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ARTICLE

Sharing Economy and New Transnational Ways of Consumption in the Unicorn Age: Definitions, Dissemination and Conditioners

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Abstract

The Sharing Economy represents a new form of consumption whose dissemination is explained by the growing ubiquity of digital platforms and applications. This article has three objectives: 1) to build an indicator capable of measuring countries' entry into the sharing economy; 2) to characterize the entry of countries in this new consumption model and 3) identify the factors that influence its spread. Descriptive data analysis and six ordinary least squares regressions are used to identify the factors that explain the expansion of the sharing economy, measured by building a Sharing Economy Index, based on 14.9 billion traffic data on the websites and specialized sharing apps for 175 countries. Descriptive statistics show that the sharing economy is spreading mainly among the countries with the highest income. Estimated regressions indicate that internet access, property rights and the presence of an over-regulated environment are the main factors that contribute to the access to this new consumption pattern.

Keywords | Sharing economy index; Opportunistic behavior; Reputation

1. INTRODUCTION

The Sharing Economy (SE) is identified by the literature as a new consumption pattern that is transforming the logic of carrying our transactions on a global scale. It is transversal to the economy, reaches a multitude of sectors and is characterized by the birth and spread of startups that in a few surpass the value of one billion dollars, being called Unicorns (LEE, 2013).

Although there is a growing literature that evaluates the transformations generated by SE, there is a lack of studies that seek to identify the factors that explain the entry of countries in this new consumption pattern (SUNDARARAJAN, 2016; BOTSMAN, 2017; RETAMAL; DOMINISH, 2017). This problem is compounded by the lack of international quality indicators.

The only indicator found in the literature is the SE Timbro Index (BERGH; FUNCKE; WERNBERG, 2018). This indicator has weaknesses, namely: the use of data referring to the number of providers, a limited sample of companies, and the use of traffic data on websites only, to the detriment of traffic in applications, which is the main channel for the use of these technologies. These weaknesses limit its use, demanding the development of a more comprehensive indicator, based on a larger sample of applications and using smartphone access data.

This study uses big data and data analytics tools to build a more robust index that can more effectively measure countries' entry into the SE. The index is elaborated based on the broader definition of SE, which brings together sharing and collaborative consumption companies (VALANT, 2016). This index is used to answer the research question of the article, namely: what factors influence countries' entry into the SE?

The behavior presented by the SE is identified through the definition of three specific objectives: 1. to build a comprehensive SE Index; 2. to characterize the entry of countries in the SE; 3. to identify the factors that influence the diffusion of new digital sharing technologies[1]. The SE Index is built using big data and data analytics tools. More specifically, website and app traffic data from 168 companies, responsible for 14.9 billion online interactions in 2018, is used to build an SE Index for 175 countries. Descriptive data analysis tools and the estimation of six Ordinary Least Squares (OLS) regressions are used to characterize countries' entry into the SE and identify the factors that influence it.

1 This paper falls within the research agenda proposed by Frenken and Schor (2017).

In addition to this introduction, the paper follows structured in 4 more sections. Section 2 will review the SE literature and the evidence on how SE is spreading to developing countries. Subsequently, section 3 will conduct a descriptive analysis to characterize countries' entry into new digital technologies and SE. Next, section 4 will consolidate the constructed Index and the results found for the estimated regressions. Finally, section 5 will make some final considerations.

2. Literature review

2.1 The term SE and related definitions

The term "Sharing Economy" was coined in the United States in the 1930s, in the midst of the great economic depression, being associated with the emergence of alternative social technologies in the face of population growth and the depletion of natural resources. With the 2008 crisis, two companies emerged in Silicon Valley, Uber and AirBnb, whose success stimulated the contribution of capital in SE startups, generating a massive movement of advance of this new economic trend (MARTIN, 2016).

In scientific circles, the concept of SE was introduced by Lessig (2008), who identifies two distinct economic models: the commercial and the sharing. *The commercial economy* is dominated by the logic of the market, and transactions are accompanied by monetary counterparts. *The Sharing Economy*, on the other hand, encompasses transactions that do not require monetary exchanges and fees, and are mediated by social relations to the detriment of profit.

Botsman (2015) demonstrates that the Collaborative Economy identifies economic transactions performed in a decentralized manner, its main characteristic being the absence of intermediary agents and monetary exchanges. The Collaborative Economy is a broader concept than the SE, involving traditional forms of sharing, such as gift exchange, and new forms provided by the advent of digital technologies, such as CouchSurfing.

In line with what Belk (2014) emphasizes, Botsman and Rogers (2010) classify different transactions as Collaborative Consumption and SE initiatives, without making a more precise distinction between these terms. Belk (2014) argues that much of the examples cited by Botsman and Rogers (2010) promote so-called pseudo-sharing, as they involve monetary quid pro quo.

Benoit *et al*. (2017) divide (pseudo-) sharing initiatives based on a classification covering three attributes: 1. the number and type of actors; 2. the nature of the exchange; and 3. the candor (directness) of the transaction. Minami (2019) complements this classification by adding a fourth attribute: the form of compensation.

Based on these four attributes Minami (2019) shows that SE identifies economic models that promote access to and sharing of underutilized goods and services without monetary consideration. Examples of correctly typified SE initiatives are Couchsurfing and FreeCycle, as they do not involve financial compensation.

All transactions that involve change in ownership and monetary consideration are classified as e-commerce, Table 1. Transactions that involve monetary consideration but exhibit no change in ownership are labeled Collaborative Consumption. Those characterized by change in ownership, without monetary exchange, are identified as Gift economy. Transactions that do not involve monetary consideration and change in ownership are typified as SE (YOKOO *et al.*, 2008).

TABLE 1
Discrimination of the concepts: monetary consideration versus change of ownership

		Change of ownership	
		Yes	**No**
Monetary Consideration	Yes	E-commerce	Collaborative Consume
	No	Gift Economy	Sharing Economy

Source: Own elaboration

SE is often misinterpreted as equivalent to concepts that cover specific aspects of online transactions, enabled using new digital technologies. It is important to distinguish between these concepts:

1. **Platform Economy**: encompasses all online transactions, commercial and non-commercial. It includes, for example, Amazon and Mercado Livre, which are specialized digital commerce platforms.
2. **Peer-to-peer Economy**: emphasizes decentralization and disintermediation, characteristics of online transactions (ASLAM; SHAH, 2017). Youtube, Napster, and social networks are some examples.
3. **Connected consumption**: emphasizes the possibilities of conducting P2P transactions, propitiated by new digital technologies (DUBOIS; SCHOR;

CARFAGNA, 2014). It brings together product reuse initiatives, without intermediation and with distributed interaction.

