DO START-UP ECOSYSTEMS FOSTER START-UP PERFORMANCE? THE MODERATING ROLE OF NETWORK LEARNING CAPABILITY

Abstract

This study investigates the relationship between start-up ecosystems (SE) and start-up performance (SP) in two distinct environments. It analyses SE as a critical antecedent of SP by considering the underlying effects of network learning capability (NLC). We test the hypothesized relationships by a study of 221 start-ups in Colombia and 203 start-ups in Australia and validate the theoretical model using survey information. We apply a structural equation modelling PLS-SEM and multigroup approaches. The results verify the positive influence of SE on SP independently of NLC development. Nevertheless, network learning as a capability acts as a moderator by establishing the impact of the SE on SP. The moderating is determined by a strong NLC linking the SE's government, financial and organisational support. The findings contribute to the literature on entrepreneurship and innovation with relevant management implications by providing new evidence regarding the benefits of SE in terms of SP effectiveness.

Keywords: Start-up Ecosystems, Start-up Performance, Network Learn Capability, PLS-SEM and Multigroup Analysis.

Introduction

For the last 20 years, SE have been an essential theme in entrepreneurship, and innovation studies (Joseph et al., 2021; Singh et al., 2019; Sipola et al., 2016), with focus in the entrepreneurial value creation (Smith et al., 2019). SE refers to the context in which governments, organisations, and financing entities collaborate with new ventures, supporting their creation, development, and growth (Baron & Harima, 2019; Chaudhari & Sinha, 2021; Acs et al., 2014; Sharif & Tang, 2014; Spender et al., 2017). Despite different researchers examining the dimensions -governmental, financial, and organisational supports- of the SE (Alvedalen & Boschma, 2017; Amedofu et al., 2019; Sperber & Linder, 2019), and its relation to SP (Chatterji et al., 2019), findings remain inconsistent.

SP are the results obtained by the new venture in enterprise performance and in terms of the entrepreneur's satisfaction (Adomako et al., 2018). The former relates to satisfied customers, problem-solving, market growth, and attracting funding, among others. The latter is concerned with a successful outcome from the point of view of being and continuing to be an entrepreneur (Cantamessa et al., 2018; Marvel et al., 2019; Marvel et al., 2020; Rekarti & Doktoralina, 2017).

The range of studies offering a general understanding of the link between a SP and the SE has been criticised for lacking attention to measuring the different internal and external links between actors and networks (Wu et al., 2020).

NLC can be understood as the network capability to generate, develop, and redesign information and knowledge through ties with actors and contexts. Type of ties emphasises essentially two: internal -e.g., agreements or contracts- and external -e.g., mentoring or access to venture capital networks- (Caseiro & Coelho, 2019). However, we still know little about how the learning capability of the SE influences SP. Thus, this research seeks to fill this gap by determining a link between a SE and SP in two ecosystems with their contextual differences -e.g., political, cultural and economy develop- to analyse the influence of the dimensions of the NLC (Baraldi et al., 2019; Karami & Tang, 2019; Jones, et al., 2019).

In drawing upon literature on organizational learning (OL), we may deduct that the NLC can foster the links between SE and SP by facilitating resources, capabilities, learning, collaboration, knowledge shared, and social capital to new ventures (Su et al., 2018; Wang and Fang 2012). our research attempts to answer the following questions: What is the role of NLC in the performance of firms in ecosystems? How do ecosystems affect NLC? How does the relevance of each SE dimension differ between the two countries? To what extent NLC influence SE and SP? We validate and test these assumptions by applying survey data from a sample of 424 start-ups (221 Colombia and 203 Australia), and employing partial least squares structural equation modeling (PLS-SEM) estimation for the empirical analyses (Hair et al., 2019), since a multigroup analysis perspective.

This study generates several relevant contributions, both for researchers and managers. First, it demonstrates the effect of NLC in the relation between SE and SP by providing new evidence regarding the benefits that generate network learning as a capability (Abbas et al., 2019). Second, it contributes to the emerging literature that studies the antecedents of SE and its influence on SP effectiveness, evidencing significant differences in multigroup analysis when comparing the two countries (Henseler et al., 2016). Third, it validates the effect of NLC in enhancing SP by learning processes generated from strong ties across internal and external actors of the SE (Choi et al., 2021; Karami & Tang, 2019). Finally, the results offer new practice insights into the importance of developing the various dimensions of SE (Governmental, Financial and Organisational support) and its effectiveness, particularly in the case of start-ups. The following section analyses the theoretical framework and hypotheses development. This is followed by the methodological approach. Then, the results are outlined. Finally, conclusions, contributions and limitations are presented.

