Economic Complexity and Entrepreneurship Density

A Non-Linear Effect Study

This version has been accepted for publication in Technological Forecasting & Social Change. This version has not gone through the publisher proofread.

Canh Phuc Nguyen

School of Public Finance, University of Economics Ho Chi Minh City, Vietnam
(canhnguyen@ueh.edu.vn)

Bach Nguyen (corresponding author)

Aston Business School, Aston University, UK

University of Economics Ho Chi Minh City, Vietnam

(b.nguyen1@aston.ac.uk)

Bui Duy Tung

School of Business and Management, RMIT University Vietnam

(tung.buiduy@rmit.edu.vn)

Thanh Dinh Su

School of Public Finance, University of Economics Ho Chi Minh City, Vietnam
(dinhthanh@ueh.edu.vn)

Acknowledgement: This study is funded by the University of Economics Ho Chi Minh City, Vietnam

Conflict of interest statement: There is no conflict of interest reporting by all authors of this paper, titled "Economic Complexity and Entrepreneurship Density: a Study of the Global Sample"

Abstract: This study examines the link between economic complexity and entrepreneurship density. Testing 53 economies over the period 2006-2016, we find a significant Granger causality from economic complexity to entrepreneurship density, but reverse causality is not supported. Also, we suggest that entrepreneurship density is an inverted-U shaped function of economic complexity. That is, an increase in economic complexity initially facilitates entrepreneurship density as more business opportunities are created. However, beyond a specific threshold, an increase in economic complexity induces higher risks and uncertainties, discouraging entrepreneurial activities. The results remain robust by different estimators and in sub-samples of High-Income Economies and Low-and-Middle-Income Economies.

Keywords: Entrepreneurship; Economic Complexity; Structural changes; Non-Linear; Panel data.

JEL code: L26, M13, M21, F14, F15, F41.

1. Introduction

The complexity of a country's economic system is a significant topic in economics literature (Holling, 2001). Economic complexity, which quantifies the amount of knowledge materialized in a country's productive structure (Hausmann et al., 2007; Hidalgo and Hausmann, 2009; Hausmann et al., 2014) has attracted substantial research interest from both academics and policymakers (Lapatinas, 2019). One of the most important aims of this strand of research is to better understand the determinants of economic complexity (Hidalgo and Hausmann, 2009), as well as to identify the contributions of economic complexity to economic development (Lapatinas, 2019).

Meanwhile, the view of entrepreneurship as a force for "*creative destruction*" has flowed from Schumpeterian economics (Schumpeter, 1911) to the mainstream economic analytical models. Entrepreneurship is an important component that boosts both economic development (Li et al., 2012; Coulibaly et al., 2018; Shan et al., 2018) and social sustainability (Douglas and Prentice, 2019; Heiskanen et al., 2019; Rosca et al., 2020a). The determinants of entrepreneurial activities are therefore extensively investigated not only in the field of microeconomics but also by other social sciences, including social networks, institutions, and psychology (Berglann et al., 2011; Ratinho et al., 2020; Ben Youssef et al., 2021; Nguyen et al., 2020a).

Unfortunately, at the national level, entrepreneurship is rarely considered out of the institutional frameworks, which focuses on the impacts of *non*-economic factors such as government quality, corruption, and cultures, values, and religions (Nguyen and Canh, 2020a; Aidis et al., 2008; Li and Zahra, 2012). While we agree that institutional settings, at

the national level, exert a non-trivial influence on the activeness of entrepreneurship, we also suggest that economic-related factors play a role in determining national entrepreneurship. A conventional aspect of economic conditions that has been examined is the *level* of economic development (e.g., GDP).[1] Meanwhile, another aspect of economic conditions – the *structure* of the economies is less well-investigated in the extant literature. This study fills this gap by examining the impacts of economic complexity – a dimension of economic structure – on the activeness of entrepreneurship, which is measured by entrepreneurship density (Simón-Moya et al., 2014).

Since economic complexity reflects the development of information and the organizational learning involved in producing and exporting products that are more sophisticated (Lapatinas, 2019), improvements in economic complexity reflect the development of the economic systems and conditions that boost industrial production and enhance product quality (Hausmann et al., 2007; Hidalgo and Hausmann, 2009; Hausmann et al., 2014). These improved conditions are usually associated with business opportunities (demands for new products and services) as well as risks (competition with multiple newcomers) for entrepreneurs. Furthermore, the literature of the determinants of entrepreneurship is still developing, which requires further empirical studies on a relatively large sample while concerning the heteroscedasticity among entrepreneurs and new ventures (Ratinho et al., 2020). In this line, recent studies have focused on some new augmented drivers of entrepreneurship, such as technology adoption and economic policy uncertainty (Nguyen et

[1] It is been widely documented that of entrepreneurship density is higher in less developed economies compared to developed ones. This is probably due to the high level of necessity entrepreneurship in the third world. Meanwhile, in developed economies, even though entrepreneurship density is lower, they are likely nurture high-impact opportunistic ventures (Sautet, 2013).

al., 2020b; Ben Youssef et al., 2021). However, the link between economic complexity and entrepreneurship has yet to be thoroughly investigated in the literature.

In this study, we examine the influence of economic complexity on entrepreneurship density using a dataset of 53 economies from 2006 to 2016. A panel Granger-causality test reveals a significant causality effect from economic complexity to entrepreneurship density. However, reverse causality is not supported. Further, we examine the non-linear effects of economic complexity on entrepreneurship density. Since economic complexity is associated with both opportunities and uncertainties, it is important to examine the dynamics of the relationship. Our findings show that entrepreneurship density is an inverted-U shaped function of economic complexity. An intuitive explanation for this is that an increase in an initially low level of economic complexity creates business opportunities and facilitates entrepreneurship density. However, when economic complexity has reached a particular threshold, a further increase induces higher levels of competition and uncertainties for entrepreneurs, leading to a reduction in entrepreneurship density.

Robust evidence is documented when we investigate two sub-samples comprising 22 Low and Middle-Income Economies (LMEs) and 31 High-Income Economies (HIEs). The study concludes that governments may successfully nurture the activeness of entrepreneurial activities by adjusting the complexity of their national economic systems.

This study is of three significant contributions to the extant literature in entrepreneurship. First, we add a "macro" determinant to the literature examining entrepreneurship. Previous studies largely focus on individual-level (e.g. personal traits, education, and experience) (Dilli and Westerhuis, 2018; Nguyen, 2018) or organizational-level (e.g., political

connections and financing constraints) factors (Zhou, 2013; Nguyen and Canh, 2020b), leaving aside the impacts of national-level elements such as economic complexity. In this study, we suggest that the degrees of activeness of entrepreneurship in a country result not only from the *level* of economic development (e.g., GDP) but also from the *structure* of its economy (e.g., economic complexity). Second, we demonstrate empirically that exceeding levels of economic complexity may harm entrepreneurial entry, leading to lower degrees of entrepreneurship density. Standing in sharp to the previous studies, which highlight the positive impacts of economic complexity, our study discusses a "dark side" of economic complexity and suggests that authorities should keep economic complexity at an appropriate level to facilitate national entrepreneurial activities. Third, we show that the effects of economic complexity are contingent on the levels of economic development. Specifically, economic complexity can boost entrepreneurship density in LMEs but not in HIEs. Our findings thus highlight the importance of contextual understanding when approaching policies aiming at boosting entrepreneurship activities.

The paper is structured as follows; the next section summarizes the related literature, in which we first introduce some key schools of thought regarding entrepreneurship and then theorize the relationship between entrepreneurship and economic complexity. In section 3, we provide a theoretical model that quantifies the proposed relationship. Section 4 introduces the data and estimation strategies. Results are presented in section 5. Finally, section 6 discusses and concludes the paper.

2. Literature

2.1. Entrepreneurship definitions and evolvement

Entrepreneurs are individuals who take risks to create new enterprises with an aim to introduce new products and services to the economy and reap the profits resulting from this venturing process (Shane, 2004). Entrepreneurship thus has been viewed as an essential driving force that boosts the development of both developed and developing economies all around the world (Geissinger et al., 2019; Rosca et al., 2020b). The concept of entrepreneurship has been used in the French language since the twelfth century (Carlsson et al., 2013). However, it was only formally discussed in relation to economic development in Schumpeter's seminal work *The Theory of Economic Development*. Schumpeterian entrepreneurs are individuals who tend to break the equilibrium by introducing innovations (new combinations) into the economic system (Schumpeter, 1965). In this viewpoint, entrepreneurs stand right at the center of the economic theory since economic development is based on changes (creative destructions) – as opposed to equilibriums. Interestingly, after being introduced by Schumpeter, the concept of entrepreneurship attracts more attention from social and behavioral scientists than from economists (Carlsson et al., 2013). As such, the large body of entrepreneurship research following Schumpeter is related to psychology and sociology of entrepreneurship, such as investigating "traits" of entrepreneurs (see Gartner (1989) for a review) or social networks of entrepreneurs (Coleman, 1988).

It was not until the late 1960s that economists began to take an interest in the role of entrepreneurship in economic development (Leibenstein, 1968). Since then, the concept of entrepreneurship has developed and evolved significantly. However, it should be noted that there is no commonly agreed definition of entrepreneurship. Since it is impossible for us to capture all the connotations of entrepreneurship in a single empirical study, we here summarize some prominent schools of thought that help facilitates the discussion of our

study. Jian et al. (2021) suggest that the concept of entrepreneurship could be considered through three theoretical lenses, which are related but with different focuses. First, the German school, represented by Schumpeter (1965) and Baumol (1968), stresses the process of innovation or "creative destruction" of entrepreneurs. Second, the neoclassical school represented by Knight (1921) and Schultz (1980) focuses on risks and uncertainties associated with entrepreneurship. And third, the Austrian school, with Mises (1951) and Kirzner (1973) as the representatives, emphasizes the ability of entrepreneurs in discerning and making use of market opportunities. Meanwhile, Carlsson et al. (2013) see that entrepreneurship could be viewed in two ways: explorative and exploitation. On the one hand, the explorative side is concerned with the discovery of entrepreneurial opportunities, the individuals involved, and the modes of action used to realize the opportunities (Baron, 2006). On the other hand, the exploitation side focus on new enterprise and its role in furthering economic progress (Valliere and Peterson, 2009). Carlsson et al. (2013) also stress that the explorative side is more micro (firm) oriented, while the exploitation side looks more at aggregate outcomes.

In this study, we take the exploitation viewpoint to examine the association between an unexplored dimension of economic development – economic complexity and national entrepreneurship density. Before delving into this relationship, we next briefly summarize the literature on the determinants of entrepreneurship.

2.2. Determinants of entrepreneurship

The ecosystem of entrepreneurship is populated with 'entrepreneurs', 'sponsors', and 'regulators', who are the three main stakeholders (Dedehayir et al., 2018). In this ecosystem,

entrepreneurs initially rely on their personal networks to seek out knowledge and resources, and this leads to the establishment of their entrepreneurial activities (Lipparini and Sobrero, 1994). As such, Zhao et al. (2011) suggest that individual social capital has a positive impact on tourism entrepreneurship. Meanwhile, Berglann et al. (2011) emphasize that social factors such as occupational qualifications, family resources, gender, and work environments are also important to entrepreneurial activities. Indeed, a large body of research uses microeconomic theories to document numerous entrepreneurship determinants that include educational diversity, experience, income, perception of opportunities, fear of failure, entrepreneurial ability, knowing other entrepreneurs, and being a business angel (see, for example, Marino et al. (2012); Ramos-Rodríguez et al. (2012); Ogbari et al. (2018)).

Besides this strand of literature focusing on the microeconomics of entrepreneurship, some recent studies (*e.g.*, see Terjesen and Hessels (2009), Simón-Moya et al. (2014), Asongu et al. (2018); Bizri (2018)) highlight a significant variation in entrepreneurial density across countries. This macroeconomic perspective focuses on the country-level determinants of entrepreneurship. For example, Li and Wu (2014) report a negative impact of high housing prices in China's cities on Chinese urban entrepreneurs. Islam (2015) finds important evidence for the crowding-out effect of government spending on entrepreneurship density in a sample of 50 countries. Meanwhile, Dutta and Sobel (2018), using a sample of 66 economies, emphasize that a rise in national human capital would have salient positive benefits for entrepreneurship when an economy is in low financial development.