4. **Mesh Economy*:*** identifies the emergence of a socioeconomic system built on sharing production, trade, and consumption of goods and services, resembling the definition of Sharing Economy (GANSKY, 2010).
5. **On-Demand Economy**: directs to the digital delivery of activities that seek to meet consumer demands through immediate and flexible access, such as: makeup, meal delivery, and manual repairs (FRENKEN; SCHOR, 2019).
6. **eLancing*:*** identifies the digital environments and platforms that bring workers and employers together to perform specialized activities, emphasizing the increasingly distributed nature of online transactions (AGUINIS; LAWAL, 2013).
7. **Gig Economy**: brings together the more flexible and temporary forms of work that have emerged in response to advances in online transactions (MULCAHY, 2016). Among these platforms are Freelancer and Workana.

Uber Drive, for example, is considered part of the On-Demand Economy, involving on-site service provision through specialized digital platforms. Freelancer, on the other hand, is classified as a Gig Economy, as it enables the hiring of workers for temporary work on demand.

At this point, it is worth pointing out that there is no absolute consensus in the literature that the term SE is the most appropriate to identify the new forms of sharing promoted by digital technologies. Kaplan (2014) and Hamari, Sjöklint, and Ukkonen (2016), argue that this term is misused to describe human activities characterized by the emergence of new forms of work organization and the sharing of surplus productive capacity in exchange for money. The result of which is the emergence of an economy characterized by more horizontal and decentralized P2P transactions.

In Eckhardt and Bardhi's (2015) understanding, the term *Access Economy* proves to be more appropriate, being used to identify the three main elements present in the new digital platforms: access to underutilized assets, the presence of digital platforms specialized in intermediation, and the existence of monetary counterparts.

Frenken and Schor (2019), in turn, argue that many platforms identified as SE initiatives are actually *Economy on Demand* ventures. The use of apps like Uber to order rides implies the creation of new capacity and the contracting of services that become offered, not the occupation of underutilized capacity.

The term SE is employed in the next sections in its broadest definition, recurrently found in literature, which uses it both to identify SE applications and collaborative consumption applications (VALANT, 2016; MA, ZHANG, 2019). Although this classification presents limitations, it results in the construction of an indicator that can measure the new forms of consumption enabled by new digital technologies.

2.2 Evidence found in the literature

The advance of SE is explained, in part, by the distortions arising from the Commercial Economy. For Botsman (2017), this consumption system is incoherent, since only agents with high incomes are able to access assets, leaving them underutilized. Underutilization of resources coexists with scarcity and restricted access. SE reduces this contradiction, enabling access to this class of assets.

Sharing initiatives have gained momentum with the technological advances seen since the 1990s (SCHOR, 2014)[2]. These platforms encompass a plurality of areas (Table 2). The emergence of increasingly cross-cutting applications highlights the transformation they are promoting.

Developing countries gain the most from SE, present mainly in three areas: youth unemployment/underemployment; access to finance and agricultural productivity (RETAMAL; DOMINISH, 2017). It helps formalize businesses, resulting in economic growth (VAN WELSUM, 2016), lower cost of access, and increased entrepreneurship (OZIMEK, 2014; JAIN, 2015; DILLAHUNT; MALONE, 2015). In addition to making knowledge accessible and cheap (ROXAS, 2016) and investments (DALBERG, 2016).

The internal self-regulatory mechanisms of SE platforms help eliminate the need for trust, making new production activities feasible in weak regulatory environments (JOHAL; ZON, 2015; ERICKSON; SORENSEN, 2016). The existence of status quo around ownership makes SE more acceptable in countries where asset ownership is limited (ALAM, 2016). However, lack of knowledge and skills related to digital technologies and low trust (JAIN, 2015; ROXAS, 2016) hinder the advancement of SE, which tends to favor income concentration (DALBERG, 2016).

2 Giovanini (2020) looks at how technological advances have contributed to the diffusion of SE.

TABLE 2
Some examples of SE companies, referenced by area of activity

Learning	Coursera, Livemocha, Maven, Skillshare, Udacity e Udemy.
Used goods	Artsy, Listia, ThredUP, Twice, Videdressing, Wallapop e Zookal
Carsharing	99, Boatbound, Cabify, Didi, Easytaxi, ENI, GETT, goget, grab, Grabtaxi, HyreCar, Liftshare, Ola, Taxify, Turo, Uber, Zipcar e Drive My Car
Food	Olio e Too Good To Go
Education	CODEMY, EDX, Khan Academy, Kiwico, Opemlearning, Steve Spangler Scienc e Floqq
Spaces	Coworking Brasil, kozaza, Liquidspace, Loungebuddy, Peerspace, ShareDesk, Splacer e WeWork
Finances/Collaborative Financing	Sprig, Auxmoney, Kiva, TransferWise, Yooli, AngelList, CircleUp, Crowdcube, CrowdMed, CrowdRise, Crowndfunder, Eloan, Funding Circle, GoFundMe, Indiegogo, Kickstarter, LendingClub, OurCroud, Tilt, WeSwap e clearly
Hospitality/Travels	EatWith, Meal Sharing, Inspirato, Roomorama, 9flats, AirBnb, Campgarden/Campspace, CanadaStays, CouchSurfing, FlipKey, HomeExchange, HouseTrip, Locateur, LoveHomeSwap, Luxe, Luxurt Retreats, Lyft, Misterb&b, Oasis, Onefinestay, Roomer Travel, Funzing e Flywheels
Personal / Community	Freecicle, Getarround, Citterclty, DogVacacy, Fancy hands, Fetch, FON, GoNannies, Helpling, Bubble, Lawn Love, Lawn Starter, Le Tote, Mad Paws, Neighbor Goods, PetCloud, Pley, PoshMarks, Quora, Rent The Runway, Share Grid, Shyp, SisterCity, Soothe, Spinlister, Spot, AirBnB, Swifto, Taskrabbit, Thumbtack, Tongal, Trusted House Sitters, UrbanSitter, Withlocals, Yourmechanic e Designerex
Professionals	99designs, AirPR, Blender, Crowdflower, Crowdspring e Kaggle Leap, Quirky, the Volte e Zaarly
Reputation	Checkr e Traity
Ridesharing	City Bike, Blablacar, Coseats e DriveNow
Health and well-being	Pager, ClassPass, Eaze e Vanderbron
Transports	Lalamove, Zūn, Deliv, Car2Go, Filld, GetMyBoat, GoCatch, GoShare, HopSkipDrive, JustPark, Lime, Outdoorsy, Parkex, Rover, RVshare, SamBoat, Tubber, VarageSale, Wingz e YourParkingSpace

