Do refugee inflows contribute to the host countries' entrepreneurial rates? A dynamic panel data analysis, 2000–2019

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Abstract

Purpose – This study aims to estimate the impact of refugee inflows on host countries' entrepreneurial rates. The refugee crisis led to an increased scientific and public policy interest in the impact of refugee inflows on host countries. One important perspective of such an impact, which is still underexplored, is the impact of refugee inflows on host countries entrepreneurial rates. Given the high number of refugees that flow to some countries, it would be valuable to assess the extent to which such countries are likely to reap the benefits from increasing refugee inflows in terms of (native and non-native) entrepreneurial talent enhancement.

Design/methodology/approach – Resorting to dynamic (two-step system generalized method of moments) panel data estimations, based on 186 countries over the period between 2000 and 2019, this study estimates the impact of refugee inflows on host countries' entrepreneurial rates, measured by the total early-stage entrepreneurial activity (TEA) rate and the self-employment rate.

Findings – In general, higher refugee inflows are associated with lower host countries' TEA rates. However, refugee inflows significantly foster self-employment rates of "medium-high" and "high" income host countries and host countries located in Africa. These results suggest that refugee inflows tend to enhance "necessity" related new ventures and/ or new ventures (from native and non-native population) operating in low value-added, low profit sectors.

Originality/value – This study constitutes a novel empirical contribution by providing a macroeconomic, quantitative assessment of the impact of refugee from distinct nationalities on a diverse set of host countries' entrepreneurship rates in the past two decades resorting to dynamic panel data models, which enable to address the heterogeneity of the countries and deal with the endogeneity of the variables of the model.

Keywords Refugee inflows, Total early-stage entrepreneurial activity, Self-employment, Dynamic panel data estimations

Paper type Research paper

1. Introduction

The creation of a new firm tends to help the development of countries or regions and is often considered a sign of economic dynamism (Jones *et al.*, 2019). The potentially positive impact

of entrepreneurship on economic growth and development, together with the turmoil associated with economic crises, such as the 2007–2008 financial crisis/Global Financial Crisis (Bordo and Landon-Lane, 2010) or the recent COVID-19 pandemic (World Bank, 2022), have pushed public policy authorities to channel their efforts into providing a more adequate entrepreneurial environment (OECD, 2021). These efforts include decreasing the barriers to new business creation (Misra *et al.*, 2014; Aparicio *et al.*, 2016; Williams, 2021), and uncovering the main factors behind this process (Roman *et al.*, 2018).

Launching new businesses and developing entrepreneurial activities are influenced by both the social environment and economic factors (GEM, 2020). These include entrepreneurial finances (Brown *et al.*, 2019), government policy (Audretsch *et al.*, 2019), government entrepreneurship programs (Hechavarría and Ingram, 2019), entrepreneurship education (Hagvall Svensson *et al.*, 2020), research and development transfer (Nicotra *et al.*, 2018), commercial and legal infrastructure (Khyareh *et al.*, 2019), internal market dynamics (Hagos *et al.*, 2019), entry regulations (Darnihamedani *et al.*, 2018), physical infrastructure and cultural and social norms (Bennett, 2019).

A pool of competent and skilled human resources is fundamental to entrepreneurship (Naroş and Simionescu, 2019). Such human capital is usually comprised of the countries' native population, but immigrants, including refugees, often perform radical entrepreneurial breakthroughs, thus contributing greatly to their host countries' progress (Harima *et al.*, 2019; Heilbrunn, 2019; Almohammad *et al.*, 2021). Despite the stronger hurdles faced, refugees demonstrate a higher rate of entrepreneurship than other immigrants, which reflects what Collins *et al.* (2017) call the "refugee entrepreneurship paradox." Moreover, the demand boost created by the increased inflow of refugees, as well as refugees' cheap labor and specific skills, may foster the entrepreneurial rate of natives (Cengiz and Tekgüç, 2022).

In terms of scientific research, few empirical contributions have addressed refugee entrepreneurship. These include, in general, high-quality qualitative case studies covering a limited set of topics (Heilbrunn and Iannone, 2020; Desai *et al.*, 2021), such as refugee integration in their host country and the contribution of refugee entrepreneurship (Freudenberg and Halberstadt, 2018; Shneikat and Alrawadieh, 2019; Shepherd *et al.*, 2020), barriers and difficulties refugees face (Heilbrunn, 2019; Meister and Mauer, 2019; Wauters and Lambrecht, 2006; De Lange *et al.*, 2021) and the contribution of refugees to their host country's economy (Alrawadieh *et al.*, 2019). Some recent studies resorting to quantitative techniques have addressed the impact of refugee inflows, but they have focused on the impact of refugees from Syria and Afghanistan located in specific host countries, Turkey (Kayaoglu, 2020; Cengiz and Tekgüç, 2022) and Australia (Collins *et al.*, 2017), respectively. To the best of our knowledge, a broader quantitative study on the impact of refugee (originated from distinct countries) inflows on a myriad of host countries' entrepreneurial rates over a long-time span has yet to be performed.

The present study contributes to the empirical literature on entrepreneurship in two innovative ways.

First, at the methodological level, it resorts to quantitative causality analyses, complementing the extant high-quality qualitative and exploratory analyses, which are based mainly on direct interviews (Collins *et al.*, 2017; Alrawadieh *et al.*, 2019; Freudenberg and Halberstadt, 2018; Barth and Zalkat, 2021). Although both qualitative and quantitative methodological approaches are valuable, having both strengths and weaknesses, quantitative approaches are less prone to researchers' subjectivity and have a broader scope for replication and generalizability (Mwita, 2022). Accordingly, the analysis is based on quantitative, econometric methods, most notably dynamic (two-step system generalized methods of moments [GMM]) panel data models, to investigate and test the impact of refugee inflows on the host countries' entrepreneurial rates. To estimate the models, we have used secondary data for the period from 2001 to 2019, gathered from several

sources, namely, the United Nations Refugee Agency (UNHCR) (refugee inflows), Global Entrepreneurship Monitor (countries' total entrepreneurial rate) and the World Bank (self-employment and other macroeconomic variables).

Second, at the empirical level, it provides complementary, quantitative and comprehensive analyses of the impact of the refugee inflows on their host countries' entrepreneurial rates. To the extent that these data encompass a larger number of countries of origin and destination of refugees, our study complements the existing empirical studies that have explored the impact of given refugee inflows, from Syria and Afghanistan, on specific host countries, Turkey (Kayaoglu, 2020; Cengiz and Tekgüç, 2022) and Australia (Collins *et al.*, 2017), respectively. Moreover, given that refugees are more likely to select into self-employment and potentially contribute to the creation of (refugee and nonrefugee) new businesses particularly in low-value sectors (Ram *et al.*, 2022), the consideration of distinct proxies for the entrepreneurship rate, including total early-stage entrepreneurial activity (TEA) rate and self-employment rate, might bring novel and interesting empirical outcomes.

In terms of structure, the present paper reviews, in the next section, the relevant literature, uncovering the mechanisms by which refugee inflows are likely to influence the host countries' entrepreneurial rates. Section 3 details the methodology, data and proxies for the relevant variables. Section 4 presents and discusses the empirical results. In the Conclusion, we highlight the main results, contributions and limitations of the present study.

2. Determinants of countries' entrepreneurial rates: a review

2.1 Refugee inflows and host countries' entrepreneurial rates: main hypotheses to be tested
To assess the macroeconomic impact of refugee inflows on host countries entrepreneurial rates, it is important to uncover the microfoundations of individuals' entrepreneurial intents and propensity. Several theories put forward a wide range of factors that are likely to affect the entrepreneurial propensity of individuals. These approaches include (see Table 1): psychological (humanistic psychology, cognitive psychology theory and Shackle's theory), economic (Casson's theory, economic decision theory, the theory of the firm and signaling theory) and institutional (disadvantage theory, protected market theory, the network theory and theory of middleman minorities).

As detailed below, the theoretical arguments of the selected theories (Table 1) applied to the case of refugees suggest that refugee inflows can undermine (cf. the humanistic psychology theory, the planned behavior/cognitive psychology theory, the theory of the firm, the Casson's theory and the signaling theory) or enhance (cf. the Shackle's theory, the economic decision theory, the disadvantage theory and the network and the middleman theories) host countries' entrepreneurial rates.

Included in the psychological theories, the humanistic psychology theory discusses the prioritization given to individual needs (O'Donnell *et al.*, 2020). This means that, if a person is assured to satisfy his/her survival needs, he/she will work on other needs and higher objectives; in other words, having a stable, secure lifestyle is an opportunity to start an entrepreneurial activity. In the case of refugees, who have faced trauma and hard situations like wars (Gericke *et al.*, 2018), having a stable life would be their highest priority. Therefore, we can infer that entrepreneurial activities tend to be more frequent among the native population than among refugees because the former has a more stable life. Hence, increasing inflows of refugees would be associated with lower rates of entrepreneurship in host countries.