Theoretical framework and hypotheses development

Organizational Learning (OL) framework

OL has been widely used to define the internal process of knowledge management (March, 1991). This theory shows the generation of learning as a dynamic process of actors' knowledge combinations (Crossan and Berdrow, 2003). New ventures can learn new knowledge from the interaction process with external agents (e.g., venture capital or clients) and use this knowledge to develop new processes, services, and products (Wang and Libaers, 2016). Hence, this is a useful framework to conceptualize the NLC and explain how it can facilitate and improve the relations between SE and SP.

Start-up Ecosystems (SE) dimensions and Start-up Performance (SP)

Academic interest in the management field has generated significant knowledge about ecosystems' influence on embryonic start-ups (Baloutsos et al., 2020; Lee et al., 2017; Ojaghi et al., 2019). At the core of any SE are the governmental, financial and organisational supports (Sperber & Linder, 2019; Cao and Shi 2020) that act as driving factors in launching new ventures (Hasani & O'Reilly, 2020).

Governmental support refers to the policies, jurisdictions, initiatives and government agencies offering potential support for new businesses or innovation (Ghazali et al., 2021; Islam et al., 2018). In terms of financial support, a company's capital potentially originates from a range of resources, including owners, friends and families as well as external resources, including bank loans (Cole & Sokolyk, 2018; Giraudo et al., 2019; Jeong et al., 2020; Rehm & Xavier, 2016). Organisational support aids the combination of the necessary people, resources, spaces, capabilities and business processes to support the formation, creation and development of new companies (Nair et al., 2017). Recent studies show that a SE significantly affects SP (Lee et al., 2019; Partanen et al., 2020). Hence, the first hypothesis is:

Hypothesis #1 (H1). The SE influences SP positively.

1.1. Moderator role of Network Learning Capability (NLC)

We argue that NLC moderates the effect of SE on SP by influencing governmental, financial, and organisational supports and the SE structuring (Raza et al., 2018). Internal and external learning capabilities may affect the components' relevance and stability inside the SE (Feng et al., 2019; Zacca et al., 2015; Tehseen, Qureshi, and Ramayah, 2018). Although there

is some evidence that nodes and their connections can have an impact on the SE (Dickel et al., 2018; Jiang et al. 2018), differences occur in forms of collaboration, communication, confidence, knowledge exchange and information (Xue et al., 2019). As Zheng et al. (2020) have predicted, a network capability may differ from generating a weak to a robust ecosystem. Therefore, networks promoting new ventures through knowledge and innovation sharing may be variably achievement-oriented in sharing knowledge and developing learning capability (Assenova, 2021; Kountur, Phangestu, and Prameswari, 2020); hence, a potential impact of NLC on SP may be expected (McGrath et al., 2019; Albourini et al. 2020; Söderblom et al., 2015) as contexts differ (Kong, 2019). Therefore, our second hypothesis is:

Hypothesis # 2 (H2): The relationship between the SE and SP is a moderator by NLC.

Methodology

The environment of Colombia and Australia

The increasing importance of creating new ventures is apparent globally (Kapoor & Singh, 2019; Kuratko et al., 2017; Shepherd et al., 2021). The above hypotheses guide investigation in two distinct nations: Colombia and Australia. First, collecting the particular sample was guided by the fact that each country has different institutional environments that the SE supports (Nair et al., 2020; Pustovrh et al., 2020). Second, they differ in their entrepreneurial culture (Hallam et al., 2018). Table 1 shows data facilitating the comprehension of the two nations' environments and their potential impact of SE on SP (Niels Bosma, 2020; StartupGenome, 2021).

Table 1. Colombia and Australia profile

Features	Colombia	Australia
Particular nation's information		
Structure of government	Republic	Federal parliamentary
Geographic point	Latin América	Oceania
Global Entrepreneurship Monitor (GEM) 2019/2020 Global Report		
Population (2020) (WEF)	50.8 million	25.5 million
GDP growth (2020, annual % change) (IMF)	-6.8%	-2.4%
GDP per capita (2020; PPP, international $) (IMF)	14.32 thousand	51.68 thousand
World Bank Ease of Doing Business Rating (2019)	70.1/100 Rank: 67/190	81.2/100 Rank: 14/190
World Bank Starting a Business Rating (2019)	87/100 Rank: 95/190	96.6/100 Rank: 7/190

Features	Colombia	Australia		
World Economic Forum Global Competitiveness Rank (2020)	57/141	18/141		
World Economic Forum Income Group Average (2020)	Upper–middle	High		
Total early-stage Entrepreneurial Activity (TEA)	2nd in High-income for Latin America & Caribbean	1st in High-income for Asia & Pacific		
The Global Start-up Ecosystem Report (GSER,2021), Factors are tiered from 10-1				
Ranking (Top 30 + Runners-Up)	**Bogotá**	**Sydney**	**Melbourne**	**Brisbane**
Performance	N/A	4	1	N/A
Funding	N/A	4	1	N/A
Connectedness	N/A	8	4	N/A
Market reach	N/A	5	2	N/A
Knowledge	N/A	1	1	N/A
Talent	N/A	4	2	N/A
Ranked		24th	36th	
Top 100 Emerging Ecosystems	**Bogotá**	**Sydney**	**Melbourne**	**Brisbane**
Performance	6	N/A	N/A	1
Funding	8	N/A	N/A	5
Market reach	8	N/A	N/A	1
Talent	3	N/A	N/A	6
Ranked	39th			76th

Source: GEM (2020) and Start-up Genome (2021).