Source: Own elaboration

Not all authors are optimistic about the advances brought about by SE. Stemler (2017) and Harris (2017) show that sharing apps are subject to market failures, cognitive biases, and manipulation. The initial optimism around the ability to self-regulate (BOTSMAN, 2017; SUNDARARAJAN, 2016) and to eliminate the need for trust between agents proved to be exaggerated (HAWLITSCHEK; NOTHEISEN; TEUBNER, 2020).

These platforms result in precarization in labor relations, and the protection of consumers and property rights is necessary (ZRENNER, 2015; CODAGNONE; ABADIE; BIAGI, 2016; ERICKSON; SØRENSEN, 2016; HARRIS, 2017). The appeal to sustainability is also not justified (MURILLO; BUCKLAND; VAL, 2017; MARTIN, 2016).

SE creates challenges that demand the development of more flexible and smarter regulatory mechanisms (BOND, 2014; RAUCH; SCHLEICHER, 2015; BRESCIA, 2016). Policy makers face the arduous task of balancing innovation incentive with regulation (MA; ZHANG, 2019).

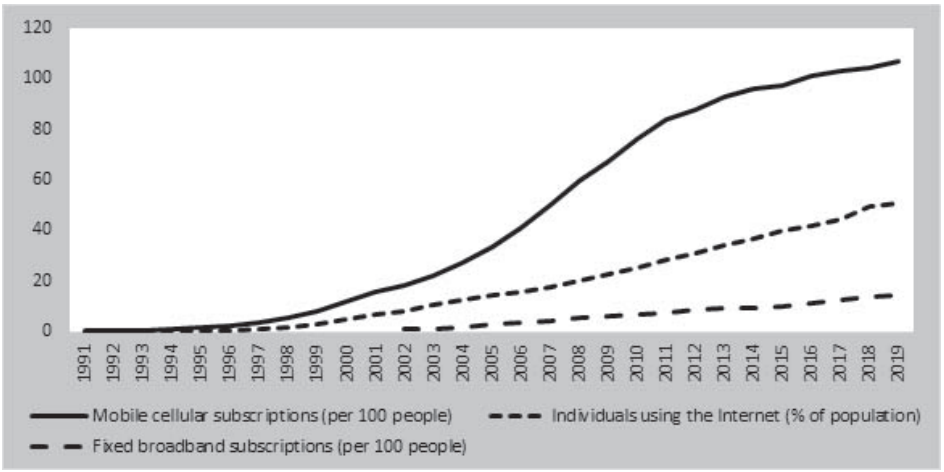
3. Descriptive analysis: new digital technologies and SE

This section measures the countries' entry into new technologies. Chart 1 shows the percentage of the world's population with access to the Internet. In 1993, only 0.25 of the world population had access to this service. However, this percentage is consistently increasing, reaching 46 in 2016. The number of cell phones per 100 people also grows exponentially; in 1993 there were only 0.61 cell phones per 100 people, but in 2011 there were 84 cell phones. From 2011, this indicator starts to grow at decreasing rates, reaching 101 cell phones in 2016.

Regarding the number of fixed broadband subscriptions per 100 people (Graph 1), in 2001 less than one in every 100 people in the world had access to high-speed internet. Over the period 2001-2016 broadband access rises, so that in 2016, 12.41 people per 100 had access.

Notwithstanding the SE expansion in developing countries (HIRA; REILLY, 2017) most platforms are created in developed countries (Map 1).

GRAPH 1
Percentage of the world's population with Internet access, number of cell phones per 100 people and fixed broadband subscriptions



Source: World Bank

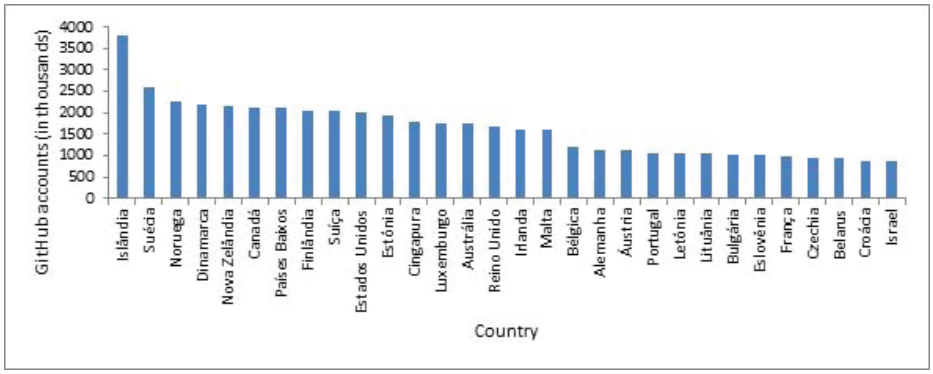
MAP 1
Origin of the largest existing sharing platforms in 2015

Source: Sharelok, http://sharelock.xyz/phase-1/

One factor that contributes to countries' entry into SE is the presence of programmers. The number of accounts on GitHub, per thousand people, is used as an indicator for the number of programmers, (Graph 2). It shows that Iceland, 3.803; Sweden, 2.610; and, Norway, 2.274, are the countries with the highest proportion of accounts. The accounts on GitHub (Map 2) are concentrated in

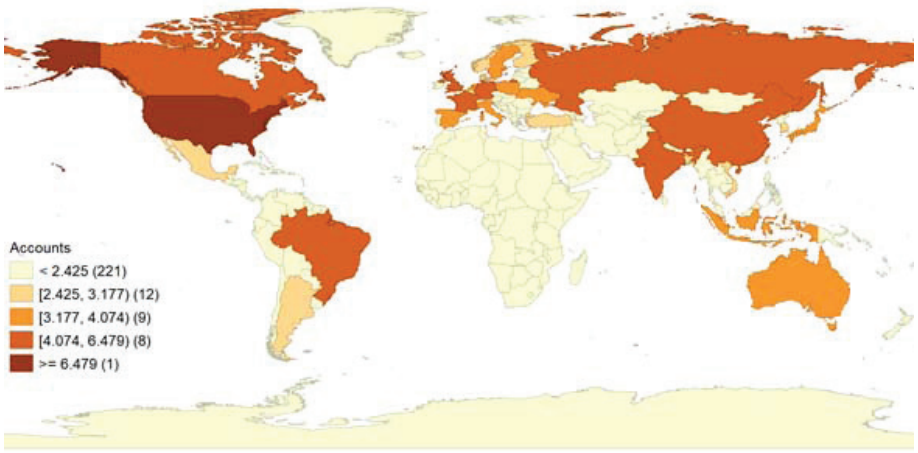
clusters, in the United States, Europe and Asia (China, South Korea and Japan). Brazil also stands out on the map.