Other studies also show the importance of government efficiency and institutional quality in facilitating entrepreneurial activities. For example, Audretsch and Lehmann (2005) employ the knowledge spillover theory of entrepreneurship to argue and empirically show that firms located close to a university are positively influenced by the knowledge capacity of the region and the knowledge output of the university. This finding highlights the importance of sub-national institutional arrangements (e.g., industrial clustering policies) in facilitating entrepreneurship. Delving deeper into this topic, Furman et al. (2002) examine the determinants of a nation's innovative capacity. In their theoretical framework, both national and local institutions play an important role. Specifically, they argue that basic research infrastructure, informational infrastructure, the availability of risk capital (e.g., government subsidies), as well as other local contexts that encourage investment in innovation-led activities are essential in boosting national innovation in particular and entrepreneurship in general.

Recently, new determinants of entrepreneurship are explored, *e.g.* information technology (Hewa Wellalage et al., 2021; Chatterjee et al., 2020; Delacroix et al., 2019), policies on climate change (Crecente et al., 2021), and economic policy uncertainty (Nguyen et al., 2020b). Interestingly, Ratinho et al. (2020) review 122 published articles from 1985 to 2015 and conclude that current empirical studies are dealing with small and idiosyncratic samples and largely employing institutional theories. As such, they suggest that further studies should focus on boosting our understanding of the variation of entrepreneurship across countries from a novel perspective. In this line, despite rich literature on the macroeconomics of entrepreneurship, prior research has paid much attention to national institutional (non-economic) factors and inadequate consideration to the importance of the

structure of the economies to entrepreneurship. The next section discusses this issue in detail.

2.3. Economic complexity and entrepreneurship density

It is now widely accepted that the diversity, number, and ubiquity of exported products is a key indicator of a country's economic development (Lapatinas, 2019; Bustos et al., 2012).[2] However, conventional measures, such as export diversification, focus merely on the quantity rather than the quality of economic production. Some prior studies (Hausmann et al., 2007; Hidalgo and Hausmann, 2009; Hausmann et al., 2014; Hidalgo et al., 2007) have introduced an elaborate metric aiming at building an index that captures the levels of economic complexity at the national level, *i.e.*, the Economic Complexity Index (*ECI*), which has been used as an indicator to quantify the amount of knowledge materialized in the structure of a country's products (Hausmann et al., 2007; Hidalgo and Hausmann, 2009; Hausmann et al., 2014; Hidalgo et al., 2007). In this study, economic complexity is defined as the productive capabilities of an entire economic system in a country. Specifically, it is a measure of the knowledge accumulated in a population and that is expressed in the economic activities (Hidalgo et al., 2007). The higher the level of economic complexity in an economy, the more diversified, more active, and more sophisticated the production activities conducted in that country and vice versa.

In line with this, substantial research on economic complexity has emerged. For example, Abdon and Felipe (2011), who build on the model of Hidalgo et al. (2007), examine Sub-

[2] In fact, Adam Smith ideas have related the division of labour to national wealth because higher specialization in economic activities increases the efficiency of economic activities (Hidalgo and Hausmann, 2009)

Saharan African economies and show that they are trapped in the export of *unsophisticated* products due to poorly connected product spaces. For this reason, the economic structural transformation of Sub-Saharan Africa is unlikely to be achieved in the short run. Further, Hidalgo and Hausmann (2009) notice that the levels of economic complexity are highly correlated with country-level incomes (*e.g.*, GDP per capita). Meanwhile, Lapatinas (2019) observes that the availability of the Internet (as a proxy for knowledge and information spreading) has a positive impact on economic complexity.

Some positive outcomes of economic complexity, such as enhanced institutional quality (Lapatinas and Litina, 2018) and socio-economic improvements (Hartmann et al., 2017) are also highlighted in the literature. Specifically, Hartmann et al. (2017) show that countries with higher levels of economic complexity (in exporting products) are likely to achieve better social development (*e.g.*, lower income inequality); meanwhile, other studies emphasize the significant contributions of economic complexity to economic growth and financial investments (Hidalgo and Hausmann, 2009; Simoes and Hidalgo, 2011). In general, economic complexity is widely acknowledged to be an important factor that determines both social and economic development (Pintea and Thompson, 2007; Oosterlaken, 2015; Ferrarini and Scaramozzino, 2016).

Although several studies have focused on the measurements and the impacts of economic complexity on socio-economic development, insufficient attention has been paid to its impacts on entrepreneurship, especially entrepreneurial density, which is defined as the number of new business registrations. We expect that the number of new business creations is driven by the level of economic complexity, but this relationship is non-monotonic.

Specifically, entrepreneurs employ their capabilities and personal network capital to execute entrepreneurial activities and extract rents (Berglann et al., 2011; Canh et al., 2021; Canh et al., 2020); however, it is noteworthy that business opportunities and failure risks are also a function of economic and institutional conditions that include economic complexity (see Marino et al. (2012); Ramos-Rodríguez et al. (2012); Ogbari et al. (2018)). Thus, changes in the level of economic complexity could bring about not just opportunities but also uncertainties for economic agents, especially for entrepreneurs who are at the frontier of the "creative destruction" (Geroski, 1990; Scott et al., 2017).

Since economic complexity, by definition, measures the amount of knowledge materialized in the structure of a country's products (Hidalgo and Hausmann, 2009), an increase in economic complexity reflects the rise in both the economic diversification and quality of the production ecosystem (Ivanova et al., 2017; Felipe et al., 2012; Bustos et al., 2012). This improvement, in turn, creates substantial opportunities for new businesses through the establishment of new sectors and new products. However, the opportunities associated with new entries into the market leads to higher competition, a more dynamic environment, and higher levels of uncertainty. As a result, the impacts of economic complexity on entrepreneurship density may be contingent on the relativity of opportunities and levels of competition.

Initially, a rise in economic complexity creates more opportunities for new businesses with innovative products. At this stage, competition is still low because the sectors are newly established. This situation stimulates the verve of economic activities (Pintea and Thompson, 2007; Oosterlaken, 2015; Ferrarini and Scaramozzino, 2016) that include

entrepreneurism, leading to higher levels of economic development. However, when economic complexity reaches a particular threshold, the levels of competition that are generated by new entrants to the market suppress the emergence of new business opportunities. A possible explanation for this would be that the new opportunities created by higher levels of economic complexity exceed the (managerial, financial, and technological) capabilities of the majority of new firms. As such, most entrepreneurial ventures are forced to compete for a limited number of feasible opportunities. In other words, the rise of economic complexity to a certain level may induce more competition than there are opportunities available to satisfy them. At that threshold, an additional increase in economic complexity will lead to higher levels of uncertainty for entrepreneurs. As a consequence, some entrepreneurs may be discouraged from continuing with their activities, leading to a reduction in entrepreneurial entries, subsequently, a lower level of entrepreneurship density (new businesses creations). In the light of the above arguments, we hypothesize a non-linear (inverted U-shape) dynamic nexus between economic complexity and entrepreneurship density.

3. Theoretical model

In this section, we build a theoretical framework to examine the relationship between economic complexity and the number of entrepreneurs in an economy. We use the number of firms to measure the number of entrepreneurs. The result of the theoretical model shows that economic complexity can be a hindrance to new business initiatives. This is because when the economy becomes more complex, firms need to spend more on R&D to incorporate existing knowledge into their new products. At a certain point, the costs incurred by R&D

can be higher than firm earnings and lead to negative profits. Thus, in this situation, entrepreneurs are better off working as employees rather than creating new businesses. As a consequence, the number of firms falls when the economy becomes more complex.

We extend the model in Jovanovic (1994) and use the same notation. A representative agent can be either an entrepreneur or an employee. This person has the innate ability x to manage an enterprise and the ability y to work as an employee. As a consequence, $\Phi_{X,Y}(x, y)$ denote the cumulative distribution function of these abilities. We normalize the total number of workers and entrepreneurs to one.

To keep the model tractable, we assume a Kruger-Welch production function $Q(h)$, which only considers units of efficient labour h as its input. Thus, a firm with an x-type manager can produce $xQ(h)$ units of output. The wage in the economy is w, being the market price of a unit of efficient labour measured by units of output. The firm needs to maximize its profit with respect to h.

Knowledge spreads globally among individuals in human society and can be obtained through markets. Thus, one can see products as the transmission channel of knowledge. However, it requires time and costs to obtain and transfer the existing knowledge to a product. Economic complexity can be seen as the ability of an economy to incorporate a substantial amount of appropriate knowledge to create various products (Hausmann et al., 2007; Hidalgo and Hausmann, 2009; Hausmann et al., 2014; Hidalgo et al., 2007).

Therefore, economic complexity exerts a cost on all firms as they operate. When the level of complexity in an economy increases, i.e. when we need to integrate more relevant knowledge to improve existing products or develop new ones, incumbents need to spend more on R&D to stay in

business and newcomers have to spend more to enter the market. Thus, the representative firm's profit is:

$$\pi(x; w, \kappa) \equiv \max_{h \geq 0} \left\{ xQ(h) - wh - \gamma xQ(h) \int_0^m q^{\kappa(i)}\, di \right\} \quad [1]$$

The last term in *Eq*. [1] denotes the complexity cost, which represents the average complexity of all the products produced by m firms. It depends on a positive parameter γ and the complexity of the good produced by the x-type firm $q^{\kappa(i)}$. Thus, as $\kappa(i)$ increases over time, each firm needs to consider investing in R&D to improve its product's complexity, thereby incurring a cost.

The first-order condition of [1] is:

$$xQ'(h)\left(1 - \gamma \int_0^m q^{\kappa(i)}\, di\right) = w \quad [2]$$

Thus, the demand function for efficient labour is:

$$h(x; w, \kappa) = Q'^{-1}\left(\frac{w}{x\left(1 - \int_0^m q^{\kappa(i)} di\right)}\right) \quad [3]$$

The agent chooses to be an entrepreneur if:

$$\pi(x; w, \kappa) \geq wy \quad [4]$$

Equation [4] means that the agent (x, y) will become an entrepreneur if the firm's profit is higher than the market wage. Otherwise, the person will work as an employee.

We define equilibrium as a set in R^2 containing all the pairs (x, y) that satisfy the inequality [4] and clear the labour market.

$$E = \{x, y | \pi(x; w, \kappa) \geq wy\} \quad [5]$$

$$\int_E h(x; w, \kappa) d\,\Phi_{X,Y}(x, y) = \int_{-E} y\, d\Phi_{X,Y}(x, y) \quad [6]$$

Equation [5] implies that the agents optimally choose their professions, whereas Equation [6] states that, at equilibrium, the labour market demand must equal the labour supply.

At equilibrium, the number of entrepreneurs is :

$$m = \int_E d\Phi_{X,Y}(x, y) \quad [7]$$

Proposition 1 *The profit function of a firm can be either concave or convex in x, depending on the value of* $\gamma \int_0^m q^{\kappa(i)}\, di$

Proof. By the envelope theorem:

$$\frac{\partial \pi}{\partial x} = Q\big(h(x; w, \kappa)\big)\left[1 - \gamma \int_0^m q^{\kappa(i)}\, di\right] \quad [8]$$

$$\frac{\partial^2 \pi}{\partial x^2} = Q'\big(h(x; w, \kappa)\big)\frac{\partial h}{\partial x}\left[1 - \int_0^m q^{\kappa(i)}\, di\right] \quad [9]$$

Since h is increasing in x by [3], the profit function is convex if $\gamma \int_0^m q^{\kappa(i)}\, di \leq 1$ and concave if $\gamma \int_0^m q^{\kappa(i)}\, di \geq 1$.

Equation [8] implies that higher managerial ability creates positive profit only if the complexity of the product is at reasonable levels, i.e., $\gamma \int_0^m q^{\kappa(i)}\, di \leq 1$. When the average complexity of the product is too high, the profit function will be concave downwards.