A formal SE may also affect SP in a specific context. TEA in the two contexts chosen is determined by distinct political rules and specific social and economic standards. Likewise, an informal start-up ecosystem context (i.e. start-up communities) can affect how new ventures conceive and interpret NLC (Van Weele et al., 2018).

Sample

The research data are of start-ups sampled in Colombia and Australia. We chose these contexts as valid for testing the model due to their contextual differences. The information was obtained through an online questionnaire, social networks, start-up communities and through personal contact, with a total of 1.410 start-ups (COL: 720 and AUS: 690), selecting principal informants, i.e., start-up founders, cofounders, investors or strategic employees. Finally, 424 responses were obtained (COL: 221 and AUS: 203), a sample size securing adequate statistical power, superior to 80% (Hair et al., 2019). A random choice of new ventures was realised, and the statistical potential of the sampling was calculated across the G* Power PLS-SEM 3.1.9.2 software (Faul et al., 2009). The outcome provides a power index for the two countries (Table 2), where the Colombia start-up group represented 0.81, and the Australia firms' sample 0.813, both data greater than proposed by Cohen (Cohen, 2013).

Table 2. Fieldwork technical datasheet

	Colombia	Australia
Sample size	720	690
Responses	221	203
Sampling Procedure	Simple random	Simple random
Confidence degree	95%	95%
	p = p = 50% α = 0.05	p = p = 50% α = 0.05
Reply	30.65%	29.42%
Sampling error	5.49%	5.78%

We tested in the survey first and second-order constructs, items and measure scale through a preliminary test conducted with a small group of start-ups. To prevent critical informant bias, we made use of the Qualtrics platform for the questionaries design and application (Bergman et al., 2020) (See Table 3).

Table 3. General sample information.

		Colombia		Australia	
		N	**%**	**N**	**%**
Role	Founder/CEO	132	59.73	107	52.70
	Cofounder	57	25.79	62	30.54
	Investor	0	0	0	0
	Employee	25	11.31	19	9.36
	Others	7	3.17	15	7.39
Gender	Male	157	70.05	110	54.19
	Female	64	28.95	72	35.47
	Prefer not to say	0	0	21	10.34
Age	18-24	3	1.35	6	2.96
	25-34	81	36.65	93	45.81
	35-44	78	35.30	67	33.00
	45-54	54	24.44	37	18.23
	55-64	5	2.26	0	0
Level of education	Primary	0	0	0	0
	High School	0	0	0	0
	Technical Education	29	13.12	0	0
	Undergraduate Degree	85	38.46	54	26.60
	Postgraduate Degree	107	48.42	149	73.40
Start-up created	2010-2015	115	52.04	81	39.90
	2016-2020	106	47.96	122	60.10
Staff (workforce)	1-5	71	32.13	73	35.96
	6-10	96	43.44	78	38.42

		Colombia		Australia	
		N	**%**	**N**	**%**
	11-15	54	24.43	52	25.62
Cities Colombia	Bogotá	51	23.08		
	Medellín	124	56.11		
	Cali	25	11.31		
	Barranquilla	21	9.50		
Cities Australia	Sydney			102	50.25
	Melbourne			68	33.50
	Brisbane			33	16.25

Measurement units

Start-up performance: Dependent variable

We have evaluated SP by applying a 10-item scale, containing the enterprise performance (7 items) and entrepreneur's satisfaction (3 items) (Rompho, 2018; Wdowiak et al., 2012). The indicators have been calculated employing a five-point Likert scale (1: strongly disagree, and 5: strongly agree). Our selection of a scheme focused on perception indicators was adopted, being aware of the difficulties in collecting specific financial data from start-up businesses (Ahn et al., 2019; Wu et al., 2020; Zacca et al., 2015).

Start-up ecosystem: Independent variable

We have evaluated the SE applying Hasani and O'Reilly (2020), with the changes introduced by Tripathi et al. (2019) and Sperber and Linder (2019). Measuring SE involves three dimensions: Financial support (4 items), Governmental support (4 items), and Organisational support (5 items). The literature tested the measures with significant validity scores and reliability (Wu, Wang, and Tsai, 2020). Indicators were calculated on a five-point Likert scale (Appendix A).