GRAPH 2
Number of GitHub accounts per thousand people between 2011 and 2018, in thousands



Source: Ben Frederickson, https://www.benfrederickson.com/github-developer-locations/

MAP 2
Logarithm of the number of accounts on GitHub between 2011 and 2018

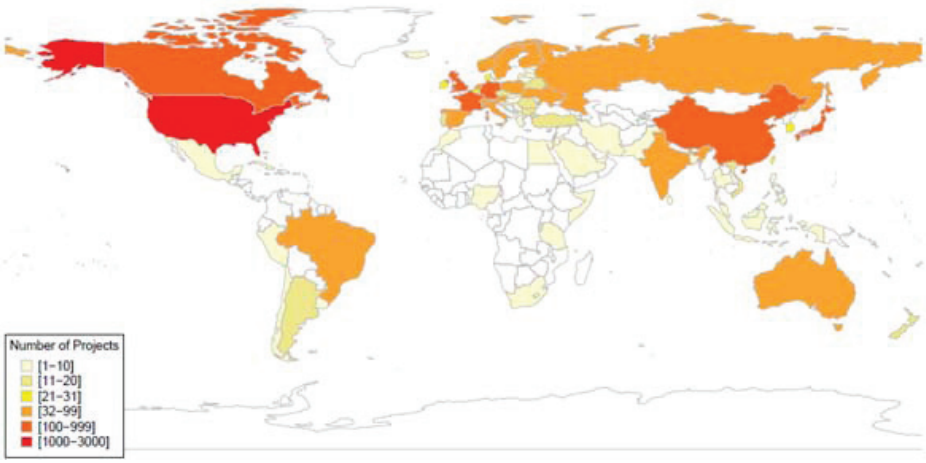


Source: Ben Frederickson, https://www.benfrederickson.com/github-developer-locations/

The number of projects on GitHub shows which countries are more proactive in developing computer code and is a proxy for the ability of countries to create applications and software. The United States and China have the most projects (Map 3), followed by Japan and some European countries.

MAP 3

Number of projects on GitHub

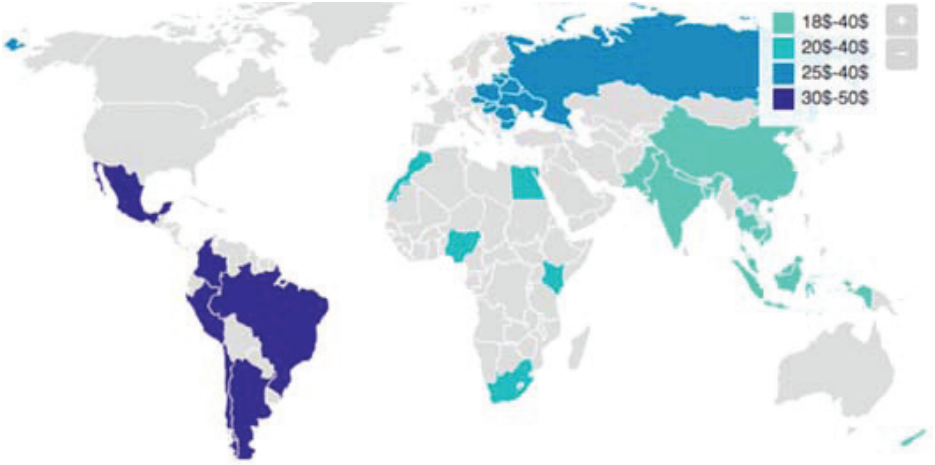


Source: Mombach *et al.* (2018)

The surveyed data also showed that Latin America is the region in the world where the cost of outsourcing programming services is the highest (Map 4), ranging from US$30 to US$50, with Asia being the region with the lowest cost, between US$18 and US$40.

MAP 4

Cost per hour of outsourcing programming services



Source: MEDIUM, https://lvivity.com/time-to-outsource-software-development

4. Factors that influence the insertion of countries in the SE

This section is divided into two subsections. Subsection 4.1 presents the methodology used in the elaboration of the SE Index. Subsection 4.2 consolidates the results found for the estimated regressions.

4.1 Database

Table 3 presents the variables used for the estimation of the regressions and the hypotheses built for each variable according to the evidence found in the literature. The database has 18 variables for 152 countries, including variables that identify the level of demand (Population and Income per capita); Internet access and quality (Population with Internet access and Fixed broadband subscriptions per 100 people); presence in new technologies (Percent of adults in social networks and Mobile cellular subscriptions); economic freedom (Commercial; Investment; Financial; Business; Labor; Monetary; Property) and Fiscal health.

TABLE 3
Variables that make up the database, broken down by source

Variable	Acronym	Source	Tested hypotheses
SE Index	Index	The author	
Confidence percentage	Confidence	World Value Survey	H1: greater trust results in greater use of CE platforms (VAN WELSUM, 2016; ROXAS, 2016; JAIN, 2015).
GDP per capita, PPP (constant 2011 dollars)	Income	World Bank	H2: higher income implies higher demand for CE services (BOTSMAN, 2017).
Logarithm of the population	Population	World Bank	H3: larger markets attract SE companies
Subscriptions, fixed broadband (per 100 people)	Broadband	World Bank	H4: higher quality internet access facilitates SE usage (THIERER et al., 2016; GANAPATI, 2016; GANAPATI; REDDICK, 2018).
Population with Internet access ()	Internet	World Bank	H5: Internet access enables access to SE (THIERER et al., 2016; GANAPATI, 2016; GANAPATI; REDDICK, 2018).
Mobile cellular subscriptions (per 100 people)	Mobile	World Bank	H6: greater presence of smartphones results in greater access to SE (GANAPATI, 2016; GANAPATI; REDDICK, 2018).
Percentage of adults who use social networks	Social	Pew Research Center.	H7: familiarity with digital technologies facilitates the use of SE (RIFKIN, 2016).

