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RESEARCH ARTICLE

Realizing expectations? High-impact entrepreneurship across countries

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Abstract Comparative international entrepreneurship research has often used measures of high-growth expectations entrepreneurship to proxy for the construct of high-impact entrepreneurship. We revisit this practice by assessing the cross-country association between high-growth *expectations* and *realized* high-impact entrepreneurship to speak to construct measurement fit. We find that expectations are not a good proxy for realizations; they are associated with different determinants and outcomes, respectively. We go on to introduce the notion of *entrepreneurial projection bias* to gauge the misfit between expectations and realizations. Conditioning on entrepreneurial projection bias partially restores the association between realized high-impact entrepreneurship and its determinants (or outcomes) when realizations are proxied using expectations. Furthermore, we show that opportunity-motivated entrepreneurship also does not proxy well for high-impact entrepreneurship. Our analysis brings into question current survey-based approaches to measuring high-impact entrepreneurship and existing rankings of countries' entrepreneurial performance, with important implications for entrepreneurship theory and policy.

Plain English Summary Realizing expectations? Across countries, high-growth *expectations* entrepreneurship and *realized* high-impact entrepreneurship are only weakly associated, with important implications for entrepreneurship theory and policy. Measuring high-impact entrepreneurship at the country level is challenging. We revisit the common practice of using high-growth expectations entrepreneurship as a proxy for high-impact entrepreneurship when comparing countries' entrepreneurial performance. We find that high-growth expectations are not a good indicator for realized high-impact entrepreneurship; the two measures are only weakly related and have different determinants and outcomes. To measure the divergence between expectations and realizations, we introduce the notion of *entrepreneurial projection*

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bias which captures cross-country differences in cognitive biases and structural impediments to business growth. Our analysis has important implications for scholars studying how to promote entrepreneurship as well as for policymakers who need a reliable indicator of country-level entrepreneurship to design effective policies.

Keywords Construct measurement · High-impact entrepreneurship · High-growth expectations entrepreneurship · Entrepreneurial projection bias · Comparative international entrepreneurship research

JEL Classification L26 · M13 · O31 · O57

1 Introduction

How do we measure entrepreneurial activity at the country level, especially in terms of the economically relevant high-impact entrepreneurship that drives innovation, job creation, well-being, and growth (Acs et al., 2018; Baumol, 2002, 2010; Baumol & Strom, 2007)? This is of major theoretical, empirical, and practical relevance for comparative international entrepreneurship research which seeks to explain the cross-country differences in entrepreneurial performance (Estrin et al., 2013a; Stephan & Uhlaner, 2010; Terjesen et al., 2016) and for policymakers intent on fostering entrepreneurship (European Commission, 2013; OECD, 2010, 2020).

Entrepreneurship *theory* sees an intimate relationship between high-impact entrepreneurship on the one side, and radical innovation, job creation, firm growth, competitiveness, and economic dynamism on the other. High-impact entrepreneurship is viewed as a key element of the process of "creative destruction", of fundamentally transformative novelty creation ("new combinations") (Schumpeter, 1934), whereby the development of new products, services, and processes, often within newly founded organizations (Audretsch, 1995), challenges and potentially displaces incumbents, and raises national productivity. Hence, high-impact entrepreneurship breaks up previous routines and replicative market patterns. But these are rare occurrences: only a very small proportion of new ventures introduce radical innovation and "new combinations" to the market. The overwhelming majority of entrepreneurs engage in incremental advances or non-innovative routine small business activity (Hurst & Pugsley, 2011). Hence, entrepreneurship research differentiates between the constructs of high-impact entrepreneurship (i.e., entrepreneurial quality) and replicative routine entrepreneurship (i.e., entrepreneurial quantity) (Guzman & Stern, 2020; Henrekson & Sanandaji, 2014, 2020; Schoar, 2010), a distinction that is also critical for the impact of entrepreneurship on national economic performance (Baumol, 2002, 2010). The theoretical construct of high-impact entrepreneurship is clear.

The *measurement* of high-impact entrepreneurship in a cross-country context, however, has been much harder to address. Collecting harmonized and reliable entrepreneurship data across countries has proven to be very difficult in general (Reynolds et al., 2005), a challenge that is further exacerbated if we focus on high-impact entrepreneurship. While there are some established measures to operationalize replicative routine entrepreneurship, such as the Global Entrepreneurship Monitor (GEM) Total (early-stage) Entrepreneurial Activity (TEA), these measures have proven to be too coarse to capture high-impact entrepreneurship, blurring the construct with self-employment and micro firms. To refine this measure, pioneering work has used the GEM measure of high-growth expectations entrepreneurship, thereby drawing attention to the critical distinction between the quantity and quality of entrepreneurship in cross-country comparative research (Autio, 2011; Autio & Acs, 2010; Bowen & De Clercq, 2008; Estrin et al., 2013a; Levie & Autio, 2011). Since then, high-growth expectations entrepreneurship has become an increasingly popular empirical proxy for the construct of country-level high-impact entrepreneurship: between 2008 and 2020, we can identify more than 40 published scholarly studies using this measure in leading journals, and we also see it being used in policy and think-tank reports (e.g., OECD/European Commission, 2021; World Economic Forum, 2015).[1] The theoretical construct of high-impact entrepreneurship is frequently operationalized using a proxy, namely, high-growth expectations entrepreneurship.

[1] The measure has been used in studies published in, for example, Administrative Science Quarterly, Entrepreneurship Theory and Practice, Journal of Business Venturing, Journal of International Business Studies, Journal of Management Studies, Small Business Economics, and the Strategic Entrepreneurship Journal. In the spirit of Crawford et al. (2022), we refrain from citing papers in instances that could be construed as "negative citations". A detailed reference list

A close correspondence between theoretical construct and empirical measurement is a necessary precondition for theory testing and the derived policy recommendations (Aguinis et al., 2023; Chandler & Lyon, 2001; Maula & Stam, 2020). To date, however, it is not known whether and to what extent cross-country differences in high-growth expectations entrepreneurship actually measure variation in the construct of high-impact entrepreneurship. At the individual level, a large literature has linked entrepreneurial growth intentions and actual growth longitudinally (Delmar & Wiklund, 2008; Levie & Autio, 2013; Wiklund & Shepherd, 2003). However, the associations between expectations and realizations at the individual level and the country level may differ sharply: Robinson (1950) cautions us that relations observed at one level of analysis cannot necessarily be 'extrapolated' to hold at another level of analysis without invoking possible (reverse) ecological fallacy concerns. At the country level, the evidence about the relationship is scant and not very encouraging: for example, Henrekson and Sanandaji (2020) report that high-growth expectations across countries correlate at -0.09 with initial public offerings (IPOs)—an important indicator of high-impact entrepreneurship.