According to the planned behavior/cognitive psychology theory, the success of any entrepreneurial activity is related to the personality and characteristics of individuals

Factors	Theory	Proponents (authors/studies)	Mechanisms that support/explain the entrepreneurship rates	The entrepreneurial propensity of refugees versus native individuals	Expected impact of refugee inflows on the host country's entrepreneurship rate
Psychological	Humanistic psychology	O'Donnell et al. (2020)	Life stability is related to entrepreneurship. Countries with more middle-aged people with a more stable lifestyle are expected to have a higher rate of entrepreneurship	Higher for Natives	Negative
	Planned behavior | Cognitive psychology theory	Van Ness and Seifert (2016)	People with an openness to experience, self-reliance and emotional stability characteristics tend to have a higher entrepreneurship rate. Hence, having more people with lower emotional stability in a country tends to decrease the entrepreneurship rate	Higher for Natives	Negative
	Shackle's theory	Lachmann (1976)	An entrepreneur is a risk-taker, a person who can decide in uncertain and dynamic environments. As refugees have a high level of risk-taking behavior, an increase in their inflows would increase the entrepreneurship rate of host countries	Higher for Refugees	Positive
Economic	Casson's theory	Casson (2005)	Countries with more transparency and easier access to financial and information resources tend to have a higher entrepreneurship rate. However, natives benefit more due to their knowledge about the market and available information	Higher for Natives	Negative
	Economic decision theory	Ripsas (1998)	Individuals who are facing discrimination and are at a disadvantage in the job market intend to start their entrepreneurial activities. Therefore, countries with the less favorable job and employment situations should have higher entrepreneurship rates	Higher for Refugees	Positive
	Theory of the firm	Auerswald (2008)	Refugees face greater barriers and difficulties than their native counterparts in accessing essential resources given their lack or limited knowledge about the host country	Higher for Natives	Negative
	Signaling theory	Connelly et al. (2011)	Getting a positive signal from society about the entrepreneurial activities would empower those activities. Therefore, countries with economic stability and positive financial market performance tend to have a higher rate of entrepreneurship	Higher for Natives	Negative

Table 1.
Entrepreneurship theories and the relationship between refugee inflows and the host countries' entrepreneurial rates

Factors	Theory	Proponents (authors/ studies)	Mechanisms that support/explain the entrepreneurship rates	The entrepreneurial propensity of refugees versus native individuals	Expected impact of refugee inflows on the host country's entrepreneurship rate
Institutional	Disadvantage theory	Boyd (2000)	Individuals who are facing discrimination and are at a disadvantage in the job market intend to start their entrepreneurial activities. Therefore, countries with the less favorable job and employment situations should have a higher entrepreneurship rate	Higher for Refugees	Positive
	Challenge-based theory of entrepreneurship	Miller and Le Breton-Miller (2017)	Challenges/ negative personal circumstances create conditions and experiences that motivate adaptive requirements which in turn foster outcomes such as work discipline, risk tolerance, social and network skills, and creativity	Higher for Refugee	Positive
	The network theory | Theory of middleman minorities	Troise (2020)| Zhou (2004)	Countries with a higher population of immigrants and emigrants are more likely to have a higher entrepreneurship rate due to the connections that those people would probably establish between two or more societies	Higher for Refugees	Positive

Source: Own elaboration

Table 1.

(Tornikoski and Maalaoui, 2019). For instance, self-efficacy is shaped by accumulated cognitive, physical and social experience and it can impact the way each person thinks and analyses the opportunities, as well as their subsequent performance (Krueger *et al.*, 2000). Moreover, the antecedents to intention include personality factors (e.g. need for achievement, risk-taking propensity and *locus* of control) and the social environment (e.g. economic climate), which indirectly influence the process of entrepreneurship (Sarri *et al.*, 2019). Many refugees suffer from psychological difficulties, such as post-traumatic stress disorder and major depression (Fazel *et al.*, 2005; Gerritsen *et al.*, 2006), which are likely to negatively affect their intention to create a business (Nabi *et al.*, 2011). Thus, according to this theory, an increase in the inflow of refugees tend to be associated, at least in the short term, with lower entrepreneurship rates in the host countries.

Looking at more economic-related approaches, Casson's theory considers an entrepreneur a coordinator who uses the available resources (financial and information) to incorporate entrepreneurial decision-making in founding a new firm (Ripsas, 1998). According to this perspective, markets provide essential information to entrepreneurs, thus, access to funding, knowledge and information about markets fosters entrepreneurship. Compared to native individuals, refugees tend to have substantially limited access to financial and information resources (Meister and Mauer, 2019), thus, one can infer from Casson's theory that they are less likely to start a new venture. Accordingly, higher inflows of refugees do not result in higher entrepreneurship rates in the host countries.

Similarly to the economic decision theory, the theory of the firm also highlights the importance of information and knowledge about potential market and clients, institutions and society, as well as access to financial resources, to start a new business, that is, to embark on entrepreneurial endeavors (Alvarez and Barney, 2004; Casson, 2005; Langlois, 2007). Moreover, and in line with Casson's theory, the easiness and transparency of access to essential resources (including information and funding) tend to promote the creation of new firms. As mentioned earlier, refugees face greater barriers and difficulties (than their native counterparts) in accessing essential resources given their lack or limited knowledge about the host country, including language barriers (Meister and Mauer, 2019). Therefore, an increase in refugee inflows would be associated with lower entrepreneurship rates.

An important issue for economic-related approaches is information asymmetries. Signals can correct such asymmetries. According to the signaling theory, the existence of positive signals, such as top management team-high human capital/market experience, founder involvement or the presence of venture capitalists or angel investors, tend to increase the likelihood of a new firm getting funding. The positive signals do not abound in the case of refugee entrepreneurial ventures; indeed, the negative signals, often conveyed by media, are widespread (Berry *et al.*, 2015). Thus, native entrepreneurs would benefit more from positive signaling than refugees, which undermines the latter's access to adequate financial resources to start and/or maintain a business. From the signaling theory, we can then infer that refugee inflows tend to be associated with lower entrepreneurship rates.

An entrepreneur is described as an ultimate decision-maker who takes risks to start a business in a dynamic and uncertain environment (Batstone and Pheby, 1996). Therefore, according to Shackle's theory, having a higher level of risk-taking behavior helps individuals to start an entrepreneurial activity. In comparison with natives, refugees are less risk-averse as they have been exposed to traumatic events and subsequent symptoms of post-traumatic stress disorder, which would increase their risk-taking behavior (Augsburger and Elbert, 2017). As a result, having more individuals with a higher level of risk-taking behavior, who are more prone to start an entrepreneurial activity, would potentially raise the countries' entrepreneurship rate. Summing up, we can infer from

Shackle's theory that refugee inflows are positively associated with host countries' entrepreneurship rates.

Everyone faces the choice of either becoming an entrepreneur or working for others and receiving a salary (Campbell, 1992). In this vein, the decision to start a business is related to the expected net gain in terms of wealth from wages and the expected gain from the entrepreneurial activity. According to the economic decision theory, that decision involves the analysis of the probability of success versus failure and the associated opportunity costs, namely, the loss of a given salary if the individual chooses to create a new venture (Campbell, 1992). In the case of refugees, this "option" is not simple, because they often face considerable disadvantages in the labor market and it is extremely difficult to find a job (cf. disadvantage theory – Hedberg and Pettersson, 2012). Thus, the opportunity costs of starting a business are often minimal (they have nothing to lose) and starting a business may be the only option available to survive given that their language barriers, absence of legal documents, related experience and qualifications usually stop them from being offered a job (Gericke *et al.*, 2018). In addition, some evidence shows that, for a similar level of human capital, employers tend to prefer to hire natives over non-natives (Cooray *et al.*, 2018; Ahmad, 2020). Thus, based on the economic decision theory, we can deduce that higher inflows of refugees tend to be associated with higher entrepreneurial rates.

Institutional-related approaches conceptualize entrepreneurship as activities that are intended to yield viable ventures (Aldrich and Ruef, 2006), focusing on the opportunities that lead to new ventures (David *et al.*, 2017). Specifically, the disadvantage theory focuses on the drawbacks and difficulties that push individuals to "choose" entrepreneurship, such as discrimination and labor market exclusion (Boyd, 2000; Abu-Asbah and Heilbrunn, 2011). Emphasizing a complementary argumentation of that of the disadvantage theory, the challenge-based theory of entrepreneurship highlights the negative personal circumstances (challenges) that create conditions and experiences, which motivate adaptive requirements that in turn foster outcomes such as work discipline, risk tolerance, social and network skills and creativity, leading to increased entrepreneurial behavior (Miller and Le Breton-Miller, 2017). Accordingly, an increased inflow of refugees would positively influence the host countries' entrepreneurship rates.