Network learning capability: Moderating variable

NLC is a moderator construct, the registered value of which is 1 in Colombia and 2 in Australia. We have measured NLC on a 10-item scale applying Weerawardena et al. (2015) with the modifications introduced by Caseiro et al. (2019) and McGrath et al. (2019). Measuring NLC includes two dimensions: externally focused NLC (5 items) and internally focused NLC (5 items). The scale to collect start-up's capability-related learning has been tested in the literature with significant validity scores and reliability (Weerawardena et al., 2015).

Control variables

The control variables applied in this research incorporate each start-up's size, age, and level of education of its founder/co-founder (Gilbert et al., 2006). Our selection of control variables was supported by their generally accepted effect on SE and SP (Eisenmann, 2020; Fraiberg, 2017; Vandenbroucke, Knockaert, and Ucbasaran, 2016).

Data analysis

We used the PLS-SEM to analyse the data and test the hypotheses: (1) Constructs used in the suggested model are multidimensional (Hair et al., 2019); (2) they allow the possibility of utilising second-order dimensions (Hair Jr et al., 2021) and (3), allow for the small size of the firm's (Ryan, 2020). Information analysis was realised applying the SmartPLS 3.2.9 tool (Henseler et al., 2014).

Results

The study applied a two-phase approach conceived through a measure model analysis as well as a structural model evaluation (Barclay et al., 1995). This design secures scale validity prior to the critical links (positive and direct moderation) being checked.

Analysis of the measure model

We were analysis-oriented in calculating the measure loading values for the path model in the two contexts. The related criteria are indicated in Table 4. The result is that measures overcame the bar set at 0.7 by Hair et al. (2021). In addition, the least values for exceeded reliability, determined at 0.7 by Hair et al. (2019), for Average Variance Extracted (AVE, recorded at 0.5), and 0.7 for Cronbach's Alfa were also overcome. This analysis offered irrefutable proof for the model's significative dimension validity, due to that the group of indicators directly evidence the latent conceptual dimension evaluated.

Table 4. Measurement of composite reliability, indicator, and measure variables.

Constructs	Indicator loading		Composite reliability		Cronbach's Alpha		AVE	
	Colombia	Australia	Colombia	Australia	Colombia	Australia	Colombia	Australia
Start-up ecosystem -SE-			0.861	0.927	0.743	0.859	0.658	0.789
Financial support -SE1-	0.741	0.899						
Governmental support -SE2-	0.879	0.906						
Organisational support -SE3-	0.835	0.873						
Network learning capability -NLC-			0.788	0.918	0.731	0.786	0.549	0.743
Externally focused NLC -NLC1-	0.786	0.912						
Internally focused NLC -NLC2-	0.704	0.875						
Start-up performance -SP-			0.746	0.913	0.743	0.964	0.563	0.912
Enterprise performance -SP1-	0.738	0.913						
Entrepreneur's satisfaction -SP2-	0.709	0.875						

We analysed the distinction among the path model compound across discriminant validity (Hair Jr et al., 2021). To quantify this validity by the values for the dimension's AVE square-root, we contrasted the correlations for the distinct compound of the path model (Hair et al., 2019). The AVE values in all cases overcome the squared inter-composite, correlational values, both for Colombia and Australia samples. Hence, the outcomes recommend an adequate discriminant validity for the dimensions in the two sample groups (Table 5).

Table 5. Discriminant validity*

	Colombia (1)	**Australia (2)**
Financial support	0.739*	
Governmental support	0.737	0.867*
Organisational support	0.649	0.796
Externally focused NLC	0.728	0.752
Internally focused NLC	0.683	0.705
Enterprise performance	0.735	0.853
Entrepreneur's satisfaction	0.716	0.802

* The square root of the AVE.

We have also studied the correlations across the different dimensions (see Table 6), inferring that the correlation across governmental, financial and organisation supports are direct and positive for the two environments. Likewise, a direct and significant correlation exists across the NLC constructs and SP. In the end, we observed a direct and notable correlation between SE and SP.

Table 6. Inter-composite covariances.

	SE1	**SE2**	**SE3**	**SE**	**NCL**	**SP**
COLOMBIA						
Financial support						
Governmental support	0.597					
Organisational support	0.526	0.582				
Start-up ecosystem	0.598	0.547	0.579			
Network learning capability	0.534	0.524	0.533	0.556		
Start-up performance	0.522	0.503	0.510	0.514	0.529	
AUSTRALIA						
Financial support						
Governmental support	0.698					
Organisational support	0.651	0.664				
Start-up ecosystem	0.622	0.633	0.641			
Network learning capability	0.609	0.618	0.623	0.623		

	SE1	SE2	SE3	SE	NCL	SP
Start-up performance	0.587	0.595	0.601	0.609	0.614	

Note: $p < 0.001$ is argue in t (4999 permutations), of one-tailed test.