Therefore, to speak to construct measurement in comparative international entrepreneurship research (Terjesen et al., 2016), we provide evidence about the cross-country association between high-growth *expectations* entrepreneurship and *realized* high-impact entrepreneurship. Comparing rich hand-collected data on realized high-impact entrepreneurship across countries (Henrekson & Sanandaji, 2018, 2020) with GEM indicators of high-growth expectations entrepreneurship (Autio, 2007; Reynolds et al., 2005), we find no evidence of a positive relationship between the two. This finding brings into question the current approach to construct measurement as well as existing national rankings of entrepreneurial performance.

We go on to introduce the notion of *entrepreneurial projection bias* which captures the discernable differences between expectations and realizations. Entrepreneurial projection bias encompasses cross-country differences in cognitive biases, such as overoptimism and overconfidence, as well as structural barriers that impede the realization of high-growth expectations. The cross-country measure of entrepreneurial projection bias is also potentially of methodological value in addressing the analytical and inferential challenges that arise from the weak association between expectations and realizations.

We then present two stylized examples related to the determinants and consequences of entrepreneurship. Our examples demonstrate that the determinants and consequences of high-growth expectations and realized high-impact entrepreneurship differ, underscoring the critical importance of construct measurement for theory testing and policy recommendations. We also illustrate the value of conditioning on entrepreneurial projection bias: it helps to partially recover the association between realized high-impact entrepreneurship and its determinants or consequences when realizations are not directly observed but proxied using high-growth expectations. We further document that another commonly used proxy, opportunity-motivated entrepreneurship, also fails to proxy well for realized high-impact entrepreneurship.

Our analyses lead us to caution against the use of high-growth expectations (or opportunity-motivated entrepreneurship) in cross-country studies theorizing on high-impact entrepreneurship or in cross-country rankings of entrepreneurial performance, with important implications for comparative international entrepreneurship research (Estrin et al., 2013a; Stephan & Uhlaner, 2010; Terjesen et al., 2016). We also suggest that conditioning on entrepreneurial projection bias may be helpful on inferential grounds in those instances where researchers or policymakers need to rely on high-growth expectations as a proxy for high-impact entrepreneurship. Collectively, our analysis has important policy implications in that the assessment of countries' entrepreneurial performance shapes the formulation, resource allocation, and evaluation of entrepreneurship policies. Without accurate construct measurement, entrepreneurship policy may be based on incorrect evaluations of the problem to be solved, potentially leading to the misallocation of public resources (Acs et al., 2016a; Bradley et al., 2021; Shane, 2009). Construct measurement matters—for theory and policy.

Footnote 1 (continued)
is available upon request. We also note that the literature has used several different terms to refer to the construct of interest, such as ambitious entrepreneurship or high-job creation entrepreneurship (cf. Hermans et al., 2015), which share the common denominator of seeking to capture entrepreneurial quality rather than entrepreneurial quantity.

2 Empirical approach

We first present our empirical approach before discussing the implications. Our analysis is informed by extant contributions regarding the conceptualization and measurement of entrepreneurship (Acs et al., 2008, 2014; Decker et al., 2016; Guzman & Stern, 2020; Henrekson & Sanandaji, 2014, 2020; Nightingale & Coad, 2014), including the importance of job creation (Anyadike-Danes et al., 2015; Birch, 1979; Burke et al., 2000; Cowling et al., 2004), as well as reviews of ambitious high-impact entrepreneurship (Block et al., 2017; Henrekson et al., 2023; Hermans et al., 2015).

2.1 Data

We use data from two principal data sources: the detailed hand-collected Henrekson and Sanandaji (2020) database and the GEM Adult Population Survey (Autio, 2007; GEM, 2022a; Reynolds et al., 2005). We pool data from 2010–2017 to construct a cross-sectional country-level dataset that comprises 62 economies.[2] Our focus on the country level follows the tradition of comparative international entrepreneurship research that centers on explaining cross-national differences in entrepreneurship (e.g., Estrin et al., 2013b; Stephan & Uhlaner, 2010; Young et al., 2018) and the national systems of entrepreneurship literature (e.g., Acs et al., 2014, 2016b; Audretsch et al., 2024).

Realized high-impact entrepreneurship We start with the Henrekson and Sanandaji (2020) approach to conceptualizing realized high-impact entrepreneurship as a reflective construct measured using four underlying measures: (1) venture capital funded initial public offerings, (2) unicorns, (3) global top young entrepreneurial firms, and (4) self-made billionaire entrepreneurs.[3] We normalize these four measures by countries' population to obtain, for example, the number of unicorns per million capita. We then apply principal-component factor analysis and find one latent factor with an eigenvalue larger than one (Cronbach's alpha 0.83); this latent factor is our measure of countries' levels of realized high-impact entrepreneurship.

High-growth expectations entrepreneurship Following the GEM (2022b) definition, we measure the prevalence of high-growth expectations entrepreneurship across countries as the share of the population involved in Total early-stage Entrepreneurial Activity (TEA) who expect to create six or more jobs in the coming five years, divided by the number of individuals involved in TEA (GEM, 2022a). In the analyses presented in the main text, we focus on the results obtained using this standard operationalization. Recognizing that scholars have employed different variants of this main measure we demonstrate the robustness of our findings to alternative operationalizations in the Appendix.[4]

While these measures differ in important ways, they have both been used to operationalize high-impact entrepreneurship which motivates our inquiry into their relationship. For comparability and to facilitate the interpretation of our visualizations, we rescale both measures from 0–100.

2.2 High-growth expectations and realized high-impact entrepreneurship

We begin our exploration by plotting the two measures in Fig. 1. In Panel A, we see that realized high-impact entrepreneurship is particularly prevalent in the United States, Israel, and Switzerland and low in Colombia, India, and Hungary. In Fig. 1 Panel B, we observe that high-growth expectations

[2] Descriptive statistics and a list of the countries included in the study are presented in Section 2.3. We include Hong Kong when calculating the measures for China. We exclude Singapore from our analyses because it constitutes an outlier. We note, though, that the results of the stylized examples presented in Section 2.4 are qualitatively unchanged by this choice.