(continued)

TABLE 3
Variables that make up the database, broken down by source
(continued)

Variable	Acronym	Source	Tested hypotheses
Tourist arrivals per capita (logarithm)	Tourism	World Bank	H8: places with tourism potential attract SE companies (AQUINO, 2019).
Tax burden	Tax	Heritage	H9: the higher taxation encourages the emergence of applications that promote informal transactions.
Property Rights	Property	Heritage	H10: Well-defined property rights encourage sharing (SUNDARARAJAN, 2016; HAMARI; SJÖKLINT; UKKONEN, 2016; SABITZER et al., 2018).
Fiscal Health	Health	Heritage	H11: fiscal instability drives firms away from SE (BERGH; FUNCKE; WERNBERG, 2018).
Business Freedom	Business	Heritage	H12: less regulation encourages the creation of CE firms (MA; ZHANG, 2019).
Labor Freedom	Labor	Heritage	H13: less regulation of the labor market facilitates entry into SE (ZRENNER, 2015; ERICKSON; SORENSEN, 2016; HARRIS, 2017).
Monetary Freedom	Monetary	Heritage	H14: price stability favors investments in SE (BERGH; FUNCKE; WERNBERG, 2018).
Commercial Freedom	Commercial	Heritage	H15: less presence of trade barriers attracts SE firms (BERGH; FUNCKE; WERNBERG, 2018).
Freedom of Investment	Investments	Heritage	H16: less restriction on investments favors SE (BERGH; FUNCKE; WERNBERG, 2018).
Financial Freedom	Financial	Heritage	H17: Greater financial efficiency facilitates innovation in SE (BERGH; FUNCKE; WERNBERG, 2018).

Source: Own elaboration

The new digital platforms are global borns, observing the emergence of new transnational forms of consumption arising from the international expansion of these platforms. Local productive characteristics are no longer relevant, and the addition of variables that measure the development capacity of national platforms, such as human capital, programming capacity, foreign exchange, presence of natural resources, sophistication of the productive structure, and local production capacity, is not justified. The expansion of these platforms depends mainly on unilateral

decisions made by their managers, the characteristics possessed by the consumer market, and minimal technological knowledge of the consumers.

All variables were surveyed for the year 2018, the only exceptions being Internet Access, 2017, and Confidence, varied years.

The index of countries' entry into the SE is built by applying big data and data analytics tools, using a rigorous procedure for identifying and classifying applications and extracting traffic data (GIOVANINI; BITTENCOURT; MALDONADO, 2020). This procedure is discriminated into four steps, namely:

1. **Apps Identification**: survey of applications and digital platforms specialized in SE and Collaborative Consumption in specialized sites and studies. Collected data was extracted from the SEMrush[3] platform in the third week of April 2020. This platform provides traffic data on websites and apps, discriminated by country and month, which enabled the extraction of data for 2018.

   The criteria used in adding/excluding platforms were adapted from Giovanini, Bittencourt and Maldonado (2020), according to the list of platforms originally identified by Giovanini (2020). Each of the platforms added to the database was previously accessed and ranked. Platforms with less than 30,000 annual accesses/less than 100 accesses in a month/used in less than five countries were excluded from the final database, which reduced the sample from 700 to 218 platforms.

2. **Apps selection**: analysis of the characteristics presented by the applications obtained in Step 1 and elimination of applications not pertaining to SE and/or Collaborative Consumption, which resulted in a sample comprising 168 platforms, **Table 3**;

3. **Traffic data collection**: in possession of the final list of apps, geolocated traffic data was collected for the year 2018, for 175 countries, totaling 14.9 billion interactions.

4. **Construction of the index**: The traffic data underwent a meticulous process of tabulation and organization, and the **SE Index (SEI)** was prepared. The construction of the Index is broken down into four steps, adapted from Bergh et al. (2018), namely:

3 https://www.semrush.com/analytics/keywordoverview/?q=leftoverswap&db=us

a. Aggregation of traffic data across applications:

$$X_i = \sum_{j=1}^{n} Y_{ij} \ , \tag{1}$$

At which $Y_{ij} \subset \mathbb{N}$ the traffic in the country $i \in \mathbb{N}$ for the app $j \in \mathbb{N}$ and $X_i \subset \mathbb{N}$ the aggregate traffic, for all Apps, in country *i*.

b. Division of traffic data by the total population of the country *i*:

$$\widehat{X}_i = \frac{X_i}{Pop_i} \ , \tag{2}$$

at which $Pop_i \subset \mathbb{N}$ is population of country *i* and $\widehat{X}_i \subset \mathbb{R}$ is the per capita traffic of the country *i*;

c. Calculation of the natural logarithm of per capita traffic:

$$\hat{x}_i = \log(\widehat{X}_i) \ , \tag{3}$$

at which $\hat{x}_i \subset \mathbb{R}$ the logarithmic per capita traffic indicator; and

D. Transformation to a linear interval scale

$$IEC_i = \frac{\hat{x}_i - \hat{x}_{min}}{\hat{x}_{max} - \hat{x}_{min}} \ , \tag{4}$$

at which $\hat{x}_i \subset \mathbb{R}$ identifies the per capita traffic, in logarithm, in the application of country i; $\hat{x}_{min} \subset \mathbb{R}$ is the per capita traffic, in logarithm, in the application of country with lower traffic; $\hat{x}_{max} \subset \mathbb{R}$ is the per capita traffic, in logarithm, in the country app with the highest traffic; and $IEC_i \subset \mathbb{R}$ is the indicator constructed to measure the entry of countries into the SE. This index varies between zero (0) and one (1), and is used to identify the degree to which countries join the CE. The closer to one the value assumed by the IEC is, the greater the country's entry into the CE, and the closer to zero, the lower the entry.