In synthesis, NLC was figured as a category b (second-order construct) from the latent variable value. However, the principal problem is that dealing with a category b composite presents collinearity issues (Hair Jr et al., 2021). Collinearity issues emerge when the Variance Inflation Factor (VIF) registers a superior score (Hair et al., 2019). In this study, no collinearity issues were perceived (Table 7).

Table 7. Collinearity statistics for constructs of the start-up ecosystem

	Colombia		Australia	
	Weights (λ)	**VIF**	**Weights (λ)**	**VIF**
Financial support	0.301	1.298	0.594	1.498
Governmental support	0.487	1.401	0.573	1.472
Organisational support	0.463	1.379	0.558	1.455

Analysis of structural model

The model tested SE's direct and significant impact on SP in the two contexts chosen. All items in the coefficients model exceeded 0.2; the value minimum limit permitted for this figure (Chin, 1998). The equivalence was realised as a bootstrap procedure supported on t (4999), showing the previous coefficients as meaningful from the t-values related along with the value for t (4999) (Table 8). Hence, our first hypothesis can be tested.

Table 8. Outcomes of the control variables and structural model analysis.

	Start-up performance			Start-up age		Level of education		Start-up size	
	β	t-value	R2	β	t-value	β	t-value	β	t-value
Colombia	0.377	5.824***	0.325	0.227	$0.187^{N.R}$	0.031	$0.297^{N.R}$	0.201	$0.056^{N.R}$
Australia	0.615	7.146***	0.612	0.134	$0.203^{N.R}$	0.956	$0.642^{N.R}$	0.956	$0.092^{N.R}$

Notes: *** The argument in t (4999 permutations) of a one-tailed test.
N.R. – Not Relevant.

Those variables considered in the study were age, level of education and start-up size (Table 8). For Colombia and Australia start-up sub-groups, none of the three variables was confirmed to affect SP (based on a path coefficient test below 0.2, and t-values less to suggested).

Multigroup analysis

To study the effect of NLC on SE and SP, the externally and internally focused NLC were considered first order moderating constructs. Therefore, a multigroup approach can be used, given the variability of NLC. To make the comparison between Colombia and Australia, it was necessary to confirm the moderating influence of NLC through analysis of indicators' invariance. Calculating invariance is considered a fundamental problem when using PLS-SEM. To evaluate it, we used the MICOM process to calculate the models' invariance, which required three phases (Henseler et al., 2016).

First, structural invariance is a process of standard parameterisation and measurement form. These analyses, their structural model, algorithm, and estimation for model assessment should be similar in all samples (based on both a similar survey and patch model – see Appendix A and Figure 1, respectively). In addition, structural invariance permitted going to the next phase by calculating composite invariance (Figure 2).

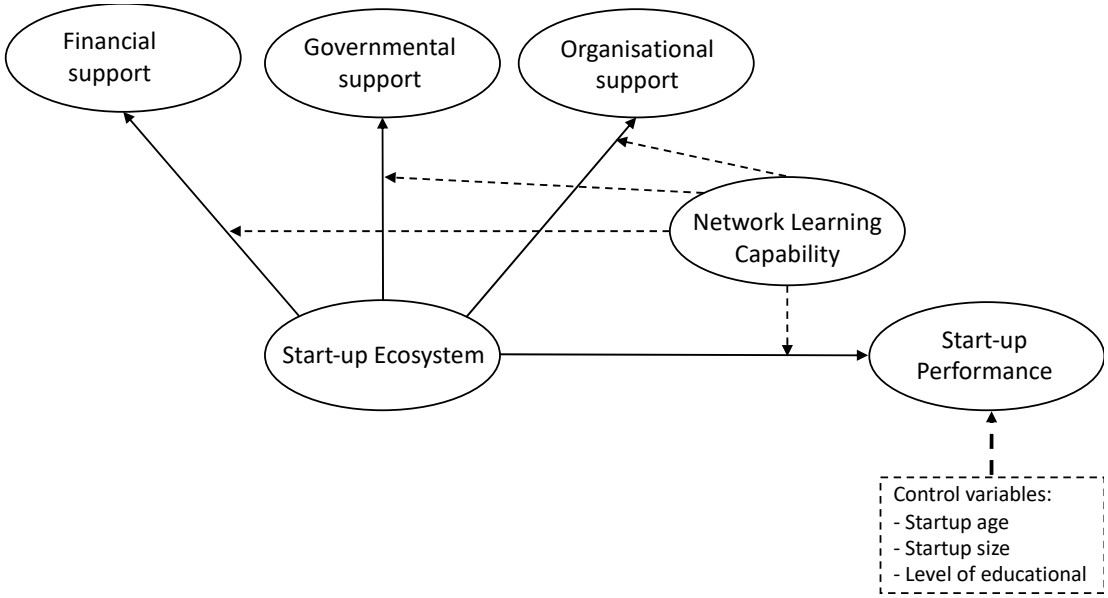

Figure 1. Conceptual model.