[3] These measures are all taken directly from the Henrekson and Sanandaji (2020) database to which we refer the reader for a detailed description (see also Henrekson and Sanandaji, 2018). Following the rationale laid out there, we view these measures as proxying for the underlying high-impact entrepreneurship that is also taking place within smaller firms. For brevity, descriptive statistics and correlation matrices of the four underlying components are presented in Appendix Tables 1 and 2.

[4] Specifically, we use different job-creation thresholds and we also vary the denominator used in deriving these alternative measures (e.g., Decker et al., 2020; Hermans et al., 2015). These support our findings discussed below and are presented in Appendix Figures 1 and 2. Furthermore, we also compare lagged and forward high-growth expectations entrepreneurship with realized high-impact entrepreneurship (see Appendix Figure 3) which also corroborate our findings reported below.

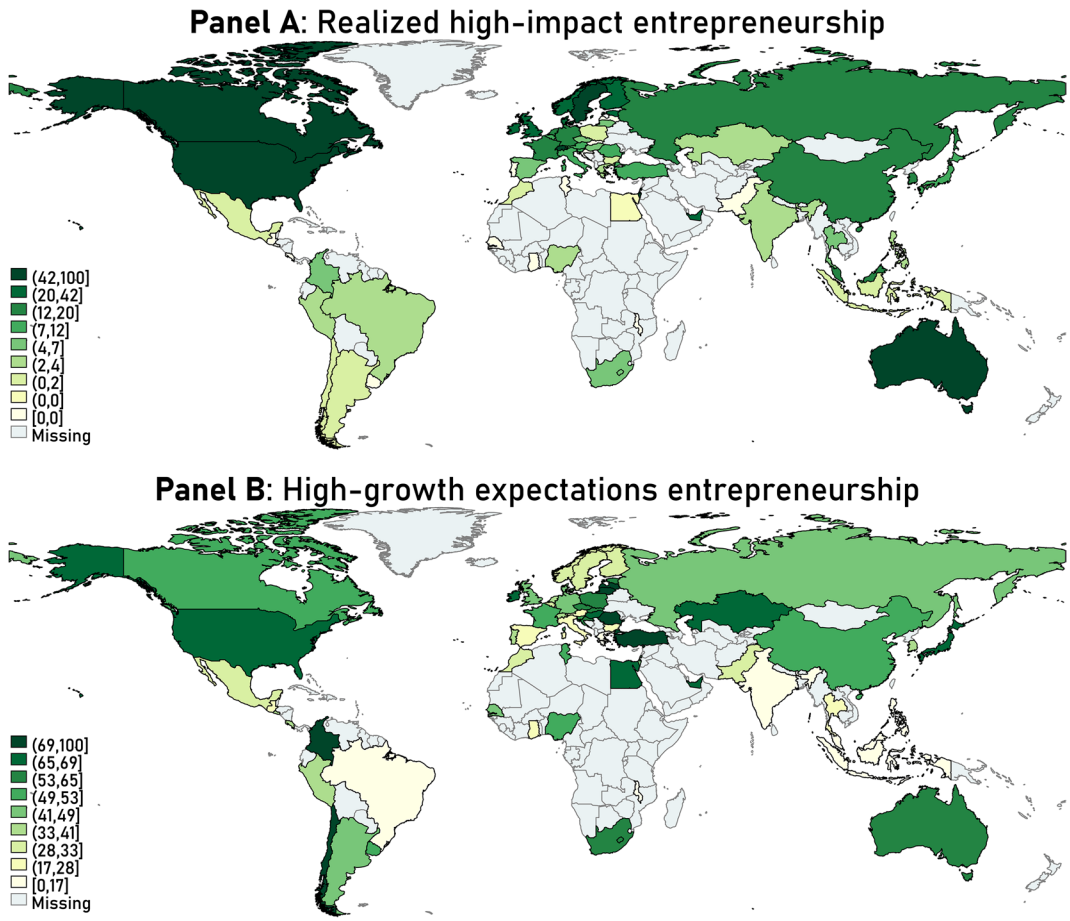

Fig. 1 Mapping realized high-impact entrepreneurship and high-growth expectations entrepreneurship. Note. Plotted are realized high-impact entrepreneurship (in Panel A) and high-growth expectations entrepreneurship (in Panel B)

entrepreneurship is pronounced in Colombia, Romania, and Turkey and low in Brazil, Greece, and India. To quantify the strength of the association, we calculate Pearson's correlation coefficient and observe only a very weak association ($r = 0.11$).[5] We next plot the measures against one another in Fig. 2 and report a two-by-two matrix in Table 1. The countries with the highest levels of realized high-impact entrepreneurship, like the United States, Israel, or Switzerland, score only modestly on the high-growth expectations measure. Conversely, countries with low levels of realized high-impact entrepreneurship exhibit either low levels of growth aspirations (e.g., Brazil, Greece, and India), medium levels of growth aspirations (e.g., Argentina, Nigeria, and Poland), or high levels of growth aspirations (e.g., Colombia, Romania, and Turkey).[6] This suggests that high-growth expectations entrepreneurship is not only weakly related to realized high-impact entrepreneurship, but also that the relationship is not a linear one.

[5] We reach the same conclusion when assessing Spearman's and Kendall's rank correlation coefficients ($\rho = 0.15$; $\tau = 0.10$).

[6] It could be that these patterns are driven by the well-established stage-of-economic-development effects in entrepreneurship (Wennekers and Thurik, 1999). In Appendix Figure 4, we present the conditional associations between expectations and realizations when conditioning on either stage-of-development fixed effects or ln GDP per capita. Doing so does not alter the findings presented here.