The following section will prove that the number of entrepreneurs, or firms, in an economy will depend on the average complexity of that economy. We will consider two cases: (i) The first case assumes that the correlation between managerial and working ability is positive. It means that if a person is a good employee, it is more likely that they are also a good entrepreneur; and (ii) There is a negative correlation between managerial skill and working ability.

Positive correlation between managerial and working ability

The positive correlation between managerial and working ability means that a good entrepreneur can also be a good employee. We can write $y = \psi(x)$ with $\psi(.)$ a strictly increasing function. Thus, we can rewrite the condition [5] as:

$$E = \{x, y | \pi(x; w, \kappa) \geq w\psi(x)\} \qquad [10]$$

[insert figure 1 here]

Figure 1 shows that the results are similar to Jovanovic (1994) only when economic complexity is at low levels. In such circumstances, those agents with high managerial skills end up becoming entrepreneurs, while others will work as employees. However, when the complexity of the products is sufficiently high, firms need to spend more to survive. As a result, the expected earnings of entrepreneurs become lower than the market price of labour and the number of entrepreneurs reduces. Thus, we can see a U-shaped relation between the number of firms and product complexity.

Negative correlation between managerial and working ability

This case assumes that good managerial skills do not accompany good working-as-an-employee skills. Thus, $\psi(.)$ is now a decreasing function. *Figure 2* illustrates this scenario.

[insert figure 2 here]

The results are similar to the first case. Agents with good managerial ability always become entrepreneurs when the economy lacks complexity. At a higher level of economic complexity, the equilibrium number of entrepreneurs reduces as agents choose to work as employees.

4. Empirical model

Following the literature that builds transdisciplinary models to estimate national entrepreneurship (Rosser, 2010), this study proposes that economic growth, taxation, human capital, trade openness, and foreign direct investment (FDI) inflows are the main determinants of entrepreneurship density (Chambers and Munemo, 2019). Economic complexity is added as an augmented driver of entrepreneurship density, as follows:

Entrepreneurship density = f(Economic growth, Taxation, Human capital, Trade openness, FDI inflows, Economic Complexity) [11]

in which economic growth is the proxy of economic cycles; and entrepreneurship density is expected to be higher in decent economic conditions (Chambers and Munemo, 2019). Meanwhile, taxation is a measure of the tax burdens on entrepreneurial businesses, with higher taxation putting heavier financial burdens on new businesses, thereby impeding start-up incentives (Chowdhury et al., 2019). Human capital reflects the accumulation of national human capabilities, which may increase the tendency that individuals successfully

identify and realize business opportunities (Chowdhury et al., 2019; Lin and Yang, 2017). Finally, trade openness and FDI inflows are employed to control for economic integration, an important global-scale determinant of domestic production, markets, and entrepreneurship (Coulibaly et al., 2018; Dinopoulos and Unel, 2015; Herrera-Echeverri et al., 2014).

The panel estimation equation is as follows:

$$EnDen_{it} = \beta_o + \boldsymbol{\beta_1 ECI_{it}} + \beta_2 GDPg_{it} + \beta_3 Tax_{it} + \beta_4 HC_{it} + \beta_5 Trade_{it} + \beta_6 FDI_{it} + \varepsilon_{it} \quad [12]$$

in which: *i*, *t* denotes country *i* in year *t; EnDen* is entrepreneurship density; *ECI* is Economic Complexity; *GDPg* is economic growth; *Tax* is taxation; *HC* is human capital accumulation; *Trade* is the level of trade openness; and *FDI* is FDI inflows. β is the coefficient and ε is the residual term.

We examine the non-linear effects of economic complexity on entrepreneurship density by adding the squared term of economic complexity:

$$EnDen_{it} = \beta_o + \boldsymbol{\beta_1 ECI_{it}} + \boldsymbol{\beta'_1 ECI\hat{}2_{it}} + \beta_2 GDPg_{it} + \beta_3 Tax_{it} + \beta_4 HC_{it} + \beta_5 Trade_{it} + \beta_6 FDI_{it} + \varepsilon_{it} \quad [13]$$

4.1. Data

In this study, we measure entrepreneurship density using the (log of) numbers of new business registrations per 1,000 people aged 15-64, extracted from the World Bank's World Development Indicators database (WDIs). Real GDP growth (*GDPg*), trade openness (*Trade*) and FDI inflows to GDP (*FDI*) are also collected from WDIs. The human capital index (based on the years of schooling and returns to education) collected from Penn World Tables

version 9.1 (PWT 9.1) is used to measure human capital (*HC*). The total tax and contribution rate (% of profit) is collected from the World Bank's Doing Business database as a proxy of taxation (*Tax*).

Our main variable, economic complexity, is measured using the Economic Complexity Index (*ECI*). ECI is calculated by Hidalgo and Hausmann (2009) and is published by MIT's Observatory of Economic Complexity.[3] Subsequently, other studies (Albeaik et al., 2017; Tacchella et al., 2013; Cristelli et al., 2015; Zaccaria et al., 2016) have developed the concept of economic complexity and improved the calculation of ECI. For example, Tacchella et al. (2013) propose an advanced method that introduces "a new metric for global competitiveness", known as ECI+. Specifically, Tacchella et al. (2013) argue that it is more efficient to measure the competitiveness of a country using the complexity of their exporting products. However, they make the criticism that merely taking the average of the exporters' fitness is a naïve measure for assessing the complexity of a product. Therefore, Tacchella et al. (2013) further refine their metric by reference to Hidalgo and Hausmann (2009)'s original ECI index. The key adjustment they make is to weigh the complexity of a given product using the inverse of its fitness. Thus, while this study uses ECl as the primary measure, it also uses ECI+ (denoted in our description as *ECIa*) as an alternative measure of economic complexity in the robustness check.

Since the number of new business registrations per 1,000 people aged 15-64[4] from WDIs is only available from 2006 to 2016, the period of 2006–2016 is thus our best choice. After collecting and matching all variables for the global sample, countries with missing data

[3] http://atlas.media.mit.edu
[4] Proxy of entrepreneurship density

(especially in main variables of entrepreneurship density and economic complexity) are dropped. The final sample includes 53 countries as the best available panel.[5] *Table 1* presents the variables, their definitions, and the sources of publication.

[insert table 1 here]

Also in *Table 1*, we report the results of a cross-sectional dependence test. Following prior work on economic complexity (e.g., Hidalgo and Hausmann (2009) and Bustos et al. (2012)), we notice that the cross-sectional dependence among countries in the global markets is significant. As such, we employ Pesaran's Cross-sectional Dependence test (Pesaran, 2004) (CD-test) to examine the existence of cross-sectional dependence in our sample. The results of the CD-test, presented in the last two columns in *Table 1,* confirm the existence of cross-sectional dependence, which is carefully addressed in our econometrical estimations.

[insert table 2 here]

Table 2 presents the unconditional correlations among the variables. The results show a negative correlation between real GDP growth, taxation, and entrepreneurship density. However, there is a positive correlation between ECI, ECI+, human capital, trade openness, FDI inflows, and entrepreneurship density.

[insert figure 3 here]

Figure 3 shows the economic complexity and entrepreneurship density across the countries in our sample. Hong Kong, UAE, UK, Estonia, and Australia are among the countries that have the highest levels of entrepreneurship density. Meanwhile, the Czech Republic, Germany,

[5] See *Table A1*, Appendix, for the list of countries. The detail on sample and the countries with missing data can be provided upon requests.

Sweden, Switzerland, UK, France are among the countries that have the highest levels of economic complexity.

[insert figure 4 here]

Finally, *Figure 4* shows an interesting relationship between economic complexity and entrepreneurship density. This figure reveals that there is indeed an inverted-U shape nexus between the two variables. In the next section, we use regression estimations to examine the validity of this relationship.

4.2. Estimation

We employ the Granger-causality test (Dumitrescu and Hurlin (2012) to examine the causal relationship between economic complexity and entrepreneurship density. After identifying the causal direction, we use the Panel Corrected Standard Errors (PCSE) model to estimate the effects of ECI on entrepreneurship density. The PCSE model is the best estimator for large N (observations) and short T (time) panel data with the existence of cross-sectional dependence (Marques and Fuinhas, 2012; Jönsson, 2005; Bailey and Katz, 2011). We also employ the Feasible Generalized Least Squares (FGLS) model for dealing with heteroskedasticity (Reed and Ye, 2011; Liao and Cao, 2013; Zhang and Nian, 2013). Other estimators such as Pool OLS, Robust Pool OLS, and Robust Pool OLS with Year Effects are used as robustness checks.[6] Finally, we replicate the analysis in two sub-samples of 31 High Income Economies (HIEs) and 22 Low and Middle-Income Economies (LMEs).

5. Results

[6] The results of these models can be provided upon request.

The main results are presented in *Table 3* to *Table 5*. First, the results of the Granger-causality tests are reported in *Table 3*.

[insert table 3 here]

Table 3 shows that economic complexity (*ECI*) has a significant Granger-causality on entrepreneurship density (*EnDen*); however, the reverse effect is not statistically significant. This finding implies that the impact of economic complexity on entrepreneurship in the sample under investigation goes only in one way. The results also indicate that we can avoid endogeneity problems emanating from the feedback effects from the dependent variable (*Enden*) to the explanatory variable (*ECI*) when estimating *Eqs*. [12] and [13].

[insert table 4 here]

Table 4 reports the results of the impacts of economic complexity on entrepreneurship density by estimating *Eq*. [12] (*Part A*) and *Eq*. [13] (*Part B*).

Results in *Part A* (Table 4) show that the impacts of economic complexity on entrepreneurship density are inconsistent when the control variables trade openness and FDI inflows are included in the estimations. However, the positive effects of economic complexity on entrepreneurship density are significant and consistent in Part B when its squared term is included in the estimations. The squared term of economic complexity (*ECI^2*) appears with a significant negative impact on entrepreneurship density. These findings therefore imply a non-linear effect of economic complexity on entrepreneurship, following the inverted-U shaped pattern.

The robustness check by FGLS estimators in *Table A2* (Appendix) and the robustness check with ECI+ (*ECIa*) in *Table A2* (Appendix) confirm the validity of the findings, i.e., entrepreneurship density is an inverted-U shaped function of economic complexity. It is worthy to notice that we also carried out an additional robustness check by collecting six institutional indicators, namely control of corruption, government effectiveness, regulatory quality, political stability and absence of violence, rules of laws, and voice and accountability, to measure institutional quality as being suggested by the literature (*e.g.*, see Nguyen et al. (2020a)). The mean of six institutional indicators is employed as a proxy of the overall institutional quality. The robustness check by adding institutions as an additional control variable is performed for both ECI and ECI+. The results are reported in Table A4, Appendix, showing consistent findings that the squared term of economic complexity index (ECI or ECI+) has a significant negative impact on entrepreneurship density. This reaffirms the inverted-U shape effect of economic complexity on entrepreneurship density.

We also calculate the predictive margins of the impacts of economic complexity on entrepreneurship density, and these are graphically shown in *Figure 5.* The figure illustrates that the turning point (threshold) of ECI is 0.45; after this point, the effect of economic complexity on entrepreneurship density becomes negative.

In terms of the control variables, economic growth (*GDPg*) and taxation (*Tax*) exert a negative impact on entrepreneurship density. Meanwhile, human capital (*HC*), trade openness (*Trade*), and FDI inflows (*FDI*) have a significant positive impact on entrepreneurship density. The coefficients associated with these control variables are consistent in both *Part A* and *Part B* of *Table 4*, indicating the robustness of our findings.

[insert figure 5 here]

[insert table 5 here]

Finally, we replicated the analysis in two sub-samples of 31 HIEs and 22 LMEs. The results are reported in *Table 5*. Regression results show that economic complexity has a significant positive impact on entrepreneurship density in LMEs, and a significant negative impact on entrepreneurship density in HIEs. Specifically, an increase in ECI in LMEs is likely to be beneficial for entrepreneurship because the economic complexity in these countries is still at fairly low levels (i.e., on the left-wing of the inverted-U shape). Meanwhile, an increase in ECI in HIEs is likely to be detrimental to entrepreneurship because the levels of economic complexity in these countries are relatively high (*i.e.*, on the right-wing of the inverted-U shape).