The network and the middleman theories emphasize that individuals tend to rely on their social capital networks (co-ethnicity, friendship and family) and other ethnic resources (language, norms and culture). This favors both the emergence of ethnic businesses in the host countries (Purbasari *et al.*, 2020) and/or the establishment of businesses between their home and host societies (Portes *et al.*, 2002; Bosiakoh, 2019). Hence, the more diverse societies are characterized by a wider social capital network of ethnic and minority groups, including refugees, which is ultimately associated with higher entrepreneurship rates (Smallbone *et al.*, 2010).

At the empirical level, and targeting specifically refugees from a given nationality (Afghanistan) in a particular context (Australia), Collins *et al.* (2017) underlined the "refugee entrepreneurship paradox," that is, the higher rate of entrepreneurship that refugee present (9.3%) compared to other immigrants (5.7% and 4.3% for migrants under family or skilled visa, respectively) in Australia despite the enhanced barriers, which nonrefugees often do not face, at least to the same degree. This evidence is consistent with the theoretical arguments of the Shackle's, disadvantage and challenge-based theories. In addition, emphasizing the business creation channel, Cengiz and Tekgüç (2022) suggest that migrants and refugee workers are likely to boost regional demand and constitute adequate labor force in given sectors (mainly low value-added), which might attract native and non-native individuals to start new businesses.

Thus, combining the theoretical and empirical considerations summarized above, we conjecture that:

H1. Refugee inflows contribute positively to host countries' entrepreneurship rates.

Entrepreneurship is a heterogeneous phenomenon (Medrano-Adán *et al.*, 2015) often encompassing two main subcategories (Fairlie and Fossen, 2020; Rodrigues and Teixeira, 2021): opportunity and necessity entrepreneurship. Opportunity entrepreneurship tends to be the net result of individual decisions to pursue entrepreneurial activities based on knowledge, technology, and innovation (Reynolds *et al.*, 2005), whereas necessity entrepreneurship is driven by lack of job opportunities causing individuals to develop their own business for economic survival (Rodrigues and Teixeira, 2021; Zighan, 2021) and tends to reflect lower value creation (Urbano and Aparicio, 2016).

As Margolis (2014, p. 419) refers, "[a]lthough some self-employment is chosen by entrepreneurs with well-defined projects and ambitions, roughly two thirds result from individuals having no better alternatives." Thus, self-employment rate is often taken as a proxy for "necessity entrepreneurship."

Some recent empirical studies have found that refugees in the UK are more likely to select into self-employment due to discrimination and labor market exclusion (Ram *et al.*, 2022), and the move into entrepreneurship of refugee entrepreneurs in Adelaide (Australia) was an experience driven mostly by necessity in the sense that opening up a business was the only way to entry into the labor market and to actively participate in the host country/region economy (Collins *et al.*, 2017). In addition, it has been found that refugees are more likely to start their ventures or be (often informally) employed in (new) ventures operating in low value-added (Hall, 2020; Kayaoglu, 2020) and the least profitable market sectors (Kloosterman, 2010).

In this context, high refugee inflows might be associated with higher host countries' self-employment rates, when new entrepreneurial ventures are mainly driven by necessity and/or operate in low value-added sectors. However, the relation between high refugee inflows and total entrepreneurial rates, which include both necessity- and opportunity-related entrepreneurial activities, might not be so clear-cut.

Accordingly, we conjecture that:

H2. The impact of refugee inflows on host countries' entrepreneurial rates is conditional on the type/nature (opportunity vs necessity) of the entrepreneurial activity.

2.2 Other potential determinants
Combining several relevant scientific contributions in entrepreneurship (see Table 2), we can group the other determinants (besides refugee inflows) of the host countries' entrepreneurial rates into three main categories: individual factors; macroeconomic factors; and institutional factors.

The individual factors that can affect entrepreneurial rates include gender, age and human capital (education, training and experience) (Sternberg, 2009; Misra *et al.*, 2014; Audretsch *et al.*, 2015; Roman *et al.*, 2018; Santamaria-Velasco *et al.*, 2021). Macroeconomic-related determinants have been considered some of the most significant in the literature (Sternberg, 2009; Nkongolo-Bakenda and Chrysostome, 2013; Welsh *et al.*, 2021). This group includes the most frequently mentioned ones, such as financial resources, GDP per capita, population, unemployment rate, inflation and foreign direct investment (FDI). There is a long list of institutional factors that can have an impact on entrepreneurial rates, most

Factors	Roman et al. (2018)	Audretsch et al. (2015)	Castaño et al. (2015)	Jayawarna et al. (2013)	Misra et al. (2014)	Sternberg (2009)	Kim et al. (2006)
Individual factors	Previous experience	Human capital	Training, Education		Education	Gender Age	Education and previous experience
Macroeconomic factors	GDP per capita Population and population growth rate Unemployment Inflation FDI	Financial resources GDP per capita Employment growth FDI	GDP per capita	Inflation	Financial resources GDP per capita Unemployment Inflation FDI		Financial resources
Institutional factors	Freedom from corruption	Policies Corruption Administrative complexity	Policies Role of law, Corruption Culture	Policies Judicial efficiency	Policies, Regulations Administrative complexity	Policies, Regulations	

Source: Own elaboration

Table 2.
Factors likely to
influence the
entrepreneurial rates
of countries

notably policies and regulations (Misra *et al.*, 2014; Audretsch *et al.*, 2015; Dileo and Pereiro, 2019), corruption and judicial efficiency (Jayawarna *et al.*, 2013; Roman *et al.*, 2018) and culture (Castaño *et al.*, 2015) [1].

Summing up, the theoretical framework underlying the present study is depicted in Figure 1.

3. Methodology

3.1 Main hypothesis and econometric specification

We intend to assess whether refugee inflows impact the entrepreneurship rates of host countries. According to the literature review in Section 2, refugee inflows, among other relevant determinants (age, gender, human capital, etc.), are likely to foster entrepreneurship rates mainly due to necessity, resilience, risk-taking, lower job opportunities and knowledge about their ethnic groups. Summing up all the factors that are likely to impact the entrepreneurial rates of countries (see Table A1 in the Appendix) [2].

The following econometric specification reflects the theoretical framework presented in Figure 1.

$$ER_{it} = \beta_1 + \beta_2 RI_{it} + \underbrace{\beta_3 AGE_{it} + \beta_4 FEM_{it} + \beta_5 HC_{it}}_{Individual\ Factors}$$

$$+ \underbrace{\beta_6 GDP_{it} + \beta_7 PG_{it} + \beta_8 UR_{it} + \beta_9 INF_{it} + \beta_{10} DCP_{it} + \beta_{11} FDI_{it}}_{Macroeconomic\ Factors}$$

$$+ \underbrace{\beta_{12} PR_{it} + \beta_{13} CR_{it} + \beta_{14} AC_{it}}_{Institutional\ Factors} + u_{it}$$

where:

i = country;

t = time;
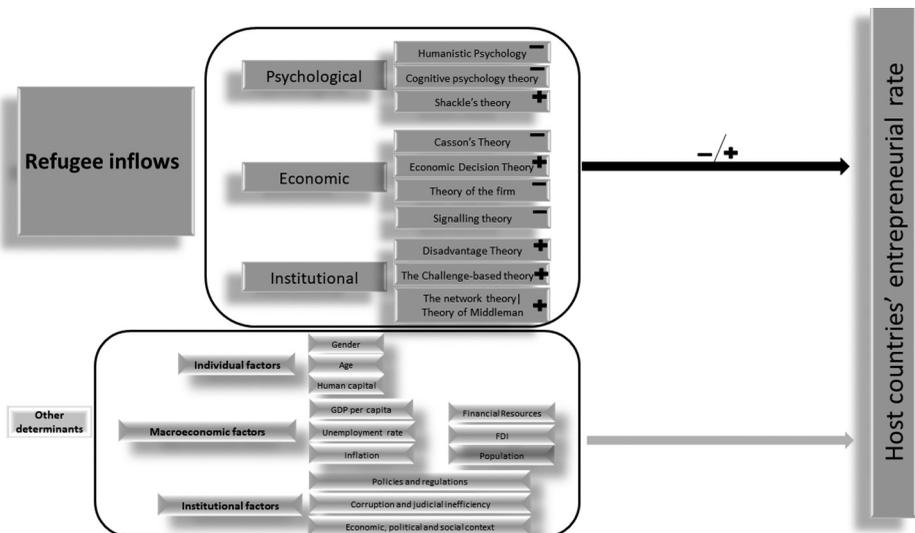
Figure 1.
Theoretical framework

Source: Own elaboration

ER = entrepreneurship rate;
RI   = refugee inflows;
AGE = vector variable that includes the age composition of the country;
FEM = percentage of females in the total population;
HC = human capital;
GDP = gross domestic product per capita;
PG = population growth;
UR = unemployment rate;
INF = inflation rate;
DCP = domestic credit to the private sector;
FDI = foreign direct investment;
PR = policies and regulations;
CR = control of corruption;
AC = administrative complexity; and
u = random error term.