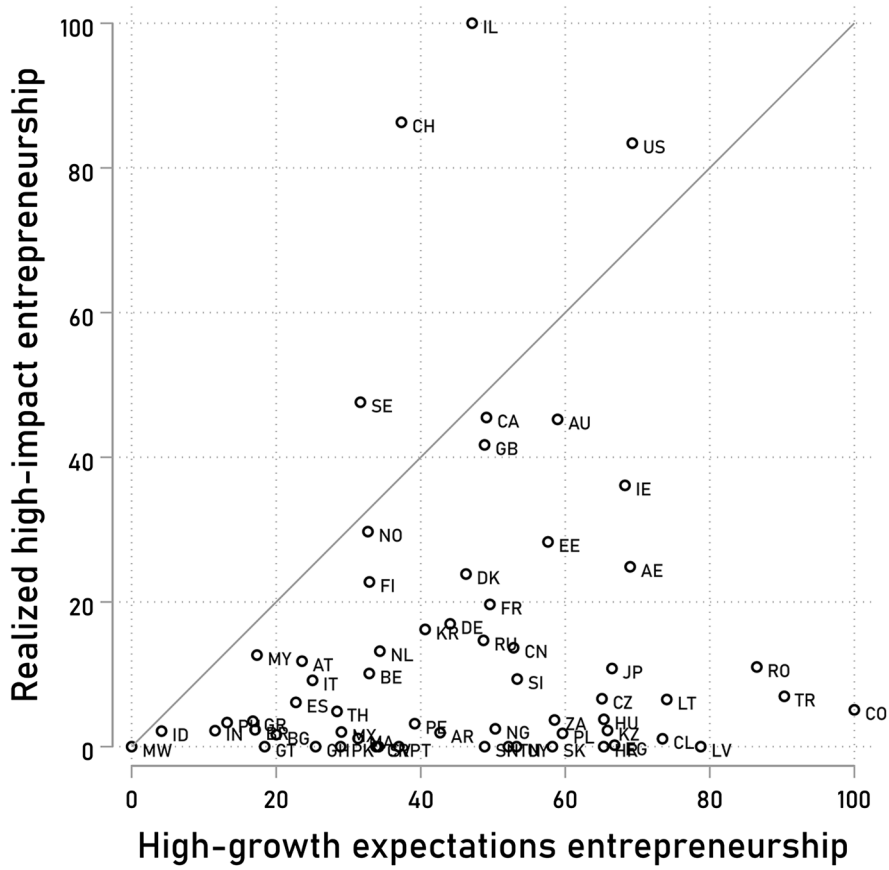

Fig. 2 Realized high-impact entrepreneurship and high-growth expectations entrepreneurship. Note. For comparability, we rescale both measures from 0 to 100 and plot the isoline. Country names are abbreviated as ISO country codes

Table 1 Realized high-impact entrepreneurship and high-growth expectations entrepreneurship—a two-by-two matrix

Realized high-impact entrepreneurship	*Above median*	Austria, Belgium, Denmark, Finland, Germany, Italy, Malaysia, Netherlands, Norway, South Korea, Spain, Sweden, Switzerland	Australia, Canada, China, Colombia, Czech Republic, Estonia, France, Ireland, Israel, Japan, Lithuania, Romania, Russia, Slovenia, Turkey, United Arab Emirates, United Kingdom, United States
	Below median	Argentina, Brazil, Bulgaria, Costa Rica, El Salvador, Ghana, Greece, Guatemala, India, Indonesia, Malawi, Mexico, Morocco, Pakistan, Peru, Philippines, Portugal, Thailand	Chile, Croatia, Egypt, Hungary, Kazakhstan, Latvia, Nigeria, Poland, Senegal, Slovakia, South Africa, Tunisia, Uruguay
		Below median	*Above median*
		High-growth expectations entrepreneurship	

2.3 A cross-country measure of entrepreneurial projection bias

An initial reaction to this finding might be to advocate the abandonment of research using high-growth expectations entrepreneurship as a proxy for high-impact entrepreneurship, calling instead for more research that employs measures of realized high-impact entrepreneurship. That is certainly an important avenue for future research. At the same time,

Table 2 Descriptive statistics and correlation matrix of the main measures

		Descriptive statistics					Correlations	
		N	Mean	SD	Min	Max	1	2
1	Realized high-impact entrepreneurship	62	13.87	21.41	0.00	100.00		
2	High-growth expectations entrepreneurship	62	45.23	21.64	0.00	100.00	0.11	
3	Biased entrepreneurial projection	62	31.36	28.67	-52.89	94.91	-0.66*	0.67*

The measures for realized high-impact entrepreneurship and high-growth expectations entrepreneurship are rescaled from 0 to 100 for comparability and because our reflective measure of realized high-impact entrepreneurship does not have a natural underlying scale. * denotes correlations that are statistically significant at the 5% level or lower

the GEM data offer unique advantages in testing rich multilevel theories (e.g., Bennett et al., 2023; Boudreaux et al., 2019; Estrin et al., 2016; Stephan et al., 2015) and will therefore continue to be an important resource for entrepreneurship scholars (Amorós et al., 2013; Bosma, 2013). Hence, in the spirit of Bergmann and Stephan (2013), we suggest an adjustment that to some extent addresses the analytical and inferential hurdles posed by the imperfect association between high-growth expectations and realized high-impact entrepreneurship. This leads us to propose the notion of *entrepreneurial projection bias*. For a country, entrepreneurial projection bias represents the extent to which high-growth expectations entrepreneurship exceeds realized high-impact entrepreneurship. This could arise, for example, because of systematic differences in entrepreneurial overconfidence or overoptimism, or because of structural impediments to venture growth.[7] The measure is defined as:

$$Entrepreneurial\ projections\ bias_c = Expectations_c - Realizations_c \quad (1)$$

Descriptive statistics and the correlations between realized high-impact entrepreneurship, high-growth expectations entrepreneurship, and entrepreneurial projection bias are presented in Table 2. We plot this latter measure onto the world map in Fig. 3 and present country-level summary statistics in Appendix Table 3. We observe that there are sizable cross-country differences in entrepreneurial projection bias, with Colombia and Turkey, for example, exhibiting particularly high levels of entrepreneurial projection bias, as one would expect from Fig. 1.

2.4 Stylized examples: assessing the determinants and consequences of high-growth expectations and realized high-impact entrepreneurship

The differences between high-growth expectations and realized high-impact entrepreneurship can be illustrated by the use of examples. Our aims are to explore whether high-growth expectations entrepreneurship and realized high-impact entrepreneurship are related to their *determinants* and *consequences* in the same way, and whether conditioning on entrepreneurial projection bias is of inferential value.

Method We use ordinary least squares (OLS) regressions (Wooldridge, 2010), yielding illustrative conditional correlations rather than causal estimates. In estimating and reporting the regressions, we use heteroscedasticity robust standard errors, and we present standardized beta coefficients and exact *p*-values.