However, the squared term of economic complexity has a significant negative effect on both groups. This finding indicates that overly high levels of economic complexity are not conducive to entrepreneurship density in either LMEs or HIEs. This result is double-checked using the FGLS estimator, and are reported in *Table A5*, Appendix.

In terms of the control variables, the results are mostly consistent for the two sub-samples save for trade openness and economic growth. Specifically, economic growth has a negative impact on entrepreneurship density in HIEs; however, it has an insignificant positive impact on entrepreneurship density in LMEs. Similarly, trade openness has a significant positive impact in HIEs and a significant negative impact in LMEs.

6. Discussion and conclusion

This study investigates the importance of economic complexity in boosting the density of national entrepreneurship. Economic complexity represents the amount of knowledge materialized in a country's productive structure (Lapatinas, 2019). As such, higher levels of economic complexity are associated with a society's greater capability to facilitate information development and learn how to produce and export more sophisticated products. This process may create new business opportunities that inspire entrepreneurs to start up and extract rents (Marino et al., 2012). For this reason, we expect the activeness of entrepreneurial activities, represented in this study by entrepreneurship density, to be determined by the levels of economic complexity.

That being said, we hypothesize a non-linear (inverted-U shaped) relationship between the two concepts. The mechanism underlying this expectation is such that when the levels of economic complexity are low, an increase in economic complexity produces substantial business opportunities (e.g., a demand for new materials, new products and services), leading to the establishment of new ventures to address the emerging market gaps (Tran, 2019). This is the case up to a certain threshold of economic complexity, beyond which further increases in the level of complexity may exert a negative impact on the activeness of entrepreneurial activities. The reason for this is that the business opportunities that are generated by a high level of economic complexity may be infeasible for entrepreneurial ventures, which are usually small, financially constrained, and managerially inexperienced (Carreira and Silva, 2010). Therefore, when entrepreneurs are forced to compete in a limited pool of business opportunities, some of the less capable entrepreneurs may decide to jump ship and pursue employment careers, leaving the most capable entrepreneurs to forge ahead

Jovanovic (1994). This filtering process will inevitably slow down the activeness of entrepreneurial activities and reduce entrepreneurship density.

We test this non-linear effect using a panel dataset of 53 economies over 11 years (2006-2016 inclusive). The results confirm the inverted-U shaped relationship between entrepreneurship density and economic complexity. We also double-check the robustness of our findings using a comprehensive set of estimators and alternative measures of economic complexity.

This study makes some important contributions to the entrepreneurship literature. First, and standing in sharp contrast to the large body of research that examines entrepreneurship from the microeconomic perspective, this study proposes a macroeconomic framework with which to investigate entrepreneurial activities. We believe that while entrepreneurs employ their capabilities and personal network capital to execute entrepreneurial activities and extract rents (Berglann et al., 2011), their identification of business opportunities (and the associated failure risks) is a function of macroeconomic conditions, including economic complexity. As such, an investigation of economic complexity from a macro level would provide a valuable understanding of the "deep" (fundamental) determinants of entrepreneurship.

Second, our finding that entrepreneurship density is an inverted-U shaped function of economic complexity demonstrates that higher levels of economic complexity may not always be conducive to entrepreneurial activities. Most venturing businesses are relatively small, managerially inexperienced, and face substantial financial constraints (Nguyen et al., 2018). For these reasons, entrepreneurs may find it challenging to address the market gaps

that stem from overly complex economic systems. A reduction in entrepreneurship density represents the filtering effect of competition, whereby only the best entrepreneurs remain in play while others, who are less capable, decide to drop out and pursue employment careers. Our study thus reveals a macrolevel mechanism explaining the activeness of entrepreneurial activities.

This study is of interest to policymakers concerned with boosting entrepreneurial activities. We show that economic complexity can boost entrepreneurship density in LMEs but not in HIEs. This finding implies that business ventures in HIEs fail to keep up with the (high) levels of economic complexity in these countries. As such, unlike the developing countries, where small businesses and entrepreneurial ventures are the key drivers of economic growth, it is the large firms that play a more significant role in boosting the economic development of developed countries. However, it is noteworthy that entrepreneurial activities with their creatively destructive nature are more likely to generate ground-breaking innovations. Therefore, governments in HIEs need to strengthen the capacity of their local entrepreneurial ventures by reducing barriers (e.g., access to financial resources), providing training, and improving institutional quality. Such assistance can help equip venturing businesses with stronger capabilities and more resources to catch up with high levels of economic complexity.

This study is not without limitations that should be acknowledged but also provide potential avenues for future research. First, the dataset employed in this study is quite small, with only 53 countries and 11 years. Future research should therefore re-test the validity of our findings using a larger dataset over a longer time period. Also, due to data limitations, we

examine only two dimensions of economic complexity (ECI and ECI+). Future studies should address this issue by examining other dimensions of economic complexity. Finally, due to the availability of data, we use entrepreneurship density as a proxy for entrepreneurial activities. Future studies may want to explore the impacts of economic complexity on other aspects of entrepreneurial activities, such as international entrepreneurship and hi-tech entrepreneurship.

References:

Abdon A and Felipe J. (2011) The product space: What does it say about the opportunities for growth and structural transformation of Sub-Saharan Africa? *Levy Economics Institute Working Papers No. 670*

Aidis R, Estrin S and Mickiewicz T. (2008) Institutions and entrepreneurship development in Russia: A comparative perspective. *Journal of Business Venturing* 23: 656-672.

Albeaik S, Kaltenberg M, Alsaleh M, et al. (2017) Improving the economic complexity index. *arXiv preprint arXiv:1707.05826*.

Asongu SA, Nwachukwu JC and Orim S-MI. (2018) Mobile phones, institutional quality and entrepreneurship in Sub-Saharan Africa. *Technological Forecasting and Social Change* 131: 183-203.

Audretsch DB and Lehmann EE. (2005) Does the Knowledge Spillover Theory of Entrepreneurship Hold for Regions? *Research Policy* 34: 1191-1202.

Bailey D and Katz JN. (2011) Implementing Panel Corrected Standard Errors in R: The pcse Package. *Journal of Statistical Software* 42: 1-11.

Baron R. (2006) Opportunity Recognition as Pattern Recognition: How Entrepreneurs 'Connect the Dots' to Identify New Business Opportunities. *Academy of Management Perspectives* 20: 104-119.

Baumol WJ. (1968) Entrepreneurship in Economic Theory. *American Economic Review* 58: 64-71.

Ben Youssef A, Boubaker S, Dedaj B, et al. (2021) Digitalization of the economy and entrepreneurship intention. *Technological Forecasting and Social Change* 164: 120043.

Berglann H, Moen ER, Røed K, et al. (2011) Entrepreneurship: Origins and returns. *Labour Economics* 18: 180-193.

Bizri OF. (2018) Chapter 5 - Innovation and Entrepreneurship in the Arab Countries. In: Bizri OF (ed) *Science, Technology, Innovation, and Development in the Arab Countries.* Academic Press, 455-502.

Bustos S, Gomez C, Hausmann R, et al. (2012) The dynamics of nestedness predicts the evolution of industrial ecosystems. *PloS one* 7: e49393.

Canh NP, Kim S and Thanh SD. (2020) Entrepreneurship and natural resource rent-seeking: The roles of institutional quality. *Economics Bulletin* 40: 1159-1177.

Canh NP, Nguyen B, Thanh SD, et al. (2021) Entrepreneurship and natural resource rents: Evidence from excessive entrepreneurial activity. *Sustainable Production and Consumption* 25: 15-26.

Carlsson B, Braunerhjelm P, McKelvey M, et al. (2013) The Evolving Domain of Entrepreneurship Research. *Small Business Economics* 41: 913-930.

Carreira C and Silva F. (2010) No Deep Pockets: Some Stylized Empirical Results on Firms' Financial Constraints. *Journal of Economic Surveys* 24: 731-753.

Chambers D and Munemo J. (2019) Regulations, Institutional Quality and Entrepreneurship. *Journal of Regulatory Economics* 55: 46-66.

Chatterjee S, Dutta Gupta S and Upadhyay P. (2020) Technology adoption and entrepreneurial orientation for rural women: Evidence from India. *Technological Forecasting and Social Change* 160: 120236.

Chowdhury F, Audretsch DB and Belitski M. (2019) Institutions and Entrepreneurship Quality. *Entrepreneurship Theory and Practice* 43: 51-81.

Coleman J. (1988) Social Capital in the Creation of Human Capital. *American Journal of Sociology* 94: 95-120.

Coulibaly SK, Erbao C and Metuge Mekongcho T. (2018) Economic globalization, entrepreneurship, and development. *Technological Forecasting and Social Change* 127: 271-280.

Crecente F, Sarabia M and Teresa del Val M. (2021) Climate change policy and entrepreneurial opportunities. *Technological Forecasting and Social Change* 163: 120446.

Cristelli M, Tacchella A and Pietronero L. (2015) The heterogeneous dynamics of economic complexity. *PloS one* 10: e0117174.
Dedehayir O, Mäkinen SJ and Ortt JR. (2018) Roles during innovation ecosystem genesis: A literature review. *Technological Forecasting and Social Change* 136: 18-29.
Delacroix E, Parguel B and Benoit-Moreau F. (2019) Digital subsistence entrepreneurs on Facebook. *Technological Forecasting and Social Change* 146: 887-899.
Dilli S and Westerhuis G. (2018) How institutions and gender differences in education shape entrepreneurial activity: a cross-national perspective. *Small Business Economics* 51: 371-392.
Dinopoulos E and Unel B. (2015) Entrepreneurs, jobs, and trade. *European Economic Review* 79: 93-112.
Douglas E and Prentice C. (2019) Innovation and profit motivations for social entrepreneurship: A fuzzy-set analysis. *Journal of Business Research* 99: 69-79.
Dumitrescu E-I and Hurlin C. (2012) Testing for Granger non-causality in heterogeneous panels. *Economic Modelling* 29: 1450-1460.
Dutta N and Sobel RS. (2018) Entrepreneurship and human capital: The role of financial development. *International Review of Economics & Finance* 57: 319-332.
Felipe J, Kumar U, Abdon A, et al. (2012) Product complexity and economic development. *Structural Change and Economic Dynamics* 23: 36-68.
Ferrarini B and Scaramozzino P. (2016) Production complexity, adaptability and economic growth. *Structural Change and Economic Dynamics* 37: 52-61.
Furman JL, Porter ME and Stern S. (2002) The Determinants of National Innovative Capacity. *Research Policy* 31: 899-933.
Gartner WB. (1989) Who is an entrepreneur? Is the wrong question. *Entrepreneurship Theory and Practice* 13: 47-68.
Geissinger A, Laurell C, Sandström C, et al. (2019) Digital entrepreneurship and field conditions for institutional change– Investigating the enabling role of cities. *Technological Forecasting & Social Change* 146: 877-886.
Geroski PA. (1990) Innovation, technological opportunity, and market structure. *Oxford economic papers* 42: 586-602.
Hartmann D, Guevara MR, Jara-Figueroa C, et al. (2017) Linking Economic Complexity, Institutions, and Income Inequality. *World Development* 93: 75-93.
Hausmann R, Hidalgo CA, Bustos S, et al. (2014) *The atlas of economic complexity: Mapping paths to prosperity*: Mit Press.
Hausmann R, Hwang J and Rodrik D. (2007) What you export matters. *Journal of economic growth* 12: 1-25.
Heiskanen E, Kivimaa P and Lovio R. (2019) Promoting sustainable energy: Does institutional entrepreneurship help? *Energy Research & Social Science* 50: 179-190.
Herrera-Echeverri H, Haar J and Estévez-Bretón JB. (2014) Foreign direct investment, institutional quality, economic freedom and entrepreneurship in emerging markets. *Journal of Business Research* 67: 1921-1932.
Hewa Wellalage N, Hunjra AI, Manita R, et al. (2021) Information communication technology and financial inclusion of innovative entrepreneurs. *Technological Forecasting and Social Change* 163: 120416.
Hidalgo CA and Hausmann R. (2009) The building blocks of economic complexity. *Proceedings of the national academy of sciences* 106: 10570-10575.
Hidalgo CA, Klinger B, Barabási A-L, et al. (2007) The product space conditions the development of nations. *Science* 317: 482-487.
Holling CS. (2001) Understanding the complexity of economic, ecological, and social systems. *Ecosystems* 4: 390-405.