3.2 Proxies and sources for the relevant variables
As Shane (2011, p. 1) correctly pointed, "[n]o single measure captures entrepreneurial activity perfectly." As such, we selected two proxies for the dependent variable, the host country's entrepreneurship rate:

(1) TEA rate, which represents the percentage of the 18–64 population who are either nascent entrepreneurs or owner-managers of a new business, that is, are involved in setting up a business or managing a business that is less than 42 months old; and

(2) self-employment rate, defined as the number of self-employed people (15–64 years old), that is, those who are in business for themselves, divided by the number of people in employment.

Self-employment rate can be taken as a reasonable proxy for "necessity entrepreneurship" (Rodrigues and Teixeira, 2021; Zighan, 2021), being particularly suitable in a study on refugee inflows, often associated to necessity rather than opportunity entrepreneurship (Margolis, 2014; Ram *et al.*, 2022), due to the substantial obstacles refugees face in their host countries (Collins *et al.*, 2017), forcing them to create their businesses to ensure their family's basic needs (Zighan, 2021).

Given that self-employment does not represent entrepreneurship in its totality (Sevä *et al.*, 2016), we also considered TEA rate, which is based on data from the Global Entrepreneurship Monitor (GEM), referring the percentage of population able to develop a professional activity that is actively involved in setting up a business, whether in business start-ups (nascent entrepreneurs) or 42 months after the birth of a business unit (owner-managers of new companies), which is likely to include opportunity and necessity-driven entrepreneurship (Guerrero *et al.*, 2021). It has been used in several studies, such as Brás and Soukiazis (2019), Dileo and Pereiro (2019) and Li (2021) (Table A1 in the Appendix).

Although the TEA rate is helpful to study the global entrepreneurship rate and is considered a stable and structural characteristic of each country (Pinillos and Reyes, 2011), it is very limited in terms of data availability. According to the GEM database, in the past 20 years, less than 50 countries per year on average are covered. Brás and Soukiazis (2019) pointed out that the TEA focuses mostly on developed countries, which led other researchers, namely, Biltagy *et al.* (2017), Aydoğan and Sevencan (2018), Sánchez (2018) and González-Sánchez *et al.* (2020) to use the self-employment rate as an alternative proxy for entrepreneurship.

The core independent variable, refugee inflows, is computed as the refugee population in the host country's total population. This proxy has been used in other studies that focus on the impact of refugee inflows on the voting behavior of their host country (Altındağ and Kaushal, 2021) or the relationship between female employment and refugee inflows (Erten and Keskin, 2021). In the data used for the estimations, gathered directly from the World Bank, based on UNHCR statistics, "Refugees" are "Refugees under UNHCR's mandate," that is:

> People who are recognized as refugees under the 1951 Convention Relating to the Status of Refugees or its 1967 Protocol, the 1969 Organization of African Unity Convention Governing the Specific Aspects of Refugee Problems in Africa, people recognized as refugees in accordance with the UNHCR statute, people granted refugee-like humanitarian status, and people provided temporary protection. Asylum seekers - people who have applied for asylum or refugee status and who have not yet received a decision or who are registered as asylum seekers - are excluded [3].

Regarding the other independent variables, the options for the proxies selected were based on the extant literature (Table A1 in the Appendix).

In Table 3, we have summarized and described the proxies for each variable and the corresponding data sources.

Most of the relevant data is available only for the most recent periods, most notably 2000–2019. However, this does not constitute a limitation for the analysis given that the refugee inflows particularly to the most developed countries coincide with the so-called "migrant crisis," which involves the movements of large groups of immigrants, most notably, displaced people (those who have been forced to leave their homes, including those who still live in their country of birth (internally displaced persons), as well as those who left for a different country (refugees and asylum seekers) and have yet to resettle permanently), escaping from the conditions which negatively affected their situation at the country of origin. In the past few decades, the world has faced various humanitarian crises like as the civil wars in Syria (since 2011), Yemen (since 2014), the economic crisis in Venezuela, which has worsened since 2010, and most recently (since February 2022), the war in Ukraine.

The displaced and refugee populations worldwide have risen exponentially and, from 2010 to 2020, it has more than doubled (Figure 2). According to the United Nations High Commissioner for Refugees (UNHCR), by 2020 there were about 90 million forcibly displaced people worldwide, of which 20.7 million were refugees (reaching almost 25 million if we add the asylum seekers), which was more than double the number recorded in 2010 (30.8 and 10.6 million, respectively) [4].

3.3 Econometric estimation technique

To estimate the relationship between the dependent (entrepreneurship rate) and the independent variables, namely refugee inflows, we analyzed several studies and the data analysis methodologies they implemented (Table A1 in the Appendix). Following Brás and Soukiazis (2019), we opted for panel data using dynamic effects as our analysis technique.

The dependent and independent variables included in the econometric specification tend to influence each other, meaning that the endogeneity problem with estimated empirical models is inevitable (Teixeira and Queirós, 2016). Moreover, the lagged dependent variable (a feature of the dynamic models) will cause interactions between explanatory variables and the random disturbances rendering the traditional panel estimators inconsistent. System GMM can correct unobserved country heterogeneity problems, omitted variable bias, measurement error and potential endogeneity issues (Bond *et al.*, 2001).

Variable type	Indicator	Proxies	Description	Data source
Dependent variables	TEA	Total early-stage entrepreneurial activity	Percentage of the 18–64 population who are either nascent entrepreneurs or owner-managers of a new business	Global Entrepreneurship Monitor (GEM)
	Self-employment	Self-employment rate	Percentage of self-employed people in all employed people	World Bank
Core independent variable	Refugee inflows	Refugees in the total population	Total refugee (under UNHCR's mandate) population in total country population (Multiply 1,000 due to low amounts)	World Bank Indicators, based on data from UNHCR
Other independent variables				
Individual factors	Age	% Population aged 20–39 years old	Population between the ages of 20 and 39 as a percentage of the total population	UN
		% Population aged 40–69 years old	Population between the ages of 40 and 59 as a percentage of the total population	UN
	Gender	Female population	The female population is the percentage of the population that is female	World Bank
	Human capital	Education (mean of schooling years)	The average number of years of education received by people aged 25 years and older, converted from education attainment levels using official durations of each level	UN
Macroeconomic factors	GDP per capita	GDP per capita, PPP (constant 2017 international $)	This indicator provides per capita values for the gross domestic product (GDP) expressed in current international dollars converted by purchasing power parity (PPP) conversion factor	World Bank
	Population growth	Population growth (Annual %)	The annual population growth rate for year t is the exponential rate of growth of the midyear population from year t-1 to t, expressed as a percentage	World Bank
	Unemployment rate	Unemployment rate	Unemployment refers to the share of the labor force that is without work but available for and seeking employment. Definitions of the labor force and unemployment differ by country	World Bank
	Inflation	Inflation, consumer prices (Annual %)	Measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services	World Bank
	Financial resources	Domestic credit to private sector (% of GDP)	The percentage of financial resources provided by private sectors as a percentage of GDP	World Bank

(*continued*)

Table 3.
Description of the variables included in the model

Variable type	Indicator	Proxies	Description	Data source
	FDI	Foreign direct investment, net inflows (% of GDP)	Foreign direct investment net inflows show net new investment inflows less disinvestment in the reporting economy from foreign investors and are divided by GDP	World Bank
Institutional factors	Policies, regulations	Regulatory quality	Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Ranging from 0 (the lowest quality) to 100 (the highest quality) in ranking	World Bank
	Transparency	Corruption control	Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, it ranges from 0 (the worst corruption control) to 100 (The best corruption control) in ranking	World Bank
	Administrative complexity	Time to contract – time required to enforce a contract (days)	The time required to enforce a contract is the number of calendar days from the filing of the lawsuit in court until the final determination and, in appropriate cases, payment	World Bank

Table 3.

forcibly displaced people (Left axis)   •••••• Refugees under UNHCR's mandate (Right axis)