Second, composite invariance (c) is recognised as a grade for metric evenness. For this evaluation, a MICOM process was applied across the SmartPLS 3.2.9 tool, requiring 5000 permutations. Consequently, the measure had a value near 1, supplying a concrete test for the happening of the indicator (Table 9). In addition, a permutation proof permitted verification that neither of the scores for c varies notably from this value. Hence, we confirmed that composition invariance complies with dimensions contemplated in this model.

Table 9. MICOM: Composite invariance.

Composite	Colombia-Australia		
	c-value (0=1)	95% confidence interval	Compositional Invariance?
Financial support	0.999	[0.997;1.000]	Yes
Governmental support	0.997	[0.995;1.000]	Yes
Organisational support	0.996	[0.994;1.000]	Yes
Start-up ecosystem	0.997	[0.995;1.000]	Yes
Network learning capability	0.992	[0.980;1.000]	Yes
Start-up performance	0.994	[0.992;1.000]	Yes

Note: MICOM for 5000 permutations, apply the tool SmartPLS 3.2.9.

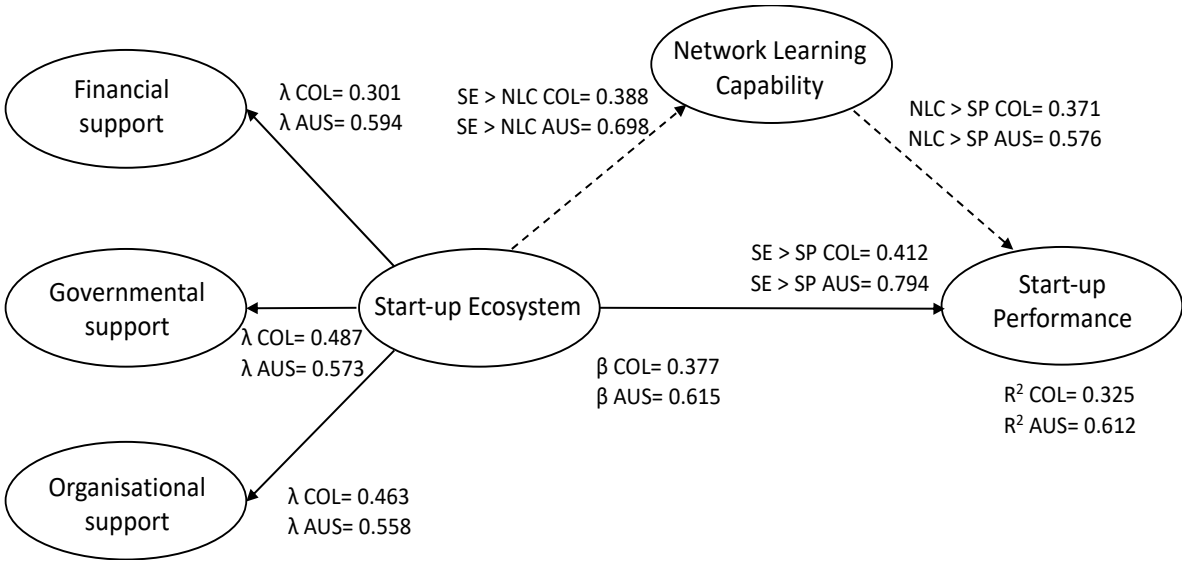

Figure 2. Structural model analysis.

Third, the permutation (5000) proof outcomes confirm the presence of uniformity patterns across estimation and variance for the dimensions (see Tables 10 and 11). In conclusion, the prior validation displayed that the final data do not notably vary from cero (Table 12).

Table 10. MICOM: Equal variances.

Composite	Colombia-Australia		
	Difference of the compsités variance ratio (=0)	95% confidence interval	Equal Invariance?
Financial support	0.999	[0.997;1.000]	Yes
Governmental support	0.997	[0.995;1.000]	Yes
Organisational support	0.996	[0.994;1.000]	Yes
Start-up ecosystem	0.997	[0.995;1.000]	Yes
Network learning capability	0.992	[0.980;1.000]	Yes
Start-up performance	0.994	[0.992;1.000]	Yes

Note: MICOM for 5000 permutations, apply the tool SmartPLS 3.2.9.

Once the three previous processes are finished, a validity of composite invariance measure is produced, and the use of a multigroup approach is proposed (Henseler et al., 2016). Hence, according to the contexts under analysis, governmental, financial, and organisational supports influence SE differently. In Colombia, governmental support is the central element in construct SE, closely followed by organisational support. Financial support is by far the least developed construct of SE in this country. In Australia, the previous constructs of SE are equally relevant, despite financial support being the most important. Finally, the second hypothesis was tested.

Table 11. MICOM: Equal means.