Control variables We condition on a number of standard control variables in the regressions (Parker, 2018): (ln) GDP per capita (Wennekers & Thurik, 1999), institutional quality (North, 1990) –operationalized as the first principal component of the six World Governance Indicators (Cronbach's alpha = 0.97) (Kaufmann et al., 2011)–, human capital –measured as the population share with completed tertiary education– (Millán et al., 2014), venture capital availability (Lerner &

[7] The notion of entrepreneurial biases has been developed in a number of important papers on, for example, overconfidence and overoptimism (e.g., Cassar, 2010; Cieślik et al., 2018; Hayward et al., 2006; Köllinger et al., 2007; Liu and Cowling, 2023; Lowe & Ziedonis, 2006; Zhang & Cueto, 2017).

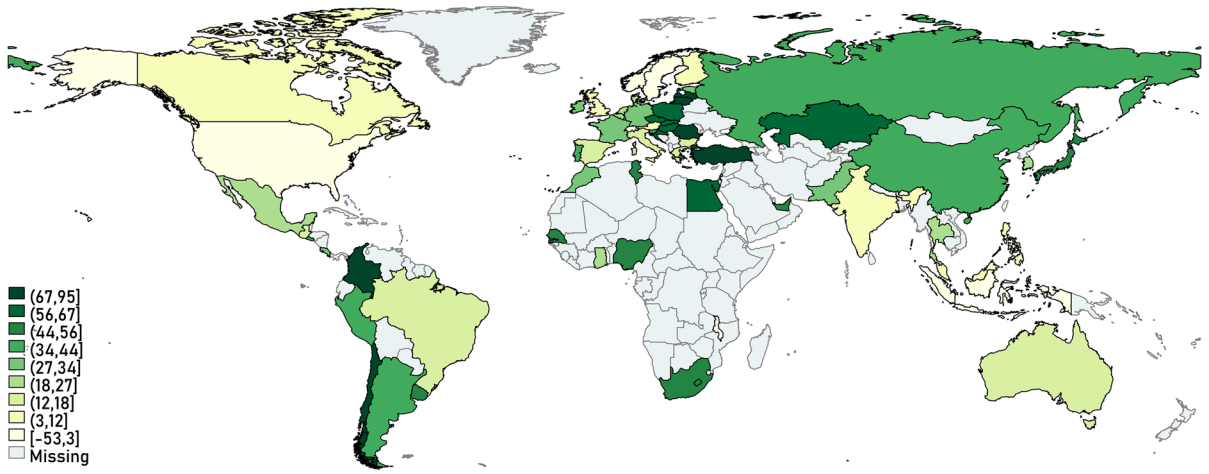

Fig. 3 Entrepreneurial projection bias

Nanda, 2020), employment in the service sector (Wennekers & Thurik, 1999), population size and growth (Autio & Acs, 2010), the unemployment rate (Köllinger & Thurik, 2012), and inequality – measured as the GINI index– (Cullen et al., 2014). All control variables are obtained from the World Bank World Development Indicators database and averaged over the period 2010–2017 (World Bank, 2022), except for human capital and venture capital availability. Human capital data are obtained from the Barro and Lee (2013) database and refer to the year 2010. Venture capital availability is obtained from the Global Competitiveness Index of the World Economic Forum (2017) and averaged over the period 2010–2017. The descriptive statistics and data sources are reported in Appendix Table 4 and the correlation matrix in Appendix Table 5.

2.4.1 *Stylized example 1: Assessing the determinants of entrepreneurship*

Drawing on culture-entrepreneurship research (Kleinhempel et al., 2023; Stephan, 2022; Stephan & Uhlaner, 2010), we probe the (contested) role of individualism in entrepreneurship, assuming that individualism is positively associated with high-impact entrepreneurship (Hayton & Cacciotti, 2002; cf. Shane, 1992, 1993). We use Hofstede's individualism (1980; 2010) as the predictor.[8] The findings are presented in Table 3. We find that individualism is positively associated with realized high-impact entrepreneurship ($\beta = 0.253$, $p = 0.011$) but not with high-growth expectations entrepreneurship ($\beta = 0.169$, $p = 0.475$). However, once we condition on entrepreneurial projection bias and re-assess the relation between individualism

[8] To maximize country coverage, we follow Beugelsdijk et al. (2015) in using World Values Survey and European Values Study data (EVS, 2021; Haerpfer et al., 2021) to replicate and extend the country coverage of Hofstede's individualism scores. Specifically, impute the individualism scores for Egypt, Ghana, Kazakhstan, Nigeria, and Tunisia. In robustness checks available upon request, we verified that this adjustment does not influence our findings reported below.

Table 3 Stylized Example 1 – Determinants of entrepreneurship

	(1) Realized high-impact entrepreneurship	(2) High-growth expectations entrepreneurship	(3) High-growth expectations entrepreneurship
Independent variable			
Individualism	0.253**	0.169	0.239**
	(0.011)	(0.475)	(0.015)
Additional adjustment			
Entrepreneurial projection bias			1.043***
			(0.000)
Control variables			
ln GDP per capita	0.363*	0.617	0.432**
	(0.098)	(0.129)	(0.047)
Institutional quality	-0.113	-0.073	-0.106
	(0.513)	(0.798)	(0.476)
Human capital	0.423***	0.171	0.372***
	(0.000)	(0.362)	(0.000)
Venture capital availability	0.359**	-0.197	0.234*
	(0.012)	(0.267)	(0.075)
Service sector employment	-0.103	-0.552*	-0.212
	(0.633)	(0.099)	(0.337)
Total population	0.004	-0.112	-0.024
	(0.956)	(0.523)	(0.804)
Population growth (%)	0.004	-0.112	-0.024
	(0.956)	(0.523)	(0.804)
Unemployment rate	-0.051	0.077	-0.022
	(0.349)	(0.689)	(0.754)
Inequality	0.128	0.203	0.149
	(0.202)	(0.330)	(0.134)
Observations	59	59	59
R-squared	0.715	0.167	0.757

The results are based on OLS regressions and presented as beta-coefficients and exact *p*-values (in parentheses); *** $p<.01$, ** $p<.05$, * $p<.1$; two-tailed tests. The constant was estimated but is not reported for brevity. We tested the equality of the estimated individualism coefficients based on an overarching structural equation model and did not reject the null of no significant differences across outcomes and model specifications [individualism (1)=(2): $(p > \chi^2) = .687$, individualism (2)=(3): $(p > \chi^2) = .697$, individualism (1)=(3): $(p > \chi^2) = .661$]

and high-growth expectations entrepreneurship, we find that the initial positive association documented in Model (1) is largely restored ($\beta = 0.239$, $p = 0.015$).[9]

[9] We also note that we observe similar patterns when looking at the role of human capital and venture capital availability. Both are positively associated with realized high-impact entrepreneurship (Model 1) but not with high-growth expectations entrepreneurship (Model 2). Upon controlling for entrepreneurial projection bias, the initial associations are largely recovered (Model 3).