Islam A. (2015) Entrepreneurship and the Allocation of Government Spending Under Imperfect Markets. *World Development* 70: 108-121.
Ivanova I, Strand Ø, Kushnir D, et al. (2017) Economic and technological complexity: A model study of indicators of knowledge-based innovation systems. *Technological Forecasting and Social Change* 120: 77-89.
Jian J, Fan X, Zhao S, et al. (2021) Business Creation, Innovation, and Economic Growth: Evidence from China's Economic Transition, 1978-2017. *Economic Modelling* 96: 371-378.
Jönsson K. (2005) Cross-sectional Dependency and Size Distortion in a Small-sample Homogeneous Panel Data Unit Root Test. *Oxford Bulletin of Economics and Statistics* 67: 369-392.
Jovanovic B. (1994) Firm formation with heterogeneous management and labor skills. *Small Business Economics* 6: 185-191.
Kirzner I. (1973) *Competition and entrepreneurship,* Chicago: University of Chicago Press.
Knight FH. (1921) *Risk, uncertainty and profit*. Available at: https://archive.org/details/riskuncertaintyp00knig.
Lapatinas A. (2019) The effect of the Internet on economic sophistication: An empirical analysis. *Economics Letters* 174: 35-38.
Lapatinas A and Litina A. (2018) Intelligence and economic sophistication. *Empirical Economics*: 1-20.
Leibenstein H. (1968) Entrepreneurship and Development. *American Economic Review* 58: 72-83.
Li H, Yang Z, Yao X, et al. (2012) Entrepreneurship, private economy and growth: Evidence from China. *China Economic Review* 23: 948-961.
Li L and Wu X. (2014) Housing price and entrepreneurship in China. *Journal of Comparative Economics* 42: 436-449.
Li Y and Zahra SA. (2012) Formal institutions, culture, and venture capital activity: A cross-country analysis. *Journal of Business Venturing* 27: 95-111.
Liao H and Cao H-S. (2013) How does carbon dioxide emission change with the economic development? Statistical experiences from 132 countries. *Global Environmental Change* 23: 1073-1082.
Lin X and Yang X. (2017) From human capital externality to entrepreneurial aspiration: Revisiting the migration-trade linkage. *Journal of World Business* 52: 360-371.
Lipparini A and Sobrero M. (1994) The glue and the pieces: Entrepreneurship and innovation in small-firm networks. *Journal of Business Venturing* 9: 125-140.
Marino M, Parrotta P and Pozzoli D. (2012) Does labor diversity promote entrepreneurship? *Economics Letters* 116: 15-19.
Marques AC and Fuinhas JA. (2012) Is renewable energy effective in promoting growth? *Energy Policy* 46: 434-442.
Mises L. (1951) *Profit and Loss. Consumers Producers Economic Services,* Illinois: South Holland.
Nguyen B. (2018) Is a Bit More Experience Bad? The Role of Entrepreneurial Experience on Investment Rate. *International Journal of Entrepreneurial Behavior & Research* 25: 1166-1187.
Nguyen B and Canh NP. (2020a) The Effects of Regional Governance, Education, and In-Migration on Business Performance. *Kyklos* 73: 291-319.
Nguyen B and Canh NP. (2020b) Formal and informal financing decisions of small businesses. *Small Business Economics* Article in Press.
Nguyen B, Canh NP and Thanh SD. (2020a) Institutions, human capital and entrepreneurship density. *Journal of the Knowledge Economy*: 1-24.
Nguyen B, Mickiewicz T and Du J. (2018) Local governance and business performance in Vietnam: the transaction costs perspective. *Regional Studies* 52: 542-557.
Nguyen B, Schinckus C, Canh NP, et al. (2020b) Economic Policy Uncertainty and Entrepreneurship: A Bad for a Good? *The Journal of Entrepreneurship*: 0971355720974819.

Ogbari ME, Olokundun MA, Uzuegbunam J, et al. (2018) Data on entrepreneurship education and entrepreneurial performance of aspiring entrepreneurs in selected Nigerian universities. *Data in Brief* 20: 108-112.
Oosterlaken I. (2015) Economic Complexity and Human Development: How Economic Diversification and Social Networks Affect Human Agency and Welfare. Taylor & Francis.
Pesaran MH. (2004) General diagnostic tests for cross section dependence in panels.
Pintea M and Thompson P. (2007) Technological complexity and economic growth. *Review of Economic Dynamics* 10: 276-293.
Ramos-Rodríguez AR, Medina-Garrido JA and Ruiz-Navarro J. (2012) Determinants of Hotels and Restaurants entrepreneurship: A study using GEM data. *International Journal of Hospitality Management* 31: 579-587.
Ratinho T, Amezcua A, Honig B, et al. (2020) Supporting entrepreneurs: A systematic review of literature and an agenda for research. *Technological Forecasting and Social Change* 154: 119956.
Reed WR and Ye H. (2011) Which panel data estimator should I use? *Applied economics* 43: 985-1000.
Rosca E, Agarwal N and Brem A. (2020a) Women entrepreneurs as agents of change: A comparative analysis of social entrepreneurship processes in emerging markets. *Technological Forecasting and Social Change* 157: 120067.
Rosca E, Agarwal N and Brem A. (2020b) Women entrepreneurs as agents of change: A comparative analysis of social entrepreneurship processes in emerging markets. *Technological Forecasting & Social Change* 157: N.PAG-N.PAG.
Rosser JB. (2010) Is a transdisciplinary perspective on economic complexity possible? *Journal of Economic Behavior & Organization* 75: 3-11.
Sautet F. (2013) Local and systemic entrepreneurship: solving the puzzle of entrepreneurship and economic development. *Entrepreneurship: Theory and Practice*: 387.
Schultz TW. (1980) Investment in Entrepreneurial Ability. *Scandinavian Journal of Economics* 82: 437-448.
Schumpeter JA. (1911) *Theory of economic development*: Routledge.
Schumpeter JA. (1965) *The theory of economic development an inquiry into profits, capital, credit, interest, and the business cycle,* New York: Oxford Univ. Press.
Scott TJ, Scott JT and Link AN. (2017) Commercial complexity and entrepreneurial finance. *Economics of Innovation and New Technology* 26: 489-500.
Shan S, Jia Y, Zheng X, et al. (2018) Assessing relationship and contribution of China's technological entrepreneurship to socio-economic development. *Technological Forecasting and Social Change* 135: 83-90.
Shane SA. (2004) *A general theory of entrepreneurship : the individual-opportunity nexus,* Cheltenham: Edward Elgar.
Simoes AJG and Hidalgo CA. (2011) The economic complexity observatory: An analytical tool for understanding the dynamics of economic development. *Workshops at the twenty-fifth AAAI conference on artificial intelligence.*
Simón-Moya V, Revuelto-Taboada L and Guerrero RF. (2014) Institutional and economic drivers of entrepreneurship: An international perspective. *Journal of Business Research* 67: 715-721.
Tacchella A, Cristelli M, Caldarelli G, et al. (2013) Economic complexity: Conceptual grounding of a new metrics for global competitiveness. *Journal of Economic Dynamics and Control* 37: 1683-1691.
Terjesen S and Hessels J. (2009) Varieties of export-oriented entrepreneurship in Asia. *Asia Pacific Journal of Management* 26: 537-561.
Tran HT. (2019) Institutional quality and market selection in the transition to market economy. *Journal of Business Venturing* 34: 1-27.

Valliere D and Peterson R. (2009) Entrepreneurship and Economic Growth: Evidence from Emerging and Developed Countries. *Entrepreneurship and Regional Development* 21: 459-480.
Zaccaria A, Cristelli M, Kupers R, et al. (2016) A case study for a new metrics for economic complexity: The Netherlands. *Journal of Economic Interaction and Coordination* 11: 151-169.
Zhang C and Nian J. (2013) Panel estimation for transport sector CO2 emissions and its affecting factors: A regional analysis in China. *Energy Policy* 63: 918-926.
Zhao W, Ritchie JRB and Echtner CM. (2011) Social capital and tourism entrepreneurship. *Annals of Tourism Research* 38: 1570-1593.
Zhou W. (2013) Political connections and entrepreneurial investment: Evidence from China's transition economy. *Journal of Business Venturing* 28: 299-315.