------- Asylum-seekers (Right axis)
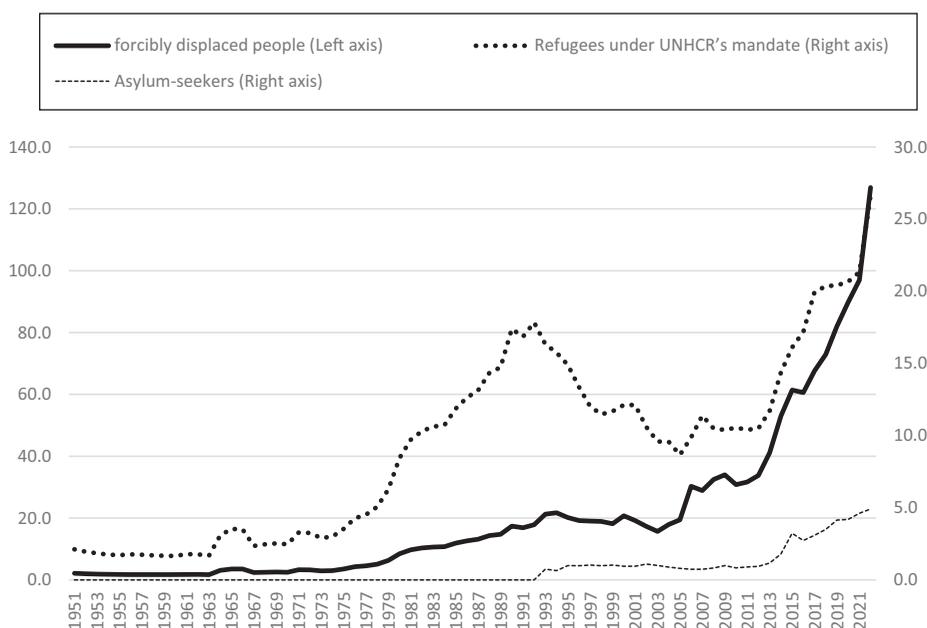
Source: Own elaboration based on data from UNHCR (Available at https://www.unhcr.org/
refugee-statistics/)

Figure 2.
Displaced, refugee
and asylum seeker
population between
1951 and 2022

Thus, in the present study, we apply the (two-step) system-GMM estimation method for the
dynamic panel data model. GMM cannot be established as a consistent method of estimation
unless there is no autocorrelation in the disturbance term (Blundell and Bond, 1998). This
would imply that the disturbances in the differenced model have significant first-order
correlation and insignificant second-order autocorrelation. For this purpose, the Arellano–
Bond tests for first-order [AR(1)] and second-order [AR(2)] serial correlation in the first-
differenced residuals are used (Arellano and Bond, 1991). Because the first differences of
independently and identically distributed idiosyncratic errors will be serially correlated,
rejecting the null hypothesis of no serial correlation in the first differenced error at order one
does not imply that the model is misspecified. Rejecting the null hypothesis at higher orders,
however, implies that the moment conditions are not valid.

3.4 Descriptive statistics
The data set of this study has a relatively vast range since it is built upon 16 variables from
186 countries for 20 years (2000–2019). This data set includes countries with different
income levels located in different regions, producing thus a consistent and diverse panel
data set. A summary of the variables is presented in Table 4.

As referred, two proxies have been used for measuring the dependent variable, TEA and
the self-employment rate. The number of observations for TEA is limited, totaling 903
observations, whereas for the self-employment rate the observations totaled 3,120. TEA
comes from GEM and represents the percentage of the 18–64 population who are either
nascent entrepreneurs or owner-manager of a new business. The lowest value of the TEA,

Variables type	Variable	Obs	Mean	Min	Max	SD
Dependent variables	TEA: Total early-stage entrepreneurial activity, % 18–64 population who are either a nascent entrepreneur or owner-manager of a new business	903	11.5	1.4	41.5	7.55
	Self-employment rate (%)	3,120	42.1	0.4	95.1	27.34
Core independent variable	Refugee (per 1,000 population)	3,029	4.4	0.0	185.5	11.36
Control variables	Female (% total population)	3,112	50.1	23.3	54.6	3.19
	Population 20–39 (% total population)	2,384	30.1	20.5	59.2	4.31
	Population 40–59 (% total population)	2,384	21.9	8.6	40.7	6.36
	Human capital (years of formal schooling)	3,120	8.0	1.1	14.2	3.26
	Population growth (%)	3,112	1.5	−9.1	17.5	1.58
	GDP per capita (US$, constant PPP)	3,042	17,025.6	435.1	141,635.0	19,148.29
	Unemployment rate (%)	2,405	8.3	0.0	45.3	6.18
	Inflation (%)	3,090	34.3	−72.7	65,374.1	1,229.25
	Private credit (%)	2,707	52.4	0.0	309.0	46.84
	FDI (% GDP)	3,052	5.6	−58.3	449.1	17.62
	Regulation quality	3,093	49.7	0.0	100.0	28.42
	Corruption control	3,098	46.9	0.5	100.0	29.01
	Time to contract – Time required to enforce a contract (days)	3,080	648.7	210.0	1,785.0	311.90

Table 4.
Descriptive statistics of the relevant variables

Source: Own elaboration

1.4%, was observed in France (in 2003) and the highest, 41.5%, was observed in Zambia (in 2012). Regarding self-employment, the lowest value (0.4%) was observed in Qatar (in 2016, 2018 and 2019) and the highest value (95.1%) was registered in Burkina Faso (in 2000).

To measure our core independent variable, the refugee population has been considered as per 1,000 host country population. This standardization of the variable by the host country population permits us to analyze the impact of the share of refugees in society on this latter's entrepreneurship rate. For instance, although in recent years Turkey is the country with the highest refugee population in absolute terms, in the same period, Lebanon has hosted the highest thousands of refugees relative to its population. In 2014, for every 1,000 Lebanese existed almost 186 refugees, which corresponded to 18.6% of their population.

The control variables are presented in three groups: individual, macroeconomic and institutional factors. Figure 3 presents the individual factors from a global perspective. We observe that human capital (formal schooling years) has increased constantly, from seven years to almost nine years. In the same period, the global population has aged. The percentage of people aged 40–59 years has risen from less than 20% to over 23%, while the population aged between 20 and 39 years has declined slightly, particularly in the past decade, from over 30.4% to less than 30%.

The macroeconomic factors include the GDP per capita, population growth, unemployment rate, inflation, private credit and FDI. Looking globally at the trends of the GDP per capita, unemployment rate and inflation rate (Figure 4), we can conclude that macroeconomic factors have improved globally, accompanied by a rise in the availability of credit to the private sector.

Source: Own elaboration

Figure 3.
Individual factors

Source: Own elaboration

Figure 4.
Macroeconomic
factors

To evaluate the institutional variables, three proxies were analyzed: regulation quality, corruption control and time to contract. Overall, regulation quality has decreased marginally in the past decade and this trend has been accompanied by rising levels of corruption among world countries and the worsening of the bureaucratic process, reflected in the increased time needed for a contract to be finalized (Figure 5).

4. Empirical results and discussion

For each proxy of the entrepreneurship rate, TEA (% 18–64 population who are either a nascent entrepreneur or owner-manager of a new business) and self-employment rate (% of working-age individuals who work for themselves), we estimated one global model [Model A1 (TEA) and Model A2 (self-employment rate)], which includes all the countries. Other models comprised subsamples of countries, by income level (two models) – low and medium-low countries [Model B1 (TEA) and Model B2 (self-employment rate)] and medium-high and high countries [Model C1 (TEA) and Model C2 (self-employment rate)]; and by geographical location (four models) – Europe [Model D1 (TEA) and Model D2 (self-employment rate)], Asia [Model E1 (TEA) and Model E2 (self-employment rate)], America [Model F1 (TEA) and Model F2 (self-employment rate)], and Africa [Model G1 (TEA) and Model G2 (self-employment rate)]. Tables 5 and 6 present the estimations of the models, for TEA and self-employment, respectively [5].

For the global models, diagnosis tests did not reveal problems of multicollinearity among the independent variables as the variance inflation factor (VIF) figures are well below 5. However, for the models that comprise subsamples, there were problems with multicollinearity. Therefore, to overcome these multicollinearity problems some variables
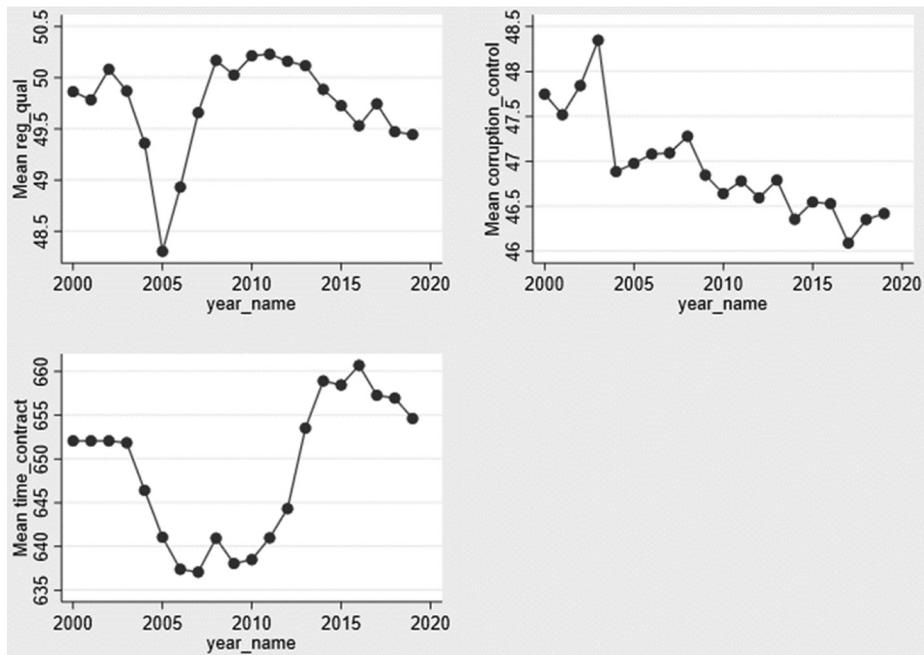
Figure 5.
Institutional factors