2.4.2 *Stylized example 2: Assessing the consequences of entrepreneurship*

Drawing on Schumpeter (1934) who predicts an intimate relationship between entrepreneurship and innovation (see also Autio et al., 2014; Baumol, 2010), we explore whether the cross-country variation in entrepreneurship is associated

with international differences in innovation. We follow Bennett and Nikolaev (2021a, 2021b) in measuring cross-country differences in innovation outputs using the 2020 Global Innovation Index (Dutta et al., 2020).[10] The results are presented in Table 4. We find that realized high-impact entrepreneurship is positively associated with innovation ($\beta = 0.362$, $p = 0.001$), as expected. However, surprisingly, high-growth expectations entrepreneurship and innovation are associated negatively, albeit not significantly ($\beta = -0.099$, $p = 0.141$). Again, once we revisit the association between high-growth expectations entrepreneurship and innovation while conditioning on entrepreneurial projection bias, we partially recover the initial positive association ($\beta = 0.263$, $p = 0.021$).

These examples illustrate that high-growth expectations and realized high-impact entrepreneurship are associated with their determinants and consequences in different ways. They also reveal that conditioning on entrepreneurial projection bias helps us partially to recover the original association between realizations and its determinants or consequences when realizations are proxied for by high-growth expectations.

2.5 Realized high-impact and opportunity-motivated entrepreneurship

Comparative international entrepreneurship research also frequently distinguishes between opportunity-motivated and necessity-motivated entrepreneurship (e.g., Amorós et al., 2019). Opportunity-motivated entrepreneurship is also used often to capture the quality of entrepreneurship, rather than the quantity of entrepreneurship, and hence may also be subject to similar construct measurement issues as identified above. This leads us to consider the association between opportunity-motivated and realized high-impact entrepreneurship.

The scatterplot between opportunity-motivated entrepreneurship and realized high-impact entrepreneurship is shown in Fig. 4. We see that the two measures are not related in a positive linear way. Countries with high levels of realized high-impact entrepreneurship, like the United States, Israel, and Switzerland, score in the lower tertile of opportunity-motivated entrepreneurship, while countries with high levels of opportunity-motivated entrepreneurship, like Colombia, Ghana, Nigeria, Peru, Senegal, and Thailand, exhibit low levels of realized high-impact entrepreneurship. The Pearson's correlation coefficient between the two measures is, in fact, negative ($r = -0.17$).[11] In view of this, analogous to our previous measure of entrepreneurial projection bias, we also derive a cross-country measure of entrepreneurial opportunity projection bias which may be useful in future research using opportunity-motivated entrepreneurship as a proxy for high-impact entrepreneurship (reported in Appendix Table 8).

3 Discussion

Entrepreneurial activity, with its far-reaching implications for innovation, job creation, and growth, varies substantially across countries (Acs et al., 2018; Autio et al., 2014; Baumol & Strom, 2007; Bjørnskov & Foss, 2016). Comparative international entrepreneurship research seeks to explain this cross-national variation to advance entrepreneurship theory and inform policy (Estrin et al., 2013a; Stephan & Uhlaner, 2010; Terjesen et al., 2016). Following calls to distinguish between entrepreneurial quality and quantity (e.g., Henrekson & Sanandaji, 2014, 2020; Schoar, 2010), comparative international entrepreneurship research increasingly employs proxies, such as high-growth expectations entrepreneurship, to capture the theoretical construct of high-impact entrepreneurship. This

[10] We focus on the 2020 edition –based on 2018 data– to create a lag between the independent and dependent variables (Estrin et al., 2016). The Global Innovation Index was jointly developed by Cornell University, INSEAD, and the World Intellectual Property Organization and has become a standard resource in entrepreneurship and innovation research (Bennett & Nikolaev, 2021a, 2021b; Gande et al., 2020; Henrekson & Sanandaji, 2014). The Global Innovation Index output measure captures knowledge creation, impact, and diffusion, as well as intangible assets, creative goods and services, and online creativity (Dutta et al., 2020).

[11] Spearman's and Kendall's rank correlation coefficients also indicate a negative relation ($\rho = -0.26$; $\tau = -0.16$). This imperfect association is not driven by differences in economic development; conditioning on economic development does not materially improve the association between the two measures as supplementary analyses reported in Appendix Figure 5 show.

Table 4 Stylized Example 2 – Consequences of entrepreneurship

	(1)	(2)	(3)
	Innovation	Innovation	Innovation
Independent variables			
Realized high-impact entrepreneurship	0.362***		
	(0.001)		
High-growth expectations entrepreneurship		-0.099	0.263**
		(0.141)	(0.021)
Additional adjustment			
Entrepreneurial projection bias			-0.510***
			(0.000)
Control variables			
ln GDP per capita	0.100	0.252	0.178
	(0.516)	(0.141)	(0.230)
Institutional quality	0.505***	0.544***	0.480***
	(0.000)	(0.000)	(0.000)
Human capital	-0.033	0.141	-0.032
	(0.752)	(0.111)	(0.758)
Venture capital availability	-0.058	0.051	-0.078
	(0.530)	(0.540)	(0.358)
Service sector employment	0.029	-0.007	-0.003
	(0.810)	(0.956)	(0.980)
Total population	0.282**	0.293**	0.274**
	(0.011)	(0.030)	(0.024)
Population growth (%)	0.282**	0.293**	0.274**
	(0.011)	(0.030)	(0.024)
Unemployment rate	-0.038	-0.036	-0.027
	(0.493)	(0.548)	(0.668)
Inequality	-0.104	-0.058	-0.096
	(0.103)	(0.401)	(0.114)
Observations	62	62	62
R-squared	0.824	0.790	0.836

The results are based on OLS regressions and presented as beta-coefficients and exact p-values (in parentheses); *** $p<.01$, ** $p<.05$, * $p<.1$; two-tailed tests. The constant was estimated but is not reported for brevity. We tested the equality of the estimated realized high-impact and high-growth expectations entrepreneurship coefficients based on an overarching structural equation model and rejected the null of no significant differences across independent variables and model specifications [independent variables (1) = (2): $(p > \chi^2) < .000$, independent variables (2) = (3): $(p > \chi^2) < .000$, independent variables (1) = (3): $(p > \chi^2) = .063$]

raises the question of how well these proxies capture the construct of interest.