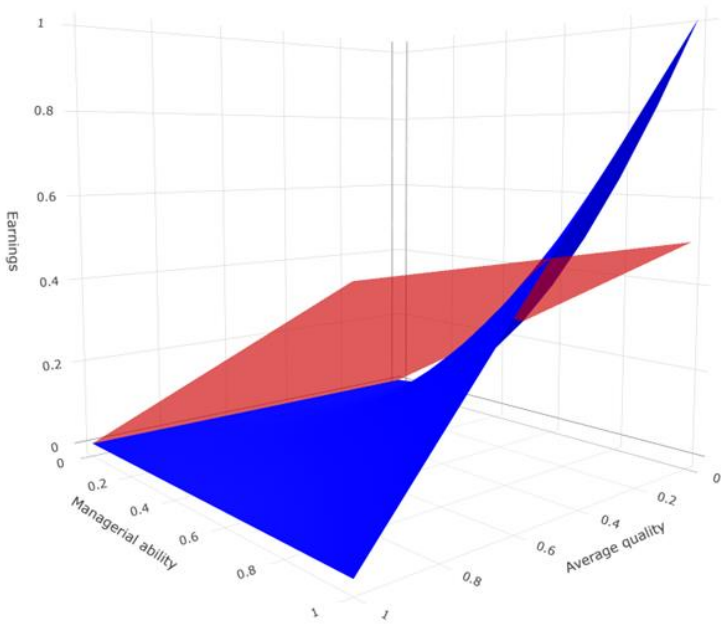

Figure 1. Equilibrium with corr(x,y)>0

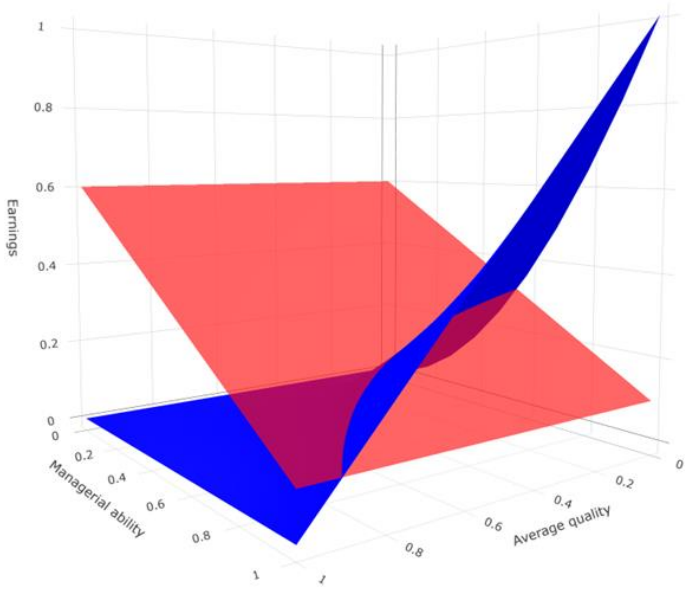

Figure 2. Equilibrium with corr(x,y)<0

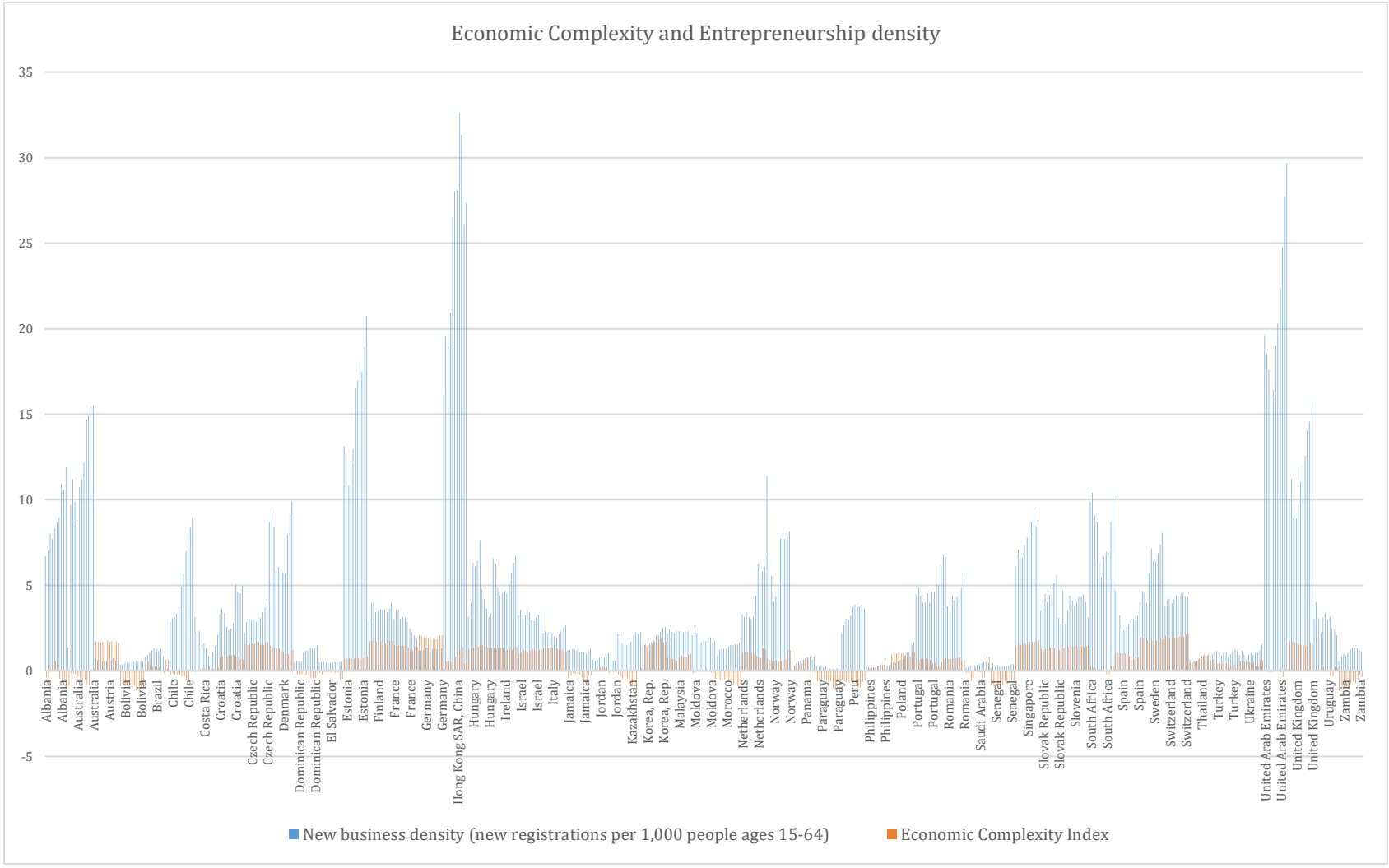

Figure 3. Economic Complexity and Entrepreneurship density (2006-2016)

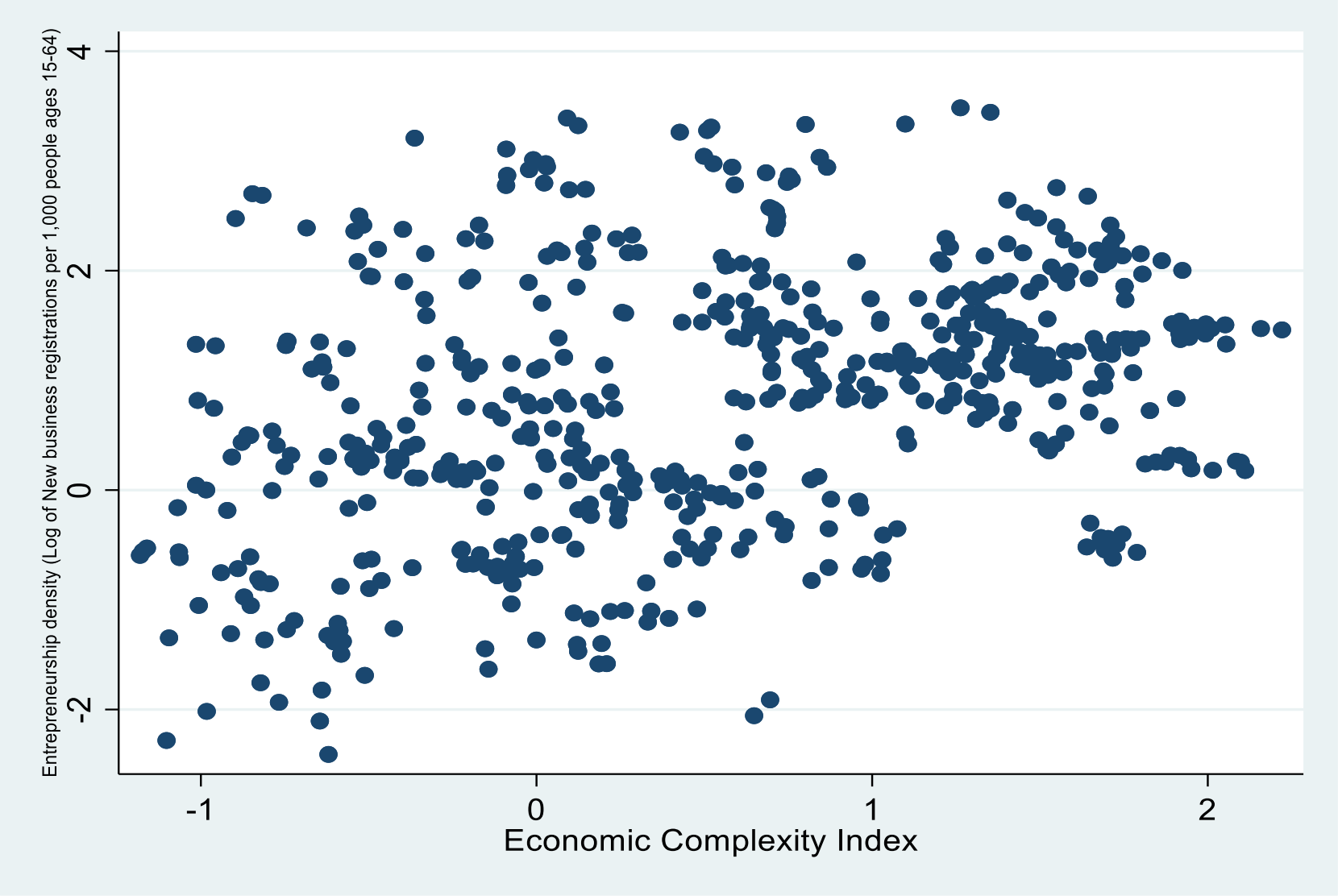

Figure 4. Economic Complexity and Entrepreneurship density nexus

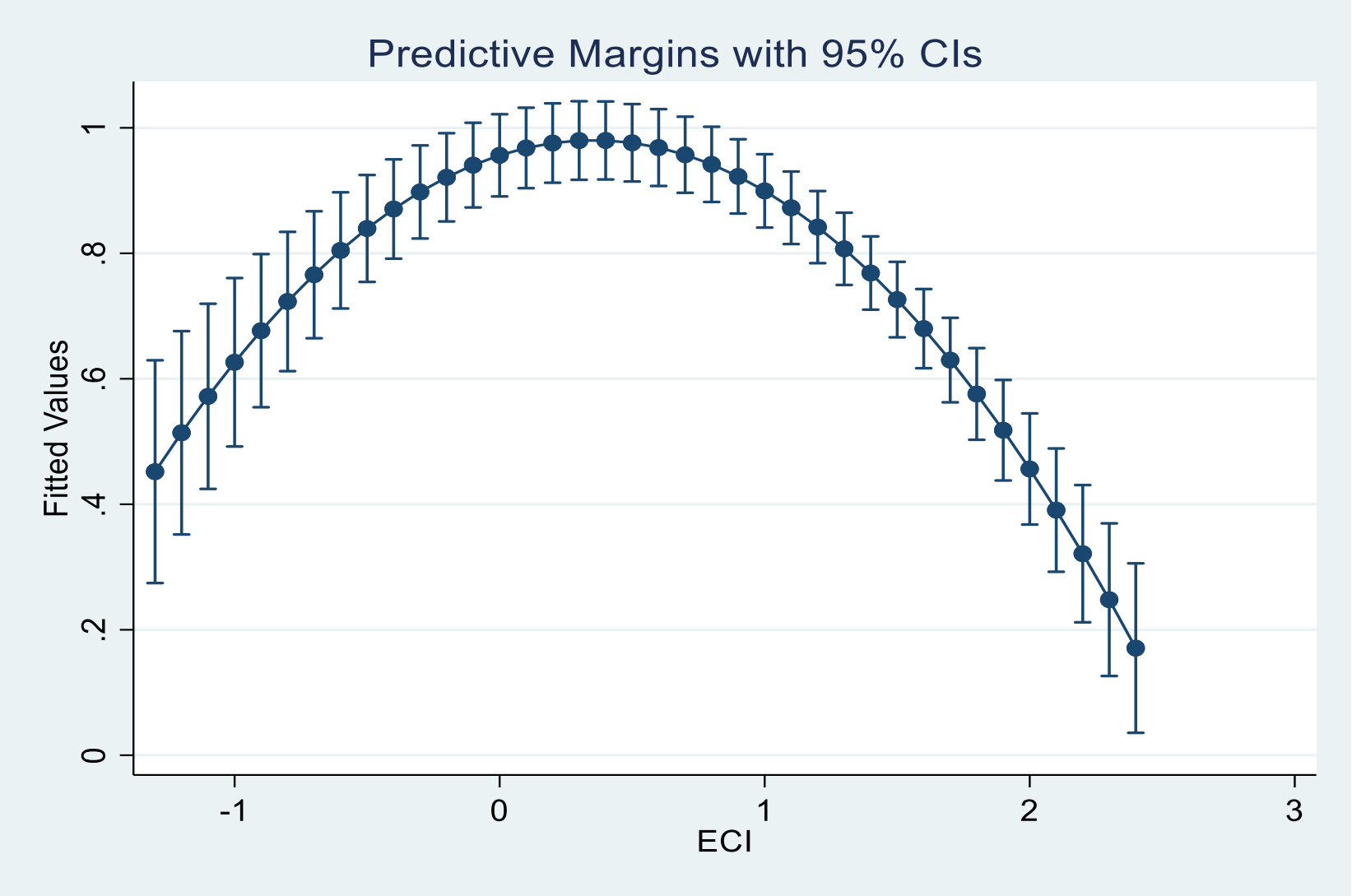

Figure 5. Predictive margins of ECI on Entrepreneurship density

Table 1. Variables, Definitions, Calculations, Sources, Data description and CD-tests.