Source: Own elaboration

	Income level			Region			
Variables	All countries Model A1	Low and medium-low Model B1	Medium-high and high Model C1	Europe Model D1	Asia Model E1	America Model F1	Africa Model G1
Past TEA							
Lag TEA	0.558*** (0.070)	−0.251 (0.914)	0.583*** (0.017)	0.317*** (0.095)	−0.163 (1.084)	−0.230 (0.744)	0.697*** (0.193)
Refugee inflows							
Refugees per 1,000 population	−0.081*** (0.029)	−0.558 (0.399)	−0.069*** (0.009)	−0.118** (0.048)	−0.028 (4.352)	0.635 (0.556)	−0.073*** (0.026)
Human capital							
Years of schooling (active population)	−0.070 (0.178)	1.474 (4.200)	−0.088 (0.068)	0.077 (0.517)	–	9.967 (8.032)	0.720*** (0.233)
Demographics							
Female share	0.800** (0.403)	–	0.624*** (0.115)	3.026 (2.421)	−16.461 (14.693)	15.724 (34.496)	–
Population aged 20–39 years old	0.307 (0.235)	−0.486 (2.809)	0.137* (0.081)	−0.913 (1.333)	−2.437 (11.134)	−5.709 (19.724)	–
Population aged 40–59 years old	−0.619** (0.247)	−0.367 (0.319)	−0.643*** (0.066)	−2.675 (2.398)	8.919 (7.221)	–	−0.446*** (0.136)
Population growth	0.082 (0.469)	–	0.178 (0.168)	0.021 (1.631)	−3.500 (3.422)	−26.165 (21.154)	–
Macroeconomic context							
GDP per capita	0.071 (0.079)	−0.260 (0.752)	0.050* (0.027)	0.104 (0.224)	–	−2.625 (4.046)	–
Unemployment rate	−0.074* (0.043)	0.058 (0.144)	−0.081*** (0.016)	−0.051 (0.106)	0.238 (0.821)	−1.036 (0.905)	–
Inflation rate	−0.406 (0.395)	−1.251* (1.630)	−0.155 (0.118)	0.049 (0.646)	12.367 (10.746)	3.052 (5.844)	0.491* (0.282)
Private credit available	0.051 (0.055)	−0.326 (0.362)	0.061*** (0.018)	0.072* (0.042)	–	−0.535 (0.707)	−0.139 (0.144)
FDI inflows	0.067 (0.160)	4.496*** (1.290)	0.077* (0.039)	0.016 (0.067)	−1.334 (2.432)	−2.096 (5.510)	–
Institutional quality							
Regulation quality	−0.128* (0.069)	−0.012 (0.311)	−0.120*** (0.014)	−0.068 (0.045)	−0.962 (3.372)	1.451 (1.479)	–
Corruption control	−0.021 (0.127)	−1.145 (0.938)	−0.039 (0.028)	−0.017 (0.095)	1.663 (3.506)	−0.739 (2.335)	−0.051 (0.081)
Time to contract	0.026 (0.078)	−0.281 (0.647)	0.055*** (0.018)			3.627* (1.765)	−0.129* (0.071)
N	634	46	588	350	85	151	54

Table 5.
The impact of
refugee inflows on
the host countries'
entrepreneurship
rates: two-step
system GMM
dynamic panel data
estimations
(dependent variable:
TEA), 2000–2019

| Variables | | Income level | | | Region | | | |
	All countries Model A1	Low and medium-low Model B1	Medium-high and high Model C1	Europe Model D1	Asia Model E1	America Model F1	Africa Model G1
Diagnosis tests							
Breusch–Pagan test	6.620 (0.010)	3.080 (0.079)	2.950 (0.086)	2.350 (0.125)	7.090 (0.008)	0.720 (0.398)	790 (0.327)
VIF [max]	2.76 [5.46]	2.82 [4.03]	2.48 [4.41]	2.11 [3.89]	3.12 [4.75]	2.86 [4.96]	2.84 [3.71]
Goodness of fit							
AR(1) – *p*-value	0.000	0.391	0.000	0.002	0.796	0.639	0.005
AR(2) – *p*-value	0.666	0.163	0.933	0.698	0.894	0.641	0.335

Notes: ***(**)[*] statistically significant at 1%(5%)[10%]. All variables are in logs. Robust standard errors. Grey cells value identify the statistically significant coefficients

Table 5.

Variables	All countries	Income level		Region			
	Model A2	Low and medium-low Model B2	Medium-high and high Model C2	Europe Model D2	Asia Model E2	America Model F2	Africa Model G2
Past self-employment							
Lagged self-employment	0.993*** (0.017)	1.000*** (0.015)	0.986*** (0.003)	0.967*** (0.008)	0.641** (0.327)	0.099*** (0.020)	0.992*** (0.001)
Refugee inflows							
Refugees per 1,000 population	0.001 (0.002)	−0.000 (0.002)	0.002* (0.001)	0.000 (0.001)	−0.058 (0.076)	−0.004 (0.004)	0.003*** (0.000)
Human capital							
Years of schooling (active population)	0.001 (0.008)	0.002 (0.006)	0.008 (0.005)	0.005 (0.010)	−0.318 (0.303)	–	−0.005*** (0.001)
Demographics							
Female share	0.038 (0.057)	−0.035 (0.025)	0.090*** (0.015)	−0.085*** (0.025)	0.376 (0.366)	−0.859** (0.396)	–
Population aged 20–39 years old	−0.014 (0.013)	−0.023 (0.018)	0.006 (0.010)	0.060*** (0.013)	−0.149 (0.505)	0.522** (0.230)	−0.053*** (0.008)
Population aged 40–59 years old	–	–	−0.019*** (0.006)	0.021 (0.015)	–	–	−0.030*** (0.002)
Population growth	−0.023 (0.027)	0.033 (0.036)	−0.037*** (0.013)	0.052*** (0.016)	0.025 (0.521)	0.398 (0.300)	−0.076*** (0.011)
Macroeconomic context							
GDP per capita	−0.008 (0.011)	−0.004 (0.005)	−0.014*** (0.003)	–	–	0.007 (0.015)	0.001 (0.001)
Unemployment rate	0.002 (0.002)	0.003 (0.002)	−0.005 (0.002)	0.012*** (0.003)	−0.003 (0.009)	0.009 (0.007)	0.067*** (0.013)
Inflation rate	0.004 (0.016)	0.015 (0.011)	−0.018 (0.011)	−0.014 (0.009)	−0.068 (0.126)	−0.079 (0.076)	0.005*** (0.001)
Private credit available	0.003 (0.004)	0.006** (0.003)	0.000 (0.002)	−0.011*** (0.002)	−0.039 (0.048)	−0.003 (0.007)	0.018*** (0.003)
FDI inflows	−0.002 (0.007)	0.006 (0.028)	−0.001 (0.002)	0.003** (0.001)	0.134 (0.215)	0.190*** (0.093)	
Institutional quality							
Regulation quality	−0.005 (0.005)	−0.002 (0.003)	0.000 (0.004)	0.010*** (0.003)	–	0.002 (0.005)	−0.000 (0.001)
Corruption control	0.006* (0.003)	0.003 (0.003)	0.001 (0.003)	–	−0.002 (0.024)	0.013 (0.013)	0.007*** (0.001)
Time to contract	0.002 (0.004)	0.005* (0.003)	0.002 (0.002)	0.007 ** (0.003)	0.140 (0.168)	0.018*** (0.006)	0.010*** (0.003)
N	1,730	538	1,190	738	298	346	346

Table 6.
Impact of refugee
inflows on the host
countries'
entrepreneurship
rates: two-step
system GMM
dynamic panel data
estimations
(dependent variable:
Self-employment),
2000–2019

| Variables | All countries Model A2 | Income level | | Region | | | |
		Low and medium-low Model B2	Medium-high and high Model C2	Europe Model D2	Asia Model E2	America Model F2	Africa Model G2
Diagnosis tests							
Breusch–Pagan test	10.090 (0.001)	65.670 (0.000)	0530 (0.466)	7.400 (0.007)	7.650 (0.006)	15.480 (0.000)	0.160 (0.692)
VIF [max]	2.28 [4.16]	1.91 [2.79]	2.30 [3.27]	1.78[2.49]	2.37 [4.18]	1.84 [3.14]	2.47 [3.96]
Goodness of fit							
AR(1) – p-value	0.000	0.001	0.000	0.000	0.215	0.002	0.005
AR(2) – p-value	0.155	0.163	0.136	0.194	0.397	0.234	0.770

Notes: ***(**)[*] statistically significant at 1%(5%)[10%]. All variables are in logs. Robust standard errors. Grey cells identify the statistically significant coefficients
Source: Own elaboration

Table 6.

were omitted [e.g. female share and population growth for the low and medium-low group (TEA); female share, the population aged 20–39 years, population growth, GDP, the unemployment rate, FDI inflows and regulation quality for the Africa group (TEA)].