The index is calculated with and without AirBnb data, the use of AirBnb data reduces the sample size from 175 countries to 72 countries. The high correlation between both calculated indices, 0.87, shows that the indicator without AirBnb data

is able to capture the main characteristics related to the advancement of SE platforms across countries. Thus, the use of the index without AirBnb data is justified, given the larger number of countries for which this index is constructed.

The identification of the factors that influence the entry of countries in the SE, measured through the SE Index, is carried out through the estimation of regressions by the Ordinary Least Squares method, formally (GUJARATI; PORTER, 2011):

$$IEC_i = \alpha_0 + \alpha_1 Income_i + \alpha_2 Trust + \sum_{j=1}^{n} \beta_j V_{i,j} + \epsilon \,, \qquad (5)$$

at which $V_{i,j} \subset \mathbb{R}$ the vector composed of j control variable; $\epsilon \subset \mathbb{R}$ the error term and $\alpha_0, \alpha_1 \in \mathbb{R}, \alpha_2 \in \mathbb{R}, \beta_j \in \mathbb{R}$ the estimated parametres.

These are estimated for three different configurations: 1. for all countries; 2. only for countries with less than US$ 25,000.00 per capita income; and, 3. for countries with income above US$ 25,000.00 per capita.

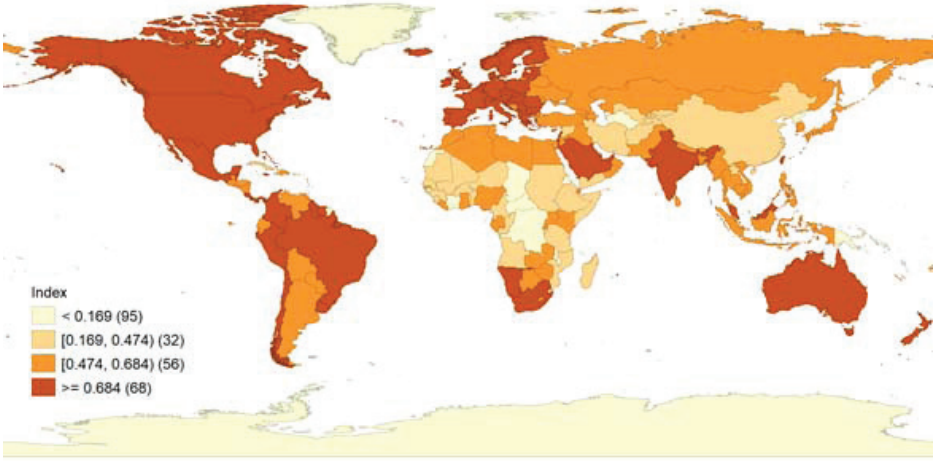
In total six regressions are estimated, namely: the first and second regression, All^i and All^t respectively include all countries, the presence of the Tourism variable in All and All^t being the element of differentiation between them. The third, <25i, and the fourth, $<25^T$, regression include only the countries with less than US$ 25,000.00 per capita income and the fifth, $>25^i$, and the sixth, $>25^T$, the countries with per capita income above US$ 25,000.00.

4.2 Results found

Map 5 compiles the results found for the SE Index, for 175 countries, without AirBnb data (Appendix 1 and Appendix 2 detail the indicator constructed by country and identify the ten platforms with the highest traffic volume).

The countries in the best position in this indicator belong to North America, especially Canada, 0.94, and the United States, 0.97. Oceania (more specifically, Australia, 0.93, and New Zealand, 0.91) is in the sequence, followed by Europe, (especially the United Kingdom, 0.92; Ireland, 0.91, Norway, 0.85; Sweden, 0.85; Iceland, 0.84 and the Netherlands, 0.84). Asia (especially Brunei, 0.86; Hong Kong, 0.85; Arab Emirates, 0.84 and Qatar, 0.81) and Latin America (for example, Mexico, 0.73; Costa Rica, 0.76; Chile, 0.76 and Brazil, 0.70) are in an intermediate position, being Africa (with higher indexes for South Africa, 0.69; Oman, 0.68; Lesotho, 0.62 and Botswana, 0.62), the continent that registers the countries with the lowest penetration in these technologies.

MAP 5
Values found for SEI



Source: Own elaboration

The variables that show the highest correlation with SEI (Table 4) are Income per capita, 84; the percentage of population with internet access, 81; Property rights, 79, and Tourism, 79.

TABLE 4
Correlation between SEI and selected variable

Variable	Correlation (%)	Variable	Correlation (%)
Income	84	Investments	58
Internet	81	Mobile	57
Proper rights	79	Social	48
Tourism	79	Confidence	47
Broadband	72	Monetary	45
Commercial	69	Labor	41
Business	68	Health	16
Financial	65	Population	-33

Source: Own elaboration

The estimated regressions, Table 5, show that countries' entry into the SE is positively influenced by *Per Capita Income* and Country Size in terms of *Population*, which are significant only when the *Tourism* variable is omitted from the regression. Therefore, the expansion of SE platforms towards countries with high income levels

and low population size is explained by the presence of tourism in these countries. Much of the entry of countries with lower income in the SE is explained by the advancement of platforms such as Uber and AirBnb (AQUINO, 2019). So that the results highlight this expansion of platforms to developing countries.

TABLE 5
Results found for the estimated models

Variable	All^{i}	All^{T}	<25^{i}	<25^{t}	>25^{i}	>25^{T}
Income	0,03	0,048**	-	0,026	-	-
Internet	0,002**	0,002**	0,002**	0,003**	-	-
Property	0,003**	0,003**	0,003**	0,002	0,005**	0,001
Confidence	0,017	0,012	0,008	0,007	-0,004	0,017
Commerce	0,002	0,004**	-	0,002	-	-
Business	-0,001	-0,002**	-	-	-	-
Investments	-0,001*	-0,001**	-0,001	-0,002*	-	-
Taxation	-0,002**	-0,002**	-	-	-	-
Health	-0,001**	-0,001**	-	-	-	-
Tourism	0,025**	-	0,035**	-	-	0,014
Labor	-	-	-	-	0,003**	0,001
Monetary	-	-	-	-	-0,003*	0,002
Population	-0,011	-0,019**	-	-0,013*	-	-
Constant	0,426**	0,202	0,434**	0,152	0,546**	0,140
R^2	0,84	0,83	0,81	0,75	0,75	0,76
F test	38,63	40,45	69,39	19,61	20,59	16,150
Sample size	87	103	60	60	32	32,000
Breusch-Pagan	2,34	7,43**	1,44	4,74	0,12	0,900

Source: Own elaboration, *(**) significant for the 90 (95) confidence level. #The Breusch-Pagan test is used to detect heteroscedasticity, corrected by White. The Variance Inflation Factor is used to test for the presence of multicollinearity.