Variables	Definitions	Calculations	Sources	Obs	Mean	Std. Dev.	Min	Max	CD-test	p-value
EnDen	Entrepreneurship density	Log of New business registrations per 1,000 people ages 15-64	WDIs	583	0.83	1.17	-2.41	3.48	18.41	0.000
ECI	Economic Complexity	Economic Complexity Index	MIT lab	583	0.57	0.85	-1.18	2.22	11.36	0.000
ECIa	Economic Complexity (alternative measurement)	Economic Complexity Index (+)	MIT lab	530	0.52	0.71	-1.53	1.46	36.24	0.000
GDPg	Economic Growth (Economic cycles)	Real GDP growth (annual %)	WDIs	583	3.02	3.58	-14.76	25.12	58.53	0.000
Tax	Taxation	Total tax and contribution rate (% of profit)	DB-WB	583	21.41	11.99	1.40	54.00	3.383	0.001
HC	Human capital	Log of Human capital index, based on years of schooling and returns to education	PWT 9.1	583	1.07	0.19	0.33	1.34	107.2	0.000
Trade	Trade openness	Trade (% of GDP)	WDIs	583	102.33	67.64	22.11	442.62	27.22	0.000
FDI	FDI inflows	Foreign direct investment, net inflows (% GDP)	WDIs	583	5.89	9.09	-15.99	87.44	20.96	0.000

Note: WDIs is World Development Indicators, World Bank (version Apr/2019, link: http://datatopics.worldbank.org/world-development-indicators/); DB-WB is Doing Business database, World Bank (link: https://datacatalog.worldbank.org/dataset/doing-business); PWT 9.1 is Penn World Tables version 9.1 (link: https://www.rug.nl/ggdc/blog/pwt-91-has-been-released-11-04-2019); Economic Complexity Index is collected from https://atlas.media.mit.edu/en/rankings/country/eci/. In CD-test, the null hypothesis of cross-section independence, CD ~ N(0,1); p-values close to zero indicate data are correlated across panel groups.

Table 2. Unconditional Correlations

Correlation	EnDen	ECI	ECIa	GDPg	Tax	HC	Trade	FDI
EnDen	1.000							
ECI	**0.350*** **	**1.000**						
p-value	0.000							
ECIa	**0.412*** **	**0.904*** **	**1.000**					
p-value	0.000	0.000						
GDPg	**-0.132*** **	**-0.258*** **	**-0.207*** **	**1.000**				
p-value	0.001	0.000	0.000					
Tax	**-0.026**	**0.274*** **	**0.217*** **	**-0.204*** **	**1.000**			
p-value	0.536	0.000	0.000	0.000				
HC	**0.515*** **	**0.668*** **	**0.634*** **	**-0.203*** **	**0.132*** **	**1.000**		
p-value	0.000	0.000	0.000	0.000	0.001			
Trade	**0.362*** **	**0.298*** **	**0.359*** **	**0.098** **	**-0.133*** **	**0.235*** **	**1.000**	
p-value	0.000	0.000	0.000	0.018	0.001	0.000		
FDI	**0.259*** **	**0.083** **	**0.125*** **	**0.185*** **	**-0.138*** **	**0.109*** **	**0.551*** **	**1.000**
p-value	0.000	0.045	0.004	0.000	0.001	0.009	0.000	

Note: *, **, *** are significant levels at 10%, 5%, and 1%, respectively.

Table 3. Granger-causality tests (Dumitrescu & Hurlin (2012))

Part A: Granger Causality tests				
Variable	Economic Complexity does not Granger-cause Entrepreneurship density (*EnDen*)		Entrepreneurship density (*EnDen*) does not Granger-cause Economic Complexity	
	Z-bar	p-value	Z-bar	p-value
ECI	5.127***	0.0000	1.388	0.1651

Note: In Granger causality test: H0: X does not Granger-cause Y, H1: X does Granger-cause Y for at least one panelvar (country).

Table 4. Economic Complexity and Entrepreneurship Density

Part A: ***Economic Complexity vs Entrepreneurship density***						
Dep. var: ***EnDen***	(1)	(2)	(3)	(4)	(5)	(6)
ECI	**0.4818*** **	**0.4659*** **	**0.5120*** **	**0.0515** **	**-0.0801** **	**-0.0674** **
	[0.0145]	[0.0175]	[0.0183]	[0.0239]	[0.0318]	[0.0287]
GDPg		-0.0146	-0.0212	-0.0144	-0.0283**	-0.0324**
		[0.0123]	[0.0143]	[0.0127]	[0.0143]	[0.0144]
Tax			-0.0137***	-0.0107***	-0.0054**	-0.0051***
			[0.0019]	[0.0019]	[0.0021]	[0.0019]
HC				3.0565***	2.9653***	2.9225***
				[0.1160]	[0.1091]	[0.1165]
Trade					0.0046***	0.0036***
					[0.0003]	[0.0003]
FDI						0.0139***
						[0.0035]
Cons.	0.5602***	0.6133***	0.9008***	-2.1936***	-2.5648***	-2.4970***
	[0.0315]	[0.0528]	[0.0865]	[0.1097]	[0.1000]	[0.1070]
R-squared	0.1223	0.1242	0.1422	0.2773	0.3370	0.3449
Part B: ***Economic Complexity vs Entrepreneurship density: Non-Linear relationships***						
Dep. var: ***EnDen***	(1)	(2)	(3)	(4)	(5)	(6)
ECI	**0.7067*** **	**0.6899*** **	**0.7452*** **	**0.2991*** **	**0.1362*** **	**0.1366*** **
	[0.0522]	[0.0508]	[0.0526]	[0.0414]	[0.0442]	[0.0429]
ECI^2	**-0.2168*** **	**-0.2136*** **	**-0.2210*** **	**-0.2396*** **	**-0.2036*** **	**-0.1933*** **
	[0.0355]	[0.0352]	[0.0352]	[0.0233]	[0.0231]	[0.0225]
GDPg		-0.0124	-0.0191	-0.0121	-0.0257*	-0.0296**
		[0.0115]	[0.0133]	[0.0119]	[0.0136]	[0.0137]
Tax			-0.0141***	-0.0112***	-0.0060***	-0.0057***
			[0.0019]	[0.0019]	[0.0021]	[0.0019]
HC				3.0908***	2.9985***	2.9580***
				[0.1395]	[0.1274]	[0.1346]
Trade					0.0044***	0.0035***
					[0.0003]	[0.0003]
FDI						0.0125***
						[0.0033]
Cons.	0.6576***	0.7013***	1.0006***	-2.1200***	-2.4859***	-2.4286***
	[0.0381]	[0.0571]	[0.0916]	[0.1268]	[0.1157]	[0.1226]
N	583	583	583	583	583	583
R-squared	0.1386	0.1399	0.1590	0.2971	0.3511	0.3575
Countries	53	53	53	53	53	53

Note: PCSE estimators; Standard Errors are in []; *, **, *** are significant levels at 10%, 5%, and 1%, respectively.

Table 5. Economic Complexity and Entrepreneurship Density in two income groups

Indep.var: ***EnDen***	(2)	(3)	(5)	(6)	(8)	(9)	(11)	(12)
Group:	***Low and Middle Income Economies***				***High Income Economies***			
ECI	**0.2279*** **	**0.3286*** **	**0.1788*** **	**0.3232*** **	**-0.5850*** **	**-0.5813*** **	**-0.3350*** **	**-0.3466*** **
	[0.0586]	[0.0701]	[0.0671]	[0.0927]	[0.0630]	[0.0632]	[0.1259]	[0.1268]
ECI^2			**-0.1935***	**-0.0184**			**-0.1572*** **	**-0.1479*** **
			[0.1064]	[0.1314]			[0.0506]	[0.0507]
GDPg	0.0140	0.0011	0.0152	0.0013	-0.0478**	-0.0501**	-0.0461**	-0.0482**
	[0.0141]	[0.0142]	[0.0139]	[0.0148]	[0.0197]	[0.0196]	[0.0190]	[0.0190]
Tax	-0.0032	-0.0068**	-0.0030	-0.0068**	-0.0027	-0.0023	-0.0035*	-0.0031*
	[0.0027]	[0.0030]	[0.0027]	[0.0031]	[0.0018]	[0.0017]	[0.0019]	[0.0018]
HC	2.1650***	1.8024***	2.1698***	1.8053***	3.6231***	3.6452***	3.7263***	3.7394***
	[0.1101]	[0.1514]	[0.1169]	[0.1604]	[0.2062]	[0.2141]	[0.1902]	[0.1973]
Trade	-0.0033***	-0.0052***	-0.0029***	-0.0052***	0.0053***	0.0049***	0.0051***	0.0048***
	[0.0009]	[0.0012]	[0.0010]	[0.0014]	[0.0003]	[0.0003]	[0.0003]	[0.0003]
FDI		0.0754***		0.0749***		0.0057**		0.0049**
		[0.0202]		[0.0223]		[0.0023]		[0.0023]
Cons.	-1.5752***	-1.2584***	-1.5613***	-1.2592***	-2.7428***	-2.7670***	-2.8468***	-2.8616***
	[0.1144]	[0.1728]	[0.1164]	[0.1760]	[0.1964]	[0.1994]	[0.1795]	[0.1825]
N	242	242	242	242	341	341	341	341
R-squared	0.1776	0.2179	0.1807	0.2180	0.2961	0.2988	0.3017	0.3037
Countries	22	22	22	22	31	31	31	31

Note: PCSE estimators; Standard Errors are in []; *, **, *** are significant levels at 10%, 5%, and 1%, respectively.

Appendix

Table A1. List of Countries

31 High Income Economies				
Australia	Finland	Israel	Poland	Spain
Austria	France	Italy	Portugal	Sweden
Chile	Germany	Korea, Rep.	Saudi Arabia	Switzerland
Croatia	Hong Kong	Netherlands	Singapore	UAE
Czech Republic	Hungary	Norway	Slovak Republic	United Kingdom
Denmark	Ireland	Panama	Slovenia	Uruguay
Estonia				
22 Low and Middle Income Economies				
Albania	El Salvador	Moldova	Romania	Ukraine
Bolivia	Jamaica	Morocco	Senegal	Zambia
Brazil	Jordan	Paraguay	South Africa	
Costa Rica	Kazakhstan	Peru	Thailand	
Dominican Rep.	Malaysia	Philippines	Turkey	

Note: Income classifications are followed the classifications of World Development Indicators database, World Bank (Apr/2019)

Table A2. Economic Complexity and Entrepreneurship density: Robustness check by FGLS estimators

Part A: ***Economic Complexity vs Entrepreneurship density***						
Dep. var: ***EnDen***	(1)	(2)	(3)	(4)	(5)	(6)
ECI	**0.4818*** **	**0.4659*** **	**0.5120*** **	**0.0515**	**-0.0801**	**-0.0674**
	[0.0534]	[0.0553]	[0.0563]	[0.0679]	[0.0675]	[0.0673]
GDPg		-0.0146	-0.0212	-0.0144	-0.0283**	-0.0324***
		[0.0131]	[0.0131]	[0.0120]	[0.0117]	[0.0117]
Tax			-0.0137***	-0.0107***	-0.0054	-0.0051
			[0.0039]	[0.0036]	[0.0035]	[0.0035]
HC				3.0565***	2.9653***	2.9225***
				[0.2927]	[0.2807]	[0.2795]
Trade					0.0046***	0.0036***
					[0.0006]	[0.0007]
FDI						0.0139***
						[0.0052]
Cons.	0.5602***	0.6133***	0.9008***	-2.1936***	-2.5648***	-2.4970***
	[0.0544]	[0.0723]	[0.1090]	[0.3128]	[0.3040]	[0.3032]
Part B: ***Economic Complexity vs Entrepreneurship density: Non-Linear relationships***						
Dep. var: ***EnDen***	(1)	(2)	(3)	(4)	(5)	(6)
ECI	**0.7067*** **	**0.6899*** **	**0.7452*** **	**0.2991*** **	**0.1362**	**0.1366**
	[0.0861]	[0.0878]	[0.0881]	[0.0907]	[0.0903]	[0.0898]
ECI^2	**-0.2168*** **	**-0.2136*** **	**-0.2210*** **	**-0.2396*** **	**-0.2036*** **	**-0.1933*** **
	[0.0654]	[0.0655]	[0.0648]	[0.0592]	[0.0571]	[0.0570]
GDPg		-0.0124	-0.0191	-0.0121	-0.0257**	-0.0296**
		[0.0130]	[0.0130]	[0.0119]	[0.0116]	[0.0116]
Tax			-0.0141***	-0.0112***	-0.0060*	-0.0057
			[0.0039]	[0.0036]	[0.0035]	[0.0035]
HC				3.0908***	2.9985***	2.9580***
				[0.2888]	[0.2778]	[0.2770]
Trade					0.0044***	0.0035***
					[0.0006]	[0.0007]
FDI						0.0125**
						[0.0052]
Cons.	0.6576***	0.7013***	1.0006***	-2.1200***	-2.4859***	-2.4286***
	[0.0614]	[0.0765]	[0.1118]	[0.3090]	[0.3015]	[0.3010]
N	583	583	583	583	583	583
Countries	53	53	53	53	53	53

Note: FGLS estimators; Standard Errors are in []; *, **, *** are significant levels at 10%, 5%, and 1%, respectively.