The Breusch–Pagan test showed that there is heteroscedasticity in the case of the TEA rate in all countries, low and medium-low groups, medium-high and high groups, and Asia, and in the case of the self-employment rate in all the groups, except in the Africa and medium-high and high groups. To overcome the heteroscedasticity problems, we used robust standard errors.

Based on the Arellano–Bond tests for first-order [AR(1)] and second-order [AR(2)] serial correlation in the first-differenced residuals, we can establish that, with exception of Models B1, E1 and F1 in Table 5, and E2 in Table 6, GMM is a consistent method of estimation implying that the disturbances in the differenced model have significant first-order correlation and insignificant second-order autocorrelation (Arellano and Bond, 1991).

There is a clear divide between the impact of refugee inflows on host countries' entrepreneurial rates depending on how the latter are measured. When entrepreneurial rate is proxied by TEA, that is, the percentage of the working-age population who are either nascent entrepreneurs or owner-manager of a new business (Table 5), which include opportunity and necessity type of entrepreneurial ventures, we found that, when statistically significant [Models A1 (all countries), C1 (medium-high and high income), D1 (Europe), G1 (Africa)], estimates convey that refugee inflows significantly diminish host countries' entrepreneurial rate. In contrast, when entrepreneurial rate is measured by self-employment rate (Table 6), which is considered to reflect necessity entrepreneurship, results suggest that for the whole sample (Model A2) refugee inflow have no significant impact on host countries' entrepreneurship rate, but it tends to significantly enhance the latter in the case of medium-high-, and high-income countries (Model C2) and African countries (Model G2).

Thus, our data and results do not validate *H1*, but partially support *H2*. Indeed, when entrepreneurial rate is proxied by self-employment, which is usually associated with necessity entrepreneurship, refugee inflows significantly and positively impact on host countries' entrepreneurial rate in the case of medium-high- and high-income host countries and host countries located in Africa.

Linking the results with the general theoretical arguments detailed in Section 2, both psychological (Van Ness and Seifert, 2016; O'Donnell *et al.*, 2020) and economic (Casson, 2005; Auerswald, 2008; Connelly *et al.*, 2011) theoretical approaches seem to have higher explanatory power than those based on the disadvantage theory or the challenge-based theory of entrepreneurship. In concrete, to the extent that refugee inflows involve higher shares of younger people with unstable lifestyles (O'Donnell *et al.*, 2020) and lower emotional stability (Van Ness and Seifert, 2016), limited access to financial and information resources (Casson, 2005), and scanty understanding/limited knowledge on how to set up a business/ compliance requirements (Auerswald, 2008; Connelly *et al.*, 2011), one would expect that increased refugee inflows are negatively associated with new business creation. As Zighan (2021) contends, refugee entrepreneurship faces many challenges and difficulties, mainly in terms of financing difficulties, cultural differences and a lack of business management skills, which inhibits the creation of new firms. Nevertheless, these hurdles are likely to be smaller for self-employment (Kazlou and Wennberg, 2021), which can, in part, explain the nonsignificant coefficients. In addition, given that refugee labor force might be a poor substitute, at least in the short run, for native labor force, as the human capital stocks of refugees are not immediately transferable to the host economy (Ceritoglu *et al.*, 2017), total entrepreneurship rates might not be influenced by refugee inflows. Finally, large pools of

refugees might push significantly more the demand for standardized, noninnovative products and services, stimulating new and extant businesses in low value-added, more intensive in the relatively abundant factor (informal, cheap, labor) yielding changes in the shares of different sectors favoring low value-added, less productive and innovative sectors (Akgündüz *et al.*, 2020), and ultimately producing a negative impact on host countries' opportunity (and total) entrepreneurship rates.

The contention by Dheer (2018) or Alrawadieh *et al.* (2019) that refugees and immigrants contribute significantly to their host countries' entrepreneurial rates is true only for necessity type of entrepreneurship in "medium-high and high income" and African host countries. Thus, in these settings, the arguments put forward by institutional-related theories (disadvantage theory, challenge-based theory of entrepreneurship and the middleman theory), which sustain that several drawbacks (Augsburger and Elbert, 2017), difficulties and challenges (Miller and Le Breton-Miller, 2017), namely, discrimination and labor market exclusion that low refugees' opportunity costs of starting a business by being the only option available to survive given their language barriers, absence of legal documents, related experience and qualifications (Boyd, 2000; Gericke *et al.*, 2018), push refugees to "choose" starting new business in sectors/activities characterized by low entry barriers (e.g. food, small-scale trade, handicrafts and beauty services), low wages, low value-added and limited training and upskilling opportunities.

The study by De la Chaux and Haugh (2020) on Dadaab (Kenya) refugee camp entrepreneurship might offer some important insights regarding the positive and significant impact of refugee inflows on the host African country. The authors argue that extreme contexts characterized by misaligned formal and informal institutions are likely to promote self-employment activities that reflect refugees' "desire to exercise choice and express autonomy and individuality" (De la Chaux and Haugh, 2020, p. 828) rather than the simple need of survival.

Regarding the other determinants of entrepreneurship, macroeconomic context and institutional quality-related factors, most notably, FDI inflows and corruption control, tend to encourage entrepreneurship rates. Interestingly, for the whole sample of countries, in particular for Africa, increased transparency significantly promotes self-employment. Private credit availability significantly enhances TEA rates in "Medium-high and high income" countries and countries located in Europe, and self-employment rates in "Low and medium-low income" countries and countries located in Africa. Surprisingly, administrative complexity, reflected by the time required to enforce a contract ("Time to contract") emerges, in general, positively and significantly related to entrepreneurship rates. This is at odds with the findings of Van Stel and Stunnenberg (2006) who found, for a sample of 18 OECD countries, that when facing complex administrative procedures related to business start-up, potential entrepreneurs are discouraged from starting a new firm. However, as the authors recall, such an effect is not immediate. Indeed, as Lecuna *et al.* (2020) more recently refer, the extant literature on the determinants of new business ventures has concluded that the degree of corruption in a country can be a significant deterrent to entrepreneurship, while the relationship between bureaucracy complexity and startup rates has been inconclusive.

5. Conclusions
The objective of the present study was to assess whether refugee inflows influence host countries' entrepreneurship rates, a topic that is underexplored in the entrepreneurship literature. Resorting to a purpose-built database of secondary data comprising 186 countries over 20 years (2000–2019), we estimated several dynamic panel data models, considering two alternative proxies for the entrepreneurial rate, TEA rate and self-employment rate.

For the overall sample of countries, we found that refugee inflows are associated with significantly lower TEA rates, but no evidence of such negative impact emerges in the case of self-employment. Regarding the latter, we encounter substantial heterogeneity by countries' income and geographic groups. Specifically, we found that refugee inflows promote self-employment rates in "medium-high and high income" host countries and host countries located in Africa.

The present study contributes to the literature at the methodological and empirical levels. At the methodological level, we use dynamic panel data estimation which entails several advantages of standard panel data (Hsiao, 2007): more accurate inference of model parameters and greater capacity for capturing the complexity of human behavior, namely, by controlling the impact of omitted variables. Moreover, we included two proxies for the entrepreneurship rate, TEA and self-employment, which permitted us to unravel the distinct impact of refugee inflows on entrepreneurial rates, depending on how the latter is measured. At the empirical level, and to the best of our knowledge, no other study has to date looked specifically at the quantitative impact of refugee inflows on their host countries' entrepreneurship rates. By providing a quantitative contextualization of the drivers and effects of refugee inflows on host countries' entrepreneurial rates, we fulfill the request put forward by Desai *et al.* (2021, p. 943) who stated that "[r]esearch is not widely available for the specific matter of refugee entrepreneurship, and the subject lacks a large base of evidence from which to draw conclusions."

Albeit cautious due to the reduced number of observations in some models, our results have important policy implications calling for an inclusive entrepreneurial approach by public policy authorities in "medium-high and high income" host countries and host countries located in Africa. Although refugee inflows can solicit additional financial resources and infrastructure and may raise competition for given jobs, our results suggest that refugees may be a highly valuable potential source of entrepreneurial endowments for host countries through self-employment, ultimately contributing to skills, and innovation, consumer demand and finance.