The percentage of the population with *Internet access* presents a positive and significant estimated coefficient, except for countries with income above 25 thousand dollars per capita. Which highlights the importance of internet access for the diffusion of SE applications (RIFKIN, 2016; BOTSMAN, 2015; ASLAM; SHAH, 2017; GANAPATI, 2016; GANAPATI; REDDICK, 2018).

Property rights presents significant coefficients for three of the six estimated regressions, demonstrating the importance of an institutional environment with well-defined property rights for SE entry (SUNDARARAJAN, 2016; HAMARI;

SJÖKLINT; UKKONEN, 2016; SABITZER *et al*., 2018). Its relevance can be exemplified based on AirBnb, if the country does not present well-defined property rights the hosts have no incentive to provide access to their domiciles, as they have no guarantees that their right to exploit the asset will be preserved.

The **Confidence** variable is not significant, corroborating the results found by the SE Timbro Index (BERGH; FUNCKE; WERNBERG, 2018) and by the literature that argues that evaluation mechanisms make platforms able to self-regulate (VAN WELSUM, 2016; SUNDARARAJAN, 2016).

A considerable part of the growth of SE in developing countries is due to the creation of a framework for monitoring the behavior of the agents involved, reducing the need for confidence, which perhaps enables the emergence of new productive activities in environments characterized by the presence of opportunistic behavior and low level of confidence between agents (OZIMEK, 2014; JOHAL; ZON, 2015; ERICKSON; SORENSEN, 2016; VAN WELSUM, 2016).

The evidence found is favorable to the argument that self-regulation and peer review mechanisms present in digital platforms, and the greater monitoring of agents, enabled by new communication technologies, enable new transactions. The new technologies are possibly enabling new transactions, reducing the need for trust between agents.

Freedom of Trade presents a significant and positive coefficient. This result highlights the importance of reducing trade barriers for transnational ES firms to enter countries (BERGH; FUNCKE; WERNBERG, 2018). The presence of restrictive regulations to foreign firms discourages entry.

Business Freedom, Investment, Monetary, Fiscal and Government Spending show coefficients with negative signs. As ES firms use new digital technologies to enable temporary and flexible transactions, they often compete in the market with traditional, highly regulated firms. One example is the clash between carsharing companies and taxi drivers. These companies use new technologies to overcome legal limitations and barriers to entry, creating business models that make intensive use of communication technologies to conduct transactions that border on informality and escape traditional regulatory mechanisms. Thus, the presence of excessively regulated environments, resulting in the existence of market reserve and unsatisfied demand, encourages the entry of SE companies. Therefore, the positive role of these companies that use new technologies to increase consumer welfare is evidenced (BERGH; FUNCKE; WERNBERG, 2018).

The significant coefficient with positive sign found for *Labor Freedom* for high-income countries shows that the presence of an overly regulated labor market has a negative effect on the progress of the SE. These results legitimize the existing debate between authors in favor of and against deregulation, indicating that these companies enter mainly in countries that have less regulation of labor relations, since the establishment of informal labor relations is one of their main vectors of expansion (ZRENNER, 2015; CODAGNONE; ABADIE; BIAGI, 2016; ERICKSON; SORENSEN, 2016; HARRIS, 2017; BOND, 2014; RAUCH; SCHLEICHER, 2015; BRESCIA, 2016).

It is worth noting that freedom indicators are collected through surveys by the consulting firm Heritage and tend to be biased to indicate that greater freedom results in prosperity. There are indications that the main indicator that affects access to SE is income. Freedom variables are possibly correlated with income. The suggestion for future work is to conduct more rigorous statistical tests, based on the estimation of panel models.

5. Final considerations

This article analyses the factors that influence the insertion of countries in the Sharing Economy (SE). *Data science and big data* techniques are employed in the elaboration of a SE Index, used to measure the dissemination of this new consumption pattern among countries. Descriptive data analysis and six ordinary least squares regressions identify the factors that influence entry into the SE.

The descriptive analysis of the data shows that the number of apps marketed has increased exponentially in recent years. The SE Index shows that the countries with the highest income are the ones that register the highest inflow. Brazil is in an intermediate position, 0.7, just behind Latin American countries, such as Chile, 0.79 and Mexico, 0.73, close to India, 0.71, and South Africa, 0.69, and ahead of Argentina, 0.60, Russia, 0.54 and China, 0.45.

The estimated regressions had demonstrated that the presence of an adequate digital infrastructure, identified by the growing ubiquity of the internet, contributes to countries joining the SE. The regulatory framework proves to be of special importance, with the greater presence of property rights and freedom of trade being important for the dissemination of the SE, while the freedom of investment and business has a negative effect. The advance of the SE is largely due to the questioning of existing regulations, a phenomenon made possible by new communication technologies.

It is concluded that there is ample space for the emergence of companies and new forms of business based on SE platforms. Entering the SE requires significant institutional changes, implying new (dis)regulatory challenges. Developing countries should be careful not to enter through precarisation in their labor relations.

The need to adopt policies that enable entry into the SE is advocated. The development of collaborative platforms in the educational area; the dissemination of programming courses; the technological development and creation of free trustworthy systems; the adoption of policies to foster the creation of digital platforms and the revision of the regulatory framework, favoring the emergence and greater appropriability of digital platforms, are some of the policies that can contribute to entry in the SE.

Finally, it should be noted that this study does not exhaust the discussion on the theme. The methodology used leaves important questions open, among which: how is the distribution of access to platforms between applications and sites? Is it possible to build more specific indicators of access? Do new sharing technologies make it possible to carry out transactions in environments with low level of confidence? How is consumption distributed between national and international platforms? With the virtualization of transactions, is it possible to develop more efficient transaction designs? Do these new designs extend the original market concept?