Composite	Colombia-Australia		
	Difference of the composite variance ratio (=0)	95% confidence interval	Equal means?
Financial support	0.002	[- 0.231;0.227]	Yes
Governmental support	0.001	[- 0.220;0.216]	Yes
Organisational support	- 0.001	[- 0.214;0.222]	Yes
Start-up ecosystem	0.001	[- 0.218;0.225]	Yes
Network learning capability	- 0.001	[- 0.213;0.221]	Yes
Start-up performance	- 0.004	[- 0.220;0.225]	Yes

Note: MICOM for 5000 permutations, apply the tool SmartPLS 3.2.9.

Subsequently, the path coefficients for each sub-sample have been evaluated, enabling a later estimation of notable distinctions within each block contrasted. A critical comparison between the resulting path coefficients has been realised, thus validating the moderating effect of NLC (see Table 8). On its part, SE is accountable for 32.5% of the

influence of variance in the Colombian start-ups' performance, 61.2% in that of Australian start-ups. Therefore, the third hypothesis is confirmed.

Table 12. Test results of Multigroup approach.

	Colombia	Australia	Diff. (Colombia Vs Australia)	[t]Parametic (EV)	[t]Parametric (NEV)	[P]Permutation	[P]Henseler
SE > SP	0.412	0.794	0.382	3.702[a]	3.865[a]	0.067[b]	0.052[c]
SE > NLC	0.388	0.698	0.310	3.402[a]	3.462[a]	0.039[b]	0.030[c]
NLC > SP	0.371	0.576	0.205	2.861[a]	2.895[a]	0.023[b]	0.021[c]

[a] Notable (one-tailed t distribution, one-sided test).
[b] Notable at 0.10.
[c] Notable (one-sided test).

We have confirmed the moderating influence of NLC; its potency could be validated across estimation of a statistical f2 coefficient (Henseler et al., 2014). In this sense, the f2- associated score for the Colombia-Australia comparative analysis was 0.28. As reported by Henseler et al. (2016), the threshold, f2-associated data permitting calculation of moderating-influence potency are the following: 0.02 for "faint", 0.15 for "acceptable", and 0.35 for "strong" (see Figure 2). Hence, we confirmed that NLC does present a moderating effect in all start-up groups. A Standardised Root Mean Square Residual ratio (SRMR) was examined for all samples to confirm the study. The final score elevates to 0.071 for the Colombian start-ups and 0.076 for Australian start-ups (the sill value is 0.08) (Henseler et al., 2014). Consequently, a significance test proves the agreement of the path model.

Conclusions, contributions and limitations

Conclusions

The study demonstrates in the first hypothesis a link across SE and SP on the radix of the current SE-associated literature developed from an open innovation perspective. The second hypothesis draws on OL perspective to contend that NLC determines the relationship and interaction between the SE and SP. In addition, we argue that other conducts of new venture yield occur and that the multiple SE constructs are dependent on cross-NLC variance. Finally, in the third hypothesis, we suggest that NLC moderates the influence of SE on SP.

We confirm the previous hypotheses in the two contexts considering each economic, social and political specificity. First, we test that SE has a direct impact on SP. The links across SE and SP, independently of start-up characteristics and contexts, are generally favourable. Likewise, our findings align with the theoretical review oriented by Tripathi et al. (2019) and Spender et al. (2017). Consequently, we may argue that SE is a valid predictor of a start-up´s aims (Ojaghi et al., 2019; Prohorovs et al., 2019). Second, we demonstrate that the contribution of NLC constructs is related to the SE notion, but varies according to each country's environment, the governmental, financial, and organisational support constructs (Kong, 2019; Champenois, Lefebvre, and Ronteau 2020; Gomes, Ferreira & Lopes, 2023).

In Colombia, the financial support dimension is less significant than governmental and organisational support in the context's structuration of SE. Governmental support has been facilitated through policies, programs, and projects, as well as funds and grants necessary to support the development of start-up capabilities. In contrast, the importance of organisational support might be sustained by arranging and facilitating access to environments such as universities, incubators, accelerators, and prototyping spaces that help the growth of new ventures. The financial support dimension could be linked to business angels, venture capital, and crowdfunding platforms (Chaudhari & Sinha, 2021; Vaznyte & Andries, 2019). Australia has a more uniform configuration of the SE construct. Australia has experienced more growth socially and economically in the culture of entrepreneurship combining the three constructs: governmental, financial, and organisational support.

Finally, this study confirmed that the influence of SE on SP varies according to country. We agree with Zheng et al. (2020), in the sense that NLC has a moderating effect on the impact of the SE on SP. NLC influences the SP, but with a specific SE configuration. Hence, we argue organizational learning and network theories help to start-up strengthen the learn new knowledge from the interaction process with internal and external actors (Crossan and Berdrow, 2003), but we think that "whilst networking often implies some central coordination, we have seen a shift towards decentralised autonomous organisations run in a shared form without any central entity" (Kromidha, et al., 2022).