We show that cross-country differences in high-growth expectations entrepreneurship do not provide a good indication of cross-country variation in realized high-impact entrepreneurship. In so doing, we contribute to research on the conceptualization and measurement of countries' entrepreneurial performance (e.g., Acs et al., 2008, 2014; Henrekson & Sanandaji, 2014, 2020). Specifically, we build on and extend the work by Henrekson and Sanandaji (2014, 2020) who compare measures of routine small business activity (e.g., self-employment) with measures of high-impact entrepreneurship (e.g., IPOs), categorizing entrepreneurship according to quantity on the one hand and quality on the other. We build on this categorization by comparing different measures commonly assumed to capture entrepreneurial quality (i.e., quality-quality comparisons), thereby extending the quantity-quality comparisons of Henrekson and Sanandaji (2014, 2020). We also contribute to this literature by introducing the notion of entrepreneurial projection bias and by developing two examples to illustrate how the complexity of operationalizing high-impact entrepreneurship may have important ramifications for comparative international entrepreneurship research (Amorós et al., 2019; Anokhin & Wincent, 2012; Estrin et al., 2013a; Young et al., 2018) and the policy recommendations derived from it (Acs et al., 2016a; Audretsch et al., 2020; Bradley et al., 2021). Important implications and promising avenues for future research arise from our study.

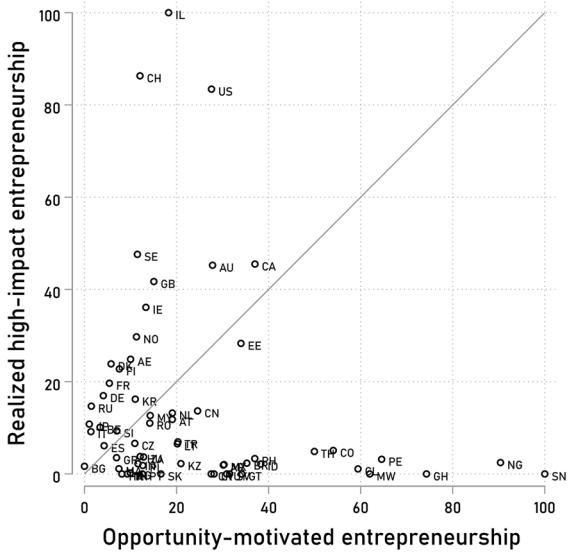

Fig. 4 Realized high-impact entrepreneurship and opportunity-motivated entrepreneurship. For comparability, we rescale both measures from 0 to 100 and plot the isoline. Country names are abbreviated as ISO country codes

Construct measurement Our analysis underscores that construct measurement is of critical importance in cross-country entrepreneurship research (Aguinis et al., 2023; Boyd et al., 2005; Chandler & Lyon, 2001; Maula & Stam, 2020; Rietveld & Patel, 2022). Realized high-impact entrepreneurship correlates at 0.11 with high-growth expectations entrepreneurship and at -0.17 with opportunity-motivated entrepreneurship. Thus, we caution against using high-growth expectations entrepreneurship or opportunity-motivated entrepreneurship as proxies for high-impact entrepreneurship or the quality of entrepreneurship.

Conceptualizing and measuring high-impact entrepreneurship Against this backdrop, we argue for a broader debate on the measurement of high-impact entrepreneurship as well as greater data collection efforts, especially in an international setting.[12] Specifically, we call for more research to develop a multidimensional conceptualization of high-impact entrepreneurship (e.g., employment growth, innovation, value creation, productivity, and profitability), both in the context of commercial as well as social and sustainable entrepreneurship. Explicitly conceptualizing and modeling the trade-offs amongst various intermediate priorities on the path to creating impact, e.g., profitability vs. speed of scaling, also presents a promising research avenue that likely holds important lessons for how to foster 'productive entrepreneurship' (Baumol, 1990). To this end, future data collection efforts are warranted to quantify the prevalence of high-impact entrepreneurship within various types and sizes of organizations and to expand data coverage in terms of time horizons and geographies. Based on these data collection efforts, replication studies could also help solidify our cumulative knowledge stock (Bettis et al., 2016; Crawford et al., 2022; Dau et al., 2022).

Determinants of high-impact entrepreneurship These data collection efforts would also enable further research into the cross-country drivers of economically relevant high-impact entrepreneurship. While there is a rich and growing stock of knowledge regarding the determinants of high-growth expectations, opportunity-motivated, and routine entrepreneurship (Parker, 2018; Terjesen et al., 2016), less is known about the determinants of high-impact entrepreneurship. Promising candidates for such enquiries would include, for example, knowledge spillovers (Audretsch & Keilbach, 2007), property rights protection (Autio & Acs, 2010), and venture capital (Lerner & Nanda, 2020). Related promising avenues for future research would be to take into account potential non-linearities as well as the role of non-normal distributions (e.g., power law distributions) and outliers when studying the antecedents of high-impact entrepreneurship (Clark et al., 2023; Crawford et al., 2015). Assessing the determinants of realized high-impact entrepreneurship –and contrasting these with the determinants of high-growth expectations and opportunity-motivated entrepreneurship– presents a promising area for further research.

Consequences of high-impact entrepreneurship Moreover, such data collection efforts would enable research into the consequences of realized high-impact entrepreneurship (Bjørnskov & Foss, 2016; van Praag & Versloot, 2007). A rich literature assesses the role of entrepreneurship in growth and innovation (Audretsch & Acs, 1988; Baumol, 2010; Baumol & Strom, 2007), often employing proxies for

[12] There is already some work underway for single countries, such as the United States (e.g., Andrews et al., 2022; Guzman & Stern, 2020).

high-impact entrepreneurship in comparative research (Wong et al., 2005). Deepening our understanding of the precise contributions of high-impact entrepreneurship to welfare –including possible externalities– is therefore also an interesting area for further research.