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Appendix

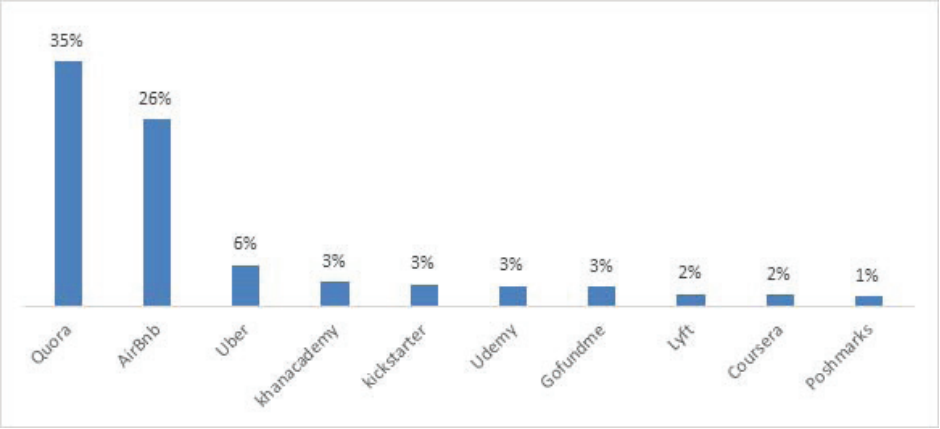
APPENDIX 1

Sharing economy Index, 2018

Country	Value	Rank	Country	Value	Rank	Country	Value	Rank	Country	Value	Rank
Singapore	1,000	1	Austria	0,778	45	Ecuador	0,673	89	Nicaragua	0,506	133
United States	0,972	2	Lithuania	0,778	46	Dominican Rep.	0,669	90	Libya	0,505	134
Saint Lucia	0,971	3	Maldives	0,773	47	Turkey	0,665	91	Djibouti	0,505	135
Canada	0,943	4	Latvia	0,766	48	Argentina	0,661	92	Algeria	0,501	136
Aruba	0,936	5	Costa Rica	0,763	49	Moldova	0,651	93	Iraq	0,501	137
Guam	0,929	6	Chile	0,763	50	Bhutan	0,648	94	Uganda	0,492	138
Australia	0,929	7	Greece	0,762	51	Armenia	0,645	95	Myanmar	0,487	139
Seychelles	0,927	8	Germany	0,762	52	Jordan	0,645	96	Rwanda	0,474	140
Cayman	0,925	9	France	0,761	53	South Korea	0,635	97	Haiti	0,460	141
United Kingdom	0,921	10	Hungary	0,760	54	Lesotho	0,624	98	China	0,456	142
New Zealand	0,914	11	Mauritius	0,759	55	Botswana	0,620	99	East Timor	0,453	143
Ireland	0,913	12	Suriname	0,757	56	Indonesia	0,618	100	Tanzania	0,449	144
Malta	0,877	13	Puerto Rico	0,754	57	Nepal	0,617	101	Somalia	0,445	145
Grenada	0,868	14	Namibia	0,752	58	Ghana	0,615	102	Cameroon	0,435	146
Brunei	0,861	15	Serbia	0,752	59	Egypt	0,614	103	Togo	0,424	147
Dominica	0,857	16	Czech Rep.	0,746	60	Bolivia	0,610	104	Laos	0,416	148
Hong Kong	0,854	17	Uruguay	0,744	61	Thailand	0,610	105	Syria	0,411	149
Curacao	0,853	18	Jamaica	0,742	62	Cape Verde	0,608	106	Benin	0,406	150
Norway	0,850	19	Bulgaria	0,739	63	Honduras	0,608	107	Sierra Leone	0,402	151
Sweden	0,847	20	Belize	0,736	64	Kenya	0,607	108	Kyrgyzstan	0,393	152
Barbados	0,844	21	Romania	0,735	65	Guatemala	0,602	109	Sudan	0,390	153
Iceland	0,844	22	Montenegro	0,733	66	Tunisia	0,602	110	Senegal	0,386	154
Netherlands	0,842	23	Macedonia	0,732	67	Ukraine	0,598	111	Yemen	0,373	155
United Arab Emirates	0,835	24	Mexico	0,730	68	Japan	0,598	112	New Caledonia	0,364	156
Denmark	0,831	25	Slovakia	0,729	69	Vietnam	0,596	113	Mauritania	0,362	157
Bahamas	0,827	26	Taiwan	0,722	70	El Salvador	0,594	114	Iran	0,358	158
Estonia	0,825	27	Poland	0,722	71	Zimbabwe	0,589	115	Mozambique	0,337	159
Spain	0,823	28	Italy	0,719	72	Sri Lanka	0,588	116	Tajikistan	0,331	160
Guyana	0,822	29	Macau	0,716	73	Morocco	0,586	117	Uzbekistan	0,328	161
Switzerland	0,819	30	Panama	0,713	74	Belarus	0,585	118	Ethiopia	0,320	162
Finland	0,817	31	Albania	0,712	75	Gambia	0,581	119	Rep. Congo	0,316	163
Andorra	0,815	32	India	0,709	76	Pakistan	0,573	120	Burundi	0,306	164
Belgium	0,812	33	Saudi Arabia	0,706	77	Nigeria	0,572	121	Burkina Faso	0,299	165
Qatar	0,811	34	Brazil	0,704	78	Mongolia	0,565	122	Afghanistan	0,297	166
Slovenia	0,809	35	Lebanon	0,695	79	Zambia	0,552	123	Cuba	0,295	167
Croatia	0,809	36	South Africa	0,692	80	Russian	0,544	124	Guinea	0,282	168
Israel	0,802	37	Peru	0,685	81	Cambodia	0,544	125	Angola	0,254	169
Bahrain	0,800	38	Colombia	0,684	82	Liberia	0,543	126	Mali	0,253	170
Portugal	0,795	39	Georgia	0,678	83	Azerbaijan	0,529	127	Madagascar	0,240	171
Luxembourg	0,791	40	Philippines	0,678	84	Gabon	0,528	128	Equ. Guinea	0,236	172
Malaysia	0,790	41	Oman	0,678	85	Bangladesh	0,528	129	South Sudan	0,231	173
Bermuda	0,788	42	Bosnia	0,677	86	Paraguay	0,527	130	Niger	0,169	174
Kuwait	0,786	43	Samoa	0,676	87	Venezuela	0,516	131	D. R. Congo	0,151	175
Cyprus	0,779	44	Fiji	0,674	88	Kazakhstan	0,513	132			

Source: Own elaboration

APPENDIX 2
Applications broken down according to their participation in the total traffic of the 168 applications that make up the indicator built



Source: Own elaboration

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