. Given that the entrepreneurial ecosystem

phenomenon is characteristically a digital-era phenomenon, they also likely hold the key to nurturing TFP in the digital era.

Our case analysis of two Thai regions suggests that it is ultimately the entrepreneurial ecosystem knowledge dynamic that drives business model innovation in new entrepreneurial ventures and makes them key agents in re-structuring countries' economies for the digital age. Whereas many Asian economies have traditionally emphasised investment in manufacturing as key to TFP, the key to successful digital transformation is designing effective entrepreneurial ecosystem policies to fully harness the innovative potential of entrepreneurs in driving this transformation.

This is not a trivial challenge. Whereas conventional national-level policies can be delivered in a top-down mode through sector-specific government agencies, entrepreneurial ecosystems regure more bottom-up and participative approaches. This is because conventional policies are designed to fix static market failures that are easily observable from outside the system and can be addressed with top-down policy action (Autio and Levie 2017). For example, the failure of firms to conduct R&D is both easily observable, static, and straightforward to fix with an R&D subsidy. In contrast, entrepreneurial ecosystem failures are typically interaction failures because the regional entrepreneurial ecosystem fails to support intense and high-quality interactions among ecosystem stakeholders, its resource and knowledge dynamics suffer, and the productivity potential of new ventures within the ecosystem is curtailed. Resulting from deficient interactions, such failures are dynamic, not static, and less straightforwardly amenable to being fixed through top-down policy action. Because regional entrepreneurial ecosystems are loose communities composed of hierarchically different participants, top–down policy actions are not likely to be very effective, and more participative, facilitative, and bottom–up approaches are required instead, ones that seek to build a deep understanding of the ecosystem dynamics, recognize bottlenecks, and mobilize action among ecosystem stakeholders towards fixing those bottlenecks. The resulting increase in the entrepreneurial ecosystem dynamic should then start boosting the innovative and productivity potential of its constituent enterpreneurial businesses.

These considerations suggest the following tangible policy conclusions:

(i) Because of their importance for advancing the digital economy and TFP therein, entrepreneurial ecosystems should be a key focus of government policy for innovation, digitalization, entrepreneurship, and industry.

(ii) ADB regional member economies should adopt a two-level policy structure for entrepreneurship policy.

a. At the national level, policy should focus on building high-quality institutions and a smooth regulatory regime to encourage the creation of entrepreneurial businesses with high innovative and productivity potential. The national-level policy framework should coordinate across policy domains and agencies and have sufficient authority to also effect harmonisation between digitalisation policy, entrepreneurial ecosystem policy, innovation policy, and industrial policy.

b. At the regional level, the focus should be on nurturing and facilitating regional entrepreneurial ecosystems. Key principles at this level should include: (1) a bottom–up, facilitative approach; (2) close engagement with all stakeholders of the regional entrepreneurial ecosystem; (3) nurturing close communities of entrepreneurs, accelerators, financiers, large businesses, mentors, public agencies, educational institutions, and regional agencies; (4) nurturing open interactions and knowledge sharing among entrepreneurs regarding their business model experiments; and (5) encouraging active public-private sector interactions.

(iii) ADB member economies should develop metrics for mapping regional entrepreneurial ecosystems, profiling them, and monitoring their development. Ideally, they should also initiate regional entrepreneurial ecosystem development initiatives that identify bottlenecks that hold back the ecosystem dynamic and mobilise action towards fixing them. The monitoring tools should be easy to use, yet comprehensively profile the ecosystems in question.

(iv) ADB member economies should recognize that entrepreneurial ecosystem policy requires close coordination with digitalisation policy. A solid investment in digital skills and capabilities is key to nurturing and harnessing the productivity potential of entrepreneurship in the digital era.

VI. TAKE-HOME MESSAGES

1. New entrepreneurial businesses represent a potent force driving countries' TFP, particularly during the digital age. This effect operates through business model innovation that challenges established industry incumbents.
2. In entrepreneurship, quality matters over quantity. In populations of new entrepreneurial firms, only a small minority tends to create the bulk of the aggregate productivity impact delivered the population.
3. Country-level institutional conditions, entry regulations, and the density of informal entries are important determinants of the productivity potential of new entrepreneurial firms through their effect on firm-level innovation and growth aspiration.
4. Knowledge and resource dynamics operating at regional entrepreneurial ecosystems exercise an important influence over the ability of new entrepreneurial firms to realise their inherent productivity potential. Much of this effect is channelled through the new entrepreneurial firm's ability to effect and scale business model innovation.
5. National entrepreneurship policy frameworks should address both country-level institutional conditions and regional-level resource and knowledge dynamics. These two levels require different policy approaches: whereas country-level institutional conditions can be addressed in a top–down mode, bottom–up, and engagement-intensive approaches are required to nurture regional entrepreneurial ecosystems.
6. In particular, the regional-level entrepreneurial dynamic has been transformed by the phenomenon of regional entrepreneurial ecosystems (sections 4 and 5). It is recommended that ADB member economies implement programs to profile, monitor, and nurture these ecosystems.