Table A3. Economic Complexity and Entrepreneurship density - Robustness check by ECI+

Part A: ***Economic Complexity (ECI+) vs Entrepreneurship density***						
Dep. var: ***EnDen***	(1)	(2)	(3)	(4)	(5)	(6)
ECIa	**0.6710*** **	**0.6531*** **	**0.6895*** **	**0.2627*** **	**0.1036*** **	**0.1162*** **
	[0.0211]	[0.0218]	[0.0218]	[0.0257]	[0.0303]	[0.0294]
GDPg		-0.0165	-0.0232*	-0.0126	-0.0235*	-0.0287**
		[0.0116]	[0.0136]	[0.0110]	[0.0124]	[0.0127]
Tax			-0.0119***	-0.0112***	-0.0067***	-0.0063***
			[0.0021]	[0.0018]	[0.0020]	[0.0016]
HC				2.5787***	2.5489***	2.5099***
				[0.1085]	[0.1057]	[0.1205]
Trade					0.0040***	0.0029***
					[0.0002]	[0.0003]
FDI						0.0158***
						[0.0042]
Cons.	0.4729***	0.5326***	0.7891***	-1.7848***	-2.1409***	-2.0778***
	[0.0412]	[0.0544]	[0.0932]	[0.1051]	[0.1003]	[0.1157]
R-squared	0.1699	0.1726	0.1867	0.2923	0.3358	0.3460
Part B: ***Economic Complexity vs Entrepreneurship density: Non-Linear relationships***						
Dep. var: ***EnDen***	(1)	(2)	(3)	(4)	(5)	(6)
ECIa	**0.7341*** **	**0.7175*** **	**0.7540*** **	**0.3236*** **	**0.1961*** **	**0.2058*** **
	[0.0352]	[0.0338]	[0.0351]	[0.0359]	[0.0408]	[0.0414]
ECIa^2	**-0.1470*** **	**-0.1529*** **	**-0.1531*** **	**-0.1411*** **	**-0.2671*** **	**-0.2602*** **
	[0.0385]	[0.0413]	[0.0423]	[0.0332]	[0.0463]	[0.0437]
GDPg		-0.0176	-0.0243*	-0.0136	-0.0270**	-0.0319**
		[0.0120]	[0.0139]	[0.0115]	[0.0136]	[0.0137]
Tax			-0.0119***	-0.0112***	-0.0061***	-0.0057***
			[0.0021]	[0.0019]	[0.0020]	[0.0017]
HC				2.5699***	2.5279***	2.4909***
				[0.1168]	[0.1212]	[0.1348]
Trade					0.0045***	0.0035***
					[0.0003]	[0.0003]
FDI						0.0152***
						[0.0038]
Cons.	0.5548***	0.6218***	0.8785***	-1.6936***	-2.0195***	-1.9619***
	[0.0491]	[0.0701]	[0.1085]	[0.1167]	[0.1184]	[0.1326]
N	530	530	530	530	530	530
R-squared	0.1745	0.1776	0.1917	0.2965	0.3500	0.3595
Countries	53	53	53	53	53	53

Note: PCSE estimators; Standard Errors are in []; *, **, *** are significant levels at 10%, 5%, and 1%, respectively.

Table A4. Economic Complexity and Entrepreneurship density - Robustness check by controlling institutional quality

Part A: ***Economic Complexity vs Entrepreneurship density: Non-Linear relationships for ECI***							
Dep. var: ***EnDen***	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ECI	-0.3018***	-0.4188***	0.1417***	-0.3874***	-0.3302***	-0.0619	-0.2256***
	[0.0445]	[0.0578]	[0.0471]	[0.0480]	[0.0552]	[0.0405]	[0.0438]
ECI^2	-0.3188***	-0.2695***	-0.3327***	-0.2584***	-0.2853***	-0.2431***	-0.3057***
	[0.0206]	[0.0199]	[0.0287]	[0.0177]	[0.0209]	[0.0221]	[0.0223]
GDPg	-0.0063	-0.0076	-0.0194*	-0.0076	-0.0091	-0.0174	-0.0105
	[0.0089]	[0.0096]	[0.0102]	[0.0092]	[0.0101]	[0.0108]	[0.0099]
Tax	0.0027	0.0112***	-0.0104***	0.0059***	0.0042**	-0.0079***	0.0070***
	[0.0019]	[0.0021]	[0.0015]	[0.0017]	[0.0019]	[0.0022]	[0.0019]
HC	2.1386***	2.3390***	2.3689***	1.9941***	2.3545***	2.4346***	2.5479***
	[0.1183]	[0.1044]	[0.1449]	[0.0990]	[0.1154]	[0.1340]	[0.1289]
Trade	0.0039***	0.0026***	0.0023***	0.0030***	0.0040***	0.0059***	0.0038***
	[0.0004]	[0.0004]	[0.0003]	[0.0004]	[0.0003]	[0.0003]	[0.0003]
FDI	-0.0034	0.0045	0.0058**	-0.0051*	-0.0013	0.0012	-0.0009
	[0.0032]	[0.0031]	[0.0027]	[0.0029]	[0.0029]	[0.0025]	[0.0032]

INST	1.0451*** [0.0367]						
Government effectiveness		0.9373*** [0.0427]					
Political stability and absence of violence			0.6571*** [0.0378]				
Regulatory quality				1.1400*** [0.0387]			
Rule of law					0.8041*** [0.0308]		
Voice and accountability						0.5516*** [0.0253]	
Control of corruption							0.6810*** [0.0262]
Cons.	-1.9626*** [0.1107]	-2.2989*** [0.1103]	-1.6258*** [0.1435]	-2.0320*** [0.0952]	-2.1333*** [0.1136]	-2.1688*** [0.1044]	-2.3407*** [0.1260]
N	583	583	583	583	583	583	583
R-squared	0.5541	0.5331	0.4682	0.5654	0.5157	0.4326	0.5330
No. of countries	53	53	53	53	53	53	53
Part B: ***Economic Complexity vs Entrepreneurship density: Non-Linear relationships for ECI+***							
Dep. var: ***EnDen***	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ECIa	-0.1295*** [0.0384]	-0.2456*** [0.0431]	0.2024*** [0.0356]	-0.2407*** [0.0386]	-0.1470*** [0.0354]	0.1082** [0.0478]	-0.1008*** [0.0382]
ECIa^2	-0.5360*** [0.0409]	-0.5199*** [0.0435]	-0.4093*** [0.0410]	-0.4847*** [0.0399]	-0.4908*** [0.0391]	-0.4623*** [0.0518]	-0.4532*** [0.0391]
GDPg	-0.0110 [0.0089]	-0.0121 [0.0095]	-0.0240** [0.0105]	-0.0103 [0.0091]	-0.0137 [0.0101]	-0.0188* [0.0105]	-0.0150 [0.0102]
Tax	-0.0004 [0.0018]	0.0072*** [0.0018]	-0.0110*** [0.0014]	0.0027* [0.0015]	0.0009 [0.0017]	-0.0087*** [0.0019]	0.0036* [0.0019]
HC	1.3737*** [0.1281]	1.6236*** [0.1220]	1.6808*** [0.1412]	1.3389*** [0.1115]	1.6433*** [0.1184]	1.6860*** [0.1590]	1.8203*** [0.1244]
Trade	0.0045*** [0.0003]	0.0035*** [0.0003]	0.0026*** [0.0002]	0.0038*** [0.0003]	0.0045*** [0.0003]	0.0061*** [0.0003]	0.0043*** [0.0003]
FDI	0.0012 [0.0029]	0.0080** [0.0032]	0.0096*** [0.0031]	-0.0010 [0.0028]	0.0032 [0.0028]	0.0040 [0.0026]	0.0032 [0.0031]
INST	0.8871*** [0.0292]						
Government effectiveness		0.7990*** [0.0252]					
Political stability and absence of violence			0.6018*** [0.0277]				
Regulatory quality				1.0060*** [0.0362]			
Rule of law					0.6608*** [0.0182]		
Voice and accountability						0.5268*** [0.0287]	
Control of corruption							0.5735*** [0.0195]
Cons.	-1.0842*** [0.1214]	-1.4371*** [0.1234]	-0.9537*** [0.1400]	-1.2467*** [0.1070]	-1.3075*** [0.1179]	-1.3569*** [0.1406]	-1.5292*** [0.1247]
N	530	530	530	530	530	530	530
R-squared	0.5137	0.4960	0.4568	0.5266	0.4765	0.4285	0.4949
No. of countries	53	53	53	53	53	53	53

Notes: six institutional indicators are collected from WGIs (World Bank), INST is average of six institutional indicators to proxy for overall institutional quality; PCSE estimators; Standard Errors are in []; *, **, *** are significant levels at 10%, 5%, and 1%, respectively.

Table A5. Economic Complexity and Entrepreneurship density by income groups: Robustness check by ECI+

Indep.var: ***EnDen***	(2)	(3)	(5)	(6)	(8)	(9)	(11)	(12)
ECIa	**0.1753*** ** [0.0343]	**0.3285*** ** [0.0600]	**0.1354*** ** [0.0380]	**0.3127*** ** [0.0680]	**-0.5364*** ** [0.1102]	**-0.5355*** ** [0.1083]	**0.2854** [0.3525]	**0.2967** [0.3493]
ECIa^2			**-0.2016*** ** [0.0506]	**-0.0582** [0.0519]			**-0.7132*** ** [0.2366]	**-0.7221*** ** [0.2344]
GDPg	0.0092 [0.0141]	-0.0100 [0.0156]	0.0075 [0.0141]	-0.0099 [0.0156]	-0.0445** [0.0193]	-0.0476** [0.0193]	-0.0435** [0.0181]	-0.0468*** [0.0179]
Tax	-0.0007	-0.0055*	-0.0010	-0.0055*	-0.0061***	-0.0055***	-0.0065***	-0.0059***

	[0.0026]	[0.0032]	[0.0028]	[0.0032]	[0.0017]	[0.0015]	[0.0017]	[0.0015]
HC	2.2202***	1.6997***	2.0369***	1.6615***	2.5078***	2.5528***	2.8287***	2.8815***
	[0.0945]	[0.1925]	[0.1118]	[0.1843]	[0.1642]	[0.1651]	[0.1312]	[0.1279]
Trade	-0.0035***	-0.0061***	-0.0027***	-0.0058***	0.0054***	0.0049***	0.0058***	0.0052***
	[0.0006]	[0.0009]	[0.0007]	[0.0010]	[0.0003]	[0.0003]	[0.0003]	[0.0003]
FDI		0.0920***		0.0894***		0.0072***		0.0078***
		[0.0247]		[0.0252]		[0.0025]		[0.0026]
Cons.	-1.6429***	-1.1573***	-1.4406***	-1.1126***	-1.5194***	-1.5710***	-1.9509***	-2.0122***
	[0.1119]	[0.2050]	[0.1358]	[0.1950]	[0.1476]	[0.1419]	[0.1738]	[0.1648]
N	220	220	220	220	310	310	310	310
Countries	0.1907	0.2458	0.1981	0.2464	0.2385	0.2429	0.2695	0.2746

Note: PCSE estimators; Standard Errors are in []; *, **, *** are significant levels at 10%, 5%, and 1%, respectively.