Contributions

This research has various implications, both academic and enterprise related. First, it extends prior works dealing with the relationship between SE and SP and adds to previous research by exploring this link in two distinct environments. Hence, the research responds to Spender et al. (2017) suggestion of the need to analyse the role of start-up networks

by relating open innovation to generative NLC. Notably, we followed the idea to validate the differences in the concept of SE and the role of agents in the learning network and information flow management promoted by collaboration between actors and their performance. We did so in the frame of open innovation (Spender et al., 2017; Freixanet et al., 2021; Kraus, et al., 2020), with the purpose of better comprehending the influence of NLC on SP (Zheng et al., 2020). We have contributed to showing the linked importance of governmental, financial and organisational support constructs to complement the definitions of SE in distinct environments (Tripathi, Seppänen, et al., 2019). In addition, we have tested that financial support can either fortify or debilitate SE constructs and their link with SP (Chaudhari & Sinha, 2021).

Second, the research tests the hypothesis that the NLC moderates the relationship between SE and SP by evaluating its measurement invariance (Hair et al., 2019). Nevertheless, these depend on the political, economic, and social fabric of each country. We provide a conceptual contribution to the discussion about the network approach and open innovation perspective specifically focused on collaboration. Considering that start-ups interact both informally and formally with the actors in their contexts, ecosystem agents as a network include different actors and their links (mentoring, training, coaching, etc.) affecting SP.

Our findings may also have implications for start-ups that attempt to compete in distinct contexts. Admitting which SE constructs are essential in the two environments should support start-ups in designing plans for innovation and development that improve the performance of new ventures. Finally, our study contributes to institutional politics by understanding the influence of NLC on SE characteristics, which could support the configuration and adaptation of start-up policies, promote ecosystems and improve performance.

Limitations and future studies

The first limitation lies in regarding SE, SP and NLC as second-order dimensions. These constructs could be researched as individual aspects to establish the impact of all constructs in distinct national contexts. The SE construct could be researched using qualitative approaches (Joseph et al., 2021). Second, the possible impact on SE of the two contexts (entrepreneurship culture, entrepreneurial orientation, etc.) could be researched. Hence, future research should examine the effect of entrepreneurial orientation on the impact of SE on SP. The third limitation is that the data is transversal due to the different transformations experienced by the two contexts. Nevertheless, a longitudinal study could be

beneficial to identify possible changes in the findings that could include a multi-sectoral analysis to provide a global dimension of the impact of SE on SP in a specific industry. Finally, it would be relevant to analyse how institutional capabilities can be secured to guarantee that governmental, financial and organisational support converts into a competitive advantage (Anwar et al., 2018; Phangestu et al., 2020).

Appendix A

Constructs with the items
Start-up ecosystem
Financial support
(1) Business angels that support new ventures
(2) Websites and other online services that connect me with business angels
(3) Websites and other online solutions that connect me with venture capitals
(4) Crowdfunding platforms that support start-ups
Governmental support
(5) Specific government funds and grants to support my start-up
(6) Government policies and initiatives that support start-up companies
(7) Government programs that promote the adoption of new technology
(8) Government programs that help build technology capabilities
Organisational support
(9) Coaches or mentors that provide free training to support ventures
(10) Coaches or mentors that provide training to support ventures for a fee
(11) Incubators, accelerators, hackathons and boot camps that help develop a start-up
(12) Prototyping spaces (Fablabs or Techlabs)
(13) Relevant entrepreneurship education (i.e. TAFE or Universities)
Network learning capability
Externally focused network learning capability
(1) The start-up undertakes extensive networking with external research institutions to acquire relevant knowledge
(2) The start-up acquires relevant knowledge through attendance at industry gatherings and conferences
(3) The start-up combines new knowledge generated through networks with existing knowledge
(4) The start-up uses new knowledge gained through networks to resolve customer problems
(5) The start-up transfers knowledge generated through networks to new products or services
Internally focused network learning capability
(6) The start-up learns new capabilities to progress my venture
(7) The start-up invests in staff capability development to advance the start-up
(8) The start-up identifies an intellectual property in building the start-up
(9) The start-up applies research knowledge to resolve problems
(10) The start-up translates existing knowledge in new ways to develop innovative products and services
Start-up performance
Enterprise performance
(1) The start-up has very satisfied customers
(2) The start-up has solved an important problem
(3) The start-up has gained significant market growth
(4) The start-up has gained major market recognition
(5) The start-up has attracted funding

Constructs with the items
(6) The start-up has exceeded expectations
(7) The start-up has overall been very successful
Entrepreneur's satisfaction
(8) I am happy about being an entrepreneur
(9) I am more satisfied since becoming an entrepreneur
(10) I intend to remain an entrepreneur

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