Our results also call for prudence regarding the frequently inflated faith in entrepreneurship as a "silver bullet" to solve refugees' integration challenges and to boost the impact they can have on host economies. The effects of necessity and opportunity entrepreneurship on economic growth/development and individuals' wellbeing vary greatly (Acs, 2006; Svetek and Drnovšek, 2022). Being forced into entrepreneurship (self-employment) because all other options for entry into the labor market are either lacking or inadequate can even lead to underdevelopment and unhappiness because it is usually a survival activity, with limited impact on the lives that people really desire and restricting agency and the development of human competences (Ballesta *et al.*, 2020).

At the level of public policies targeting refugees, more than strengthening the entrepreneurial framework conditions available to them, it is fundamental to strengthening general host countries framework conditions that grant refugees special protection measures and, following ILO (2020, p. 10) recommendations, promote "[. . .] full, productive and freely chosen employment through the adoption of a comprehensive and inclusive national policy on employment and decent work that takes into account all segments of society and the profound changes taking place in the world of work." Therefore, any programs fostering inclusive entrepreneurship and/or decent work that could ease the process of refugee integration and familiarization with their host countries can help to reap the benefits derived from increased new business creation by refugees.

Despite its contributions, the present study has some noteworthy limitations that are likely to constitute interesting and challenging avenues for further research. We managed to

show that entrepreneurship is a heterogeneous phenomenon; however, we failed to explicitly analyze the impact of refugee inflows on opportunity entrepreneurship. Future works can take advantage of GEM's indicators "Opportunity-driven early-stage entrepreneur," "Necessity-driven early-stage entrepreneur" and "Improvement-driven opportunity early-stage entrepreneur" to provide a more in-depth analysis of the impact of refugee inflows. In addition, given that higher entrepreneurship rates do not mean higher economic growth (Rodrigues and Teixeira, 2021), development and well-being, it would be important to directly assess the impact of refugee inflows on host countries' economic growth and development. Finally, and to the extent that resource competition, market and governmental support for entrepreneurs, and their inherent mechanisms significantly differ across countries depending on the types of capitalism (Gould *et al.*, 2015), it would be interesting to include in the model specification controls for the capitalism varieties/versions.

Notes

1. Some authors, mainly addressing immigrant entrepreneurship suggest the level of embeddedness to their home country networks may affect their choice of venture in a host country, and thus underline the need for include home countries' social, economic and institutional contexts besides their host country, creating a multilayered understanding of embeddedness (Yetkin and Tunçalp, 2022). However, given that refugees are fleeing from violence, conflict, persecution and discrimination, they frequently lack social capital in home country, as their family networks are fractured in the process of displacement and flight (Collins *et al.*, 2017). For this reason, we opted for not controlling/include home country institutional related factors.

2. Although refugees are primarily mobile and might not stick with one host country until they settle, which would advise the consideration of refugee outflows, some evidence gathered by the UNHCR and the World Bank suggests that most refugees remain in their host countries for many years (Lücke and Schneiderheinze, 2017). As of end-2018, the mean duration of refugees permanence in a host country stands at 10.3 years, and has been relatively stable since the late 1990s, between 10 and 15 years (in https://blogs.worldbank.org/dev4peace/2019-update-how-long-do-refugees-stay-exile-find-out-beware-averages, last accessed in January 2023).

3. World Bank Indicators, Metadata indicators.

4. The data for the latest year (2022), available up until the mid-year, registered 26.7 million refugees, 4.9 asylum seekers and 126.9 forcibly displaced people worldwide (see www.unhcr.org/refugee-statistics/download/?url=2bxU2f, last accessed 31 December 2022).

5. The correlation matrixes are presented in Tables A2 and A3 in the Appendix.

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Appendix

Study	Countries (no.)	Period	Method	Proxy for the entrepreneurship rate	Determinants' categories	Independent variables	Proxy for the independent variables	Description	Results
Brás and Soukiazis (2019)	26 developed countries	2004–2011	Dynamic panel data GMM – generalized method of moments	Total entrepreneurial activity rate (TEA) – the percentage of the population able to develop a professional activity that is actively involved in setting up a business, whether in business start-ups (nascent entrepreneurs) or 42 months after the birth of a business unit (owner-managers of new companies)	Individual	Social and cultural	Education Index100	Represents the average level of education of adults and the expected level of education for children	0
					Macroeconomic	Economic formal factors	Paid-in minimum capital	The paid-in minimum capital requirement is the amount that the entrepreneur needs to deposit in a bank before registration and up to three months following incorporation and it is recorded as a percentage of the economy's income per capita. It is an observable variable that belongs to the factor "starting a business."	– – –
						Economic informal factors	Monetary Freedom	Represents the absence of market distortions caused by the inflation rate and price controls	+++
							Investment Freedom	Represents the absence of investment restrictions	+
						Competitiveness	Financial Market Development	Reflects the funding efficiency level for the economy and the capital market stage	+++

(*continued*)

Table A1.
Determinants of entrepreneurship – synthesis of a set of empirical studies

Study	Countries (no.)	Period	Method	Proxy for the entrepreneurship rate	Determinants' categories	Independent variables	Proxy for the independent variables	Description	Results
Dileo and Pereiro (2019)	49 countries		Multilevel binary logistic regression models	Nascent entrepreneur: individuals who are actively involved in a business that must not have been paying wages for more than three months; 0 for those who are not Nascent Entrepreneurs. Young Entrepreneurs. Young entrepreneur: individuals whose business has been paying income, such as salaries or drawings, for more than three months, but not more than 42 months; 0 for those who are not Young Entrepreneurs. Established entrepreneur: individuals whose business has been paying income, such as salaries or drawings, for more than 42 months; 0 for those who are not Established, Entrepreneurs	Individual	Socio-economic and demographic	Age	Individual's age	+++
							Age2	Individual's age (squared)	---
							Gender	(1 Man, 0 Woman)	+++
							Education	Graduate education (1/0)	+++
							Work status	Working (1/0)	+++
							Income level	Upper 33% (1/0)	++
					Perceptual	Opportunity	Measures individuals' confidence in the prospects for success with a new business in the area where they live	+++
							Fear of failure	Measures individuals perceived opportunities	---
							Entrepreneurial skills and experience	Measures individuals' confidence in their knowledge, skill and experience for entrepreneurship	+++
							Knows other entrepreneurs	Measures the existence of a network of social contacts linked to entrepreneurship	+++
					Macroeconomic	Macroeconomic	GDP per capita	GDP per capita PPP (constant international dollars)	–
							GDP per capita annual growth	Measures the change of the GDP per capita between t and $t-1$ periods (that is the nation compared to the previous year), with respect to the year	0

(continued)

Table A1.

Study	Countries (no.)	Period	Method	Proxy for the entrepreneurship rate	Determinants' categories	Independent variables	Proxy for the independent variables	Description	Results
					Institutional	Institutional	Unemployment rate	The share of the labor force that is unemployed (jobless)	0
							Tax burden (fiscal freedom)	Based on a 100-point scale in which a score of 100 indicates total fiscal freedom. The score measures the top marginal tax rates on individual income and corporate income, and the total tax burden as a percentage of GDP, each component is weighted equally (one-third)	+
							Freedom to establish firms	Based on a four-point scale in which a score of 4 indicates total freedom to establish firms and a score of 0 indicates no establishment possible	++
							Postmaterialism	Indicates the percentage of individuals that are classified as postmaterialistic according to the 4-item Postmaterialist index	0
Hoogendoorn et al. (2016)	30 OECD countries	1984–2010	OLS estimator	Country's business ownership rate (the share of the labor force that is a business owner as primary occupation)	Institutional	Religion	Belonging	Refers to belonging to a religious community or (transhistorical) group with a common history and future	0
							Believing		++

(continued)

Study	Countries (no.)	Period	Method	Proxy for the entrepreneurship rate	Determinants' categories	Independent variables	Proxy for the independent variables	Description	Results
								Is considered a basic universal aspect of religion	0
							Bonding	Refers to "self-transcendent experiences that bond the individual with what it perceives to be the transcendent "reality with others, and/or with the inner-self"	
							Behaving	Refers to the behaviour of an individual according to the norms and moral standards associated with one's religious convictions	++
Fang *et al.* (2020)	30	1980–2008	Panel data fixed effects	Domestic entrepreneurship rate: The percentage of the civilian labor force that is self-employed	Macroeconomic	Presence of Foreign ventures		Inward FDI stock as a percentage of GDP	+++ (short term); 0(long term)
Li (2021)	67	2014	Logistic regressions	Total entrepreneurial activity rate (TEA) – the percentage of the population able to develop a professional activity that is actively involved in setting up a business, whether in business start-ups (nascent