High-impact and routine entrepreneurship Our focus on construct measurement in high-impact entrepreneurship should not be taken to imply that we are advocating to focus research or policy efforts *solely* on high-impact entrepreneurship. Routine small business activity and self-employment fulfill critical economic functions and constitute a sizable share of employment and value creation, and it is the diversity of facets of entrepreneurship that collectively makes up the fabric of economies (Aldrich & Ruef, 2018; Kuckertz et al., 2023; Kuratko & Audretsch, 2022; Welter et al., 2017). Yet given that these diverse activities are initiated to fulfill different functions, we should be cautious not to conflate high-impact entrepreneurship and routine small business activity in theory or measurement (Henrekson & Sanandaji, 2014, 2020; Schoar, 2010).

Entrepreneurial projection bias We introduced the notion of cross-country entrepreneurial projection bias to quantify the differences between high-growth expectations and realized high-impact entrepreneurship. Future research into the determinants, prevalence, and consequences of entrepreneurial projection bias is a promising and relevant area of inquiry. First, studying entrepreneurial projection bias from a comparative cultural-cognitive perspective (DiMaggio, 1997; Stephan, 2022) would complement the rich body of research on cognitive biases and heuristics in entrepreneurship which is largely derived from individual-level single-country studies (cf. Åstebro et al., 2014; Frese & Gielnik, 2014). Second, studying entrepreneurial projection bias from a structural-institutional perspective (Baker et al., 2005; Mickiewicz et al., 2021) is also promising since little is known about the cross-country differences in excess entry as well as overly confident/optimistic entries that fail to meet entrepreneurs' aspirations. Finally, we propose incorporating entrepreneurial projection bias in cross-country studies to partially recover the association between realized high-impact entrepreneurship and its determinants/consequences when expectations are used to proxy for realizations. However, we note that this does not present a panacea and should not substitute for expanded data collection efforts.

From expectations to realizations The flip side of entrepreneurial projection bias is the success ratio of expectations to realizations. Studying the contributing factors that allow entrepreneurs to translate their growth intentions into realized outcomes also presents a fruitful avenue for further research (cf. Bergmann & Stephan, 2013). In many countries, the 'bottleneck' is not necessarily the incidence of entrepreneurs with high growth expectations but rather entrepreneurs' ability to translate these into realized high-impact entrepreneurship. A process lens could help identify where, when, and why salient bottlenecks during the scale-up process arise (Baker et al., 2005; Kleinhempel et al., 2022; Van der Zwan et al., 2013).

Limitations Our work is subject to limitations which provide opportunities for future research. First, the measure of realized high-impact entrepreneurship encompasses much of the popular discourse on the topic but is also based on rare events; it captures the entrepreneurial 'Mount Everest'. But high-impact entrepreneurship is also taking place in many other organizations, i.e., the 'basecamp'. Moreover, the measures we used are largely valuation-based, and more efforts are needed to explicitly capture value creation, which is at the heart of the relation between entrepreneurship and economic growth. Thus, systematic efforts to collect cross-country data on realized high-impact entrepreneurship which cover a broader measurement base –e.g., firm and employment growth, innovation, and value creation, as well as social and environmental impacts– would be warranted to improve theory testing and policy recommendations. Second, our measure of high-growth expectations entrepreneurship is derived from the aggregation of the responses of individual entrepreneurs to the country level. Although the GEM data collection efforts are directed at creating a population-representative sample, this sample may be more representative of entry into entrepreneurship than of entrepreneurs' growth expectations, given that the latter are observable only for a subsample. Perhaps future data collection efforts could also consider oversampling the population of entrepreneurs and

collecting information on realized growth. Third, ideally, we would have studied the association between expectations and realizations longitudinally. Albeit we can assume entrepreneurial expectations and realizations to be relatively stable over time (cf. Freytag & Thurik, 2007), our approach is subject to limitations if there are rapid developments, either in expectations, realizations, or both. Longitudinal research into expectations, projection bias, and realizations is therefore warranted. Finally, as noted, conditioning on entrepreneurial projection bias is no panacea, and further work regarding the conditional independence assumption and appropriate functional form is warranted.

Policy implications Notwithstanding these limitations, our analysis holds important implications for the development and evaluation of entrepreneurship policy. Policymakers face difficult tradeoffs regarding how to allocate scarce public resources, and it is an ongoing debate whether and how entrepreneurship policy can contribute to fostering high-impact entrepreneurship (Acs et al., 2016a; Audretsch et al., 2020; Autio & Rannikko, 2016; Bradley et al., 2021; Buffart et al., 2020; Lerner, 2021; Shane, 2009; Wennberg & Sandström, 2022). The appropriate design of policy interventions depends on, amongst others, the status quo of countries' entrepreneurial performance and entrepreneurial ecosystem conditions; broader national policies related to, for example, education, health, and immigration; the rationale for intervention; as well as the desired target, i.e., routine or high-impact entrepreneurship. As we have documented, the use of different measures of entrepreneurship leads to vastly different assessments of a country's relative performance. A reliance on proxies for high-impact entrepreneurship would lead to an overly pessimistic assessment of the status quo in countries like Sweden and Switzerland, and an overly optimistic assessment in countries like Colombia or Turkey. This matters because both the level of expectations and realizations, as well as the misfit between them, i.e., entrepreneurial projection bias, suggest different policy priorities. Thus, in countries with high expectations and low realizations, improving the entrepreneurial framework conditions to enable impactful scale-ups, including interventions related to human and financial capital, are first-order concerns. Vice versa, in countries with low expectations and high realizations, policymakers may underestimate the sophistication of the entrepreneurial ecosystem, and, unintendedly, introduce policies that are inefficient or even detrimental (for example, by crowding out private investment). Similarly, precise construct measurement is critical in evaluating policies once they have been put into effect. As many governments and supranational institutions are seeking to facilitate entrepreneurship (European Commission, 2013; OECD, 2010, 2020), a stronger comparative evidence base on (realized) high-impact entrepreneurship is needed.

Conclusion Much comparative international entrepreneurship research is motivated by the desire to advance theories to better understand the determinants of high-impact entrepreneurship and to develop policies to stimulate such activity. To that end, research based on strong construct measurement is critical in furthering our collective understanding. This note scrutinizes commonly used measures, identifies a need to collect a richer cross-national evidence base, and further develops the relevant and exciting research agenda on comparative international entrepreneurship research.

Data Availability The data used in this article are reported in the Appendix or available from public sources.

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