REFERENCES

Acemoglu, D. and J.A. Robinson. 2012. *Why Nations Fail: The Origins of Power, Prosperity and Poverty*. London: Profile Books.

Acs, Z. J., E. Autio, and L. Szerb. 2014. National Systems of Entrepreneurship: Measurement Issues and Policy Implications. *Research Policy*, 43(1): pp. 476-494.

Acs, Z. J., W. Parsons, and S Tracy. 2008. High-Impact Firms: Gazelles Revisited (manuscript). In S. O. o. Advocacy (Ed.), *SBA Reports*. Washington, D.C.: SBA Office of Advocacy.

Aidis, R., S. Estrin, and T. Mickiewicz. 2009. Entrepreneurial Entry: Which Institutions Matter? *IZA Discussion Paper No. 4123*.

Amit, R., and C. Zott. 2012. Creating value through business model innovation. *Sloan Management Review*, 53: pp. 41–49.

Audretsch, D. B. 2002. The Dynamic Role of Small Firms: Evidence from the U.S. *Small Business Economics*, 18(1-3): pp. 13–40.

Autio, E. 2007. GEM 2007 Report on High-Growth Entrepreneurship, *GEM Global Reports*. London: GERA.

Autio, E. 2011. High-aspiration entrepreneurship. In M. Minniti (Ed.), *The dynamics of entrepreneurship*: pp. 251–276. Oxford: Oxford University Press.

Autio, E., and Z. Acs. 2010. Intellectual Property Protection and the Formation of Entrepreneurial Growth Aspirations. *Strategic Entrepreneurship Journal*, 4(3): pp. 234–251.

Autio, E., S. Cao, S. Chumjit, P. Kaensup, and W. Temsiripoj. 2019. E*ntrepreneurial Ecosystem Advantage: Ecosystem Interactions and Business Model Innovation*. London: Academy of Management Conference.

Autio, E., S. Cao, W. Temsiripoj, P. Guntasopatr, P. Kaensup, and S. Chumjit. 2018a. *Enhancing Thailand's Ecosystems for Entrepreneurship*. Bangkok: King Mongkut University of Technology.

Autio, E. and K. Fu. 2015. Economic and political institutions and entry into formal and informal entrepreneurship. *Asia Pacific Journal of Management*, 32(1): pp. 67–94.

Autio, E. and W. Hoeltzl. 2008. Europe Innova Gazelles Panel Final Report. In E. Innova (Ed.), *Europe Innova Panel Reports*. Brussels: EU DG Innovation.

Autio, E. and J. Levie. 2017. Management of entrepreneurial ecosystems. In G. Ahmetoglu, T. Chamorro-Premuzic, B. Klinger, & T. Karcisky (Eds.), *The Wiley Handbook of Entrepreneurship*: pp. 423–450. Chichester: John Wiley & Sons.

Autio, E., S. Nambisan, L. D. W. Thomas, and M. Wright. 2018b. Digital affordances, spatial affordances, and the genesis of entrepreneurial ecosystems. *Strategic Entrepreneurship Journal*, 12(1): pp. 72–95.

Autio, E., S. Pathak, and K. Wennberg. 2013. Consequences of cultural practices for entrepreneurial behaviors. *Journal of International Business Studies*, 44(4): pp. 334–362.

Autio, E. and H. Rannikko. 2016. Retaining winners: Can policy boost high-growth entrepreneurship? *Research Policy*, 45(1): pp. 42–55.

Autio, E., L. Szerb, E. Komlósi, and M. Tiszberger. 2018c. The European Index of Digital Entrepreneurship Systems. In Publications Office of the European Union (Ed.), *JRC Technical Reports*: 153. Luxembourg: European Commission,.

Baily, M. N. and R. M. Solow. 2001. International productivity comparisons built from the firm level. *Journal of Economic Perspectives*, 15(3): pp. 151–172.

Baron, R. M. and D. A. Kenny. 1986. The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of personality and social psychology*, 51(6): p. 1173.

Baumol, W. J. 1996. Entrepreneurship: Productive, Unproductive, and Destructive. *Journal of Business Venturing*, 11(1): pp. 3–22.

Birch, D., A. Haggerty, and W. Parsons. 1997. *Who's Creating Jobs?* Cambridge, MA: Cognetics.

Bu, J. and A. Cuervo-Cazurra. 2019. How Does Informal Entrepreneurship Affect Innovation? Paper presented at the Academy of Management Proceedings.

Capelleras, J.-L., K. F. Mole, F. J. Greene, and D. J. Storey. 2007. Do more heavily regulated economies have poorer performing new ventures? Evidence from Britain and Spain. *Journal of International Business Studies*, 39(4): pp. 688–704.

Coad, A., S.-O. Daunfeldt, W. Hölzl, D. Johansson, and P. Nightingale. 2014. High-growth firms: introduction to the special section. *Industrial and Corporate Change*, 23(1): pp. 91–112.

Coad, A. and W. Hölzl. 2009. On the autocorrelation of growth rates. *Journal of Industry, Competition*

and Trade, 9(2): pp. 139–166.

Crevoisier, O. 2004. The innovative milieus approach: toward a territorialized understanding of the economy? *Economic Geography*, 80(4): pp. 367–379.

De Soto, H. 1989. *The Other Path: The Invisible Revolution in the Third World*. New York: Harper Collins.

Decker, R. A., J. Haltiwanger, R. S. Jarmin, and J. Miranda. 2015. *Where has all the skewness gone? The decline in high-growth (young) firms in the US*. {City}: National Bureau of Economic Research.

Delgado, M., . W. Porter, and S. SternS. 2010. Clusters and entrepreneurship. *Journal of Economic Geography*, 10(4): pp. 495–518.

Desai, S. 2011. Measuring entrepreneurship in developing economies, *Entrepreneurship and economic development*: pp. 94–107: Springer.

Djankov, S., E. Glaeser, R. La Porta, F. Lopez-de-Silanes, and A. Shleifer. 2003. The New Comparative Economics. *Journal of Comparative Economics*, 31(4): pp. 595–619.

Djankov, S., R. La Porta, F. Lopez-de-Silanes, and A. ShleiferA. 2002a. The Regulation of Entry. *Quarterly Journal of Economics*, 117(1): pp. 453–517.

Djankov, S., R. La Porta, F. Lopez-de-Silanes, and A. ShleiferA. 2002b. The regulation of entry. *Quarterly Journal of Economics*, 117: pp. 453–517.

Estrin, S., J. Korosteleva, and T. Mickiewicz. 2012. Which institutions encourage entrepreneurial growth aspirations? *Journal of Business Venturing*.

Estrin, S. and T. Mickiewicz. 2012. Shadow Economy and Entrepreneurial Entry. *Review of Development Economics*, 16(4): pp. 559–578.

Feld, B. 2012. *Startup communities: Building an entrepreneurial ecosystem in your city*. Hoboken, NJ: Wiley.

Ferguson, C. J. 2009. An effect size primer: A guide for clinicians and researchers. *Professional Psychology: Research and Practice*, 40(5): p. 532.

Gal, P. N. 2013. *Measuring Total Factor Productivity at the Firm Level using OECD-ORBIS*. {City}.

Godfrey, P. C. 2011. Toward a Theory of the Informal Economy. *The Academy of Management Annals*, 5(1): pp. 231–277.

Goswami, K., J. R. Mitchell, and S. Bhagavatula. 2018. Accelerator expertise: Understanding the intermediary role of accelerators in the development of the Bangalore entrepreneurial ecosystem. *Strategic Entrepreneurship Journal*, 12(1): pp. 117–150.

Gwartney, J., R. Lawson, and J. Hall. 2012. 2012 Economic Freedom Dataset, published in *Economic Freedom of the World: 2012 Annual Report*: Fraser Institute.

Hartog, C., A. V. Stel, and D. J. Storey. 2010. *Institutions and entrepreneurship: The role of the rule of law: EIM Research Reports.* {City}.

Henrekson, M. and D. Johansson. 2008. Gazelles as Job Creators—A Survey and Interpretation of the Evidence. *Small Business Economics*, in press.

Henrekson, M. and D. Johansson. 2010. Gazelles as Job Creators—A Survey and Interpretation of the Evidence. *Small Business Economics*, in press.

Holl, A. 2011. Market potential and firm-level productivity in Spain. *Journal of Economic Geography*, 12(6): pp. 1191–1215.

Hölzl, W. 2006. Gazelles Scoping Report, *Europe Innova Scoping Reports*. Wien: WIFO.

Hölzl, W. and K. Friesenbichler. 2008. Final Sector Report Gazelles. In E. Innova (Ed.), *Sector Reports*. Vienna: WIFO.

Howell, L. D. 2011. *International economy risk guide methodology*. East Syracuse, NY: PRS Group.

International Labour Organization. 2011. *Statistical updates on employment in the informal economy.* Geneva.

Joo, D. 2011. Determinants of the Informal Sector and their Effects on the Economy: The Case of Korea. *Global Economic Review*, 40(1): pp. 21–43.

Kawai, H., and S. Urata. 2002. Entry of small and medium enterprises and economic dynamism in Japan. *Small Business Economics*, 18: pp. 41–51.

Klapper, L., L. Laeven, and R. Rajan. 2006. Entry regulation as a barrier to entrepreneurship. *Journal of Financial Economics*, 82(3): pp. 591–629.

Klapper, L., A. Lewin, and J. M. Q. Delgado. 2009. *The Impact of the Business Environment on the Business Creation Process*. {City}.

Kus, B. 2010. Regulatory governance and the informal economy: cross-national comparisons. *Socio-Economic Review*, 8(3): pp. 487–510.

Lee, S. H., U. Yamakawa, M. W. Peng, and J. B. Barney. 2011. How do bankruptcy laws affect entrepreneurship development around the world? *Journal of Business Venturing*, 26(5): pp. 505–520.

Levie, J. and E. Autio. 2011. Regulatory burden, rule of law, and entry of strategic entrepreneurs: An international panel study. *Journal of Management Studies*, 48(6): pp. 1392–1419.

Levie, J., E. Autio, Z. Acs, and M. Hart. 2014. Global entrepreneurship and institutions: an introduction. *Small Business Economics*, 42(3): pp. 437–444.

Malmberg, A. and P. Maskell. 2002. The elusive concept of localization economies: towards a knowledge-based theory of spatial clustering. *Environment and Planning A*, 34(3): pp. 429–449.

Marshall, A. 1920. *Principles of Economics*. London: MacMillan.

Maskell, P. 2001. Towards a knowledge-based theory of the geographical cluster. *Industrial and corporate change*, 10(4): pp. 921–943.

Mason, C. and R. Brown. 2013. Creating good public policy to support high-growth firms. *Small Business Economics*, 40(2): pp. 211–225.

Muller, P., C. Caliandro, D. Gagliardi, and C. Marzocchi. 2015. Annual Report on European SMEs 2014/2015: *Special Working Paper*: 131. Brussels: European Commission.

Murphy, K. M., A. Schleifer, and R. W. Vishny. 1991. The allocation of talent: Implications for growth. *The Quarterly Journal of Economics*, 106(2): pp. 503–530.

O'Brien, J. P., T. B. Folta, and D. R. Johnson. 2003. A Real Options Perspective on Entrepreneurial Entry in the Face of Uncertainty. *Managerial & Decision Economics*, 24(8): pp. 515–533.

Piore, M. and C. Sabel. 1984. *The second industrial divide: possibilities for prosperity.* {City}: Basic books.

Podsakoff, P. M., S. B. MacKenzie, J.-Y. Lee, and N. P. Podsakoff. 2003. Common Method Biases in Behavioral Research: A Critical Review of the Literature and Recommended Remedies. *Journal of Applied Psychology*, 88(5): pp. 879–903.

Podsakoff, P. M. and D. W. Organ. 1986. Self-reports in organizational research: Problems and prospects. *Journal of management*, 12(4): pp. 531–544.

Reynolds, P. D., N. Bosma, and E. Autio. 2005. Global Entrepreneurship Monitor: Data Collection Design and Implementation 1998–2003. *Small Business Economics*, 24(3): pp. 205–231.

Sobel, M. E. 1982. Asymptotic Confidence Intervals for Indirect Effects in Structural Equation Models. *Sociological Methodology*, 13: pp. 290–312.

Storey, D. J. 1994. *Understanding the Small Business Sector*. London, UK: Routledge.

Thai, M. T. T. and E. Turkina. 2014. Macro-level determinants of formal entrepreneurship versus informal entrepreneurship. *Journal of Business Venturing*, 29(4): pp. 490–510.

Webb, J. W., L. Tihanyi, R. D. Ireland, and D. G. Sirmon. 2009. You say illegal, I say legitimate: Entrepreneurship in the informal economy. *Academy of Management Review*, 34(3): pp. 492–510.

Williams, C. C. and S. Nadin. 2010. Entrepreneurship and the Informal Economy: An Overview. *Journal of Developmental Entrepreneurship*, 15(4): pp. 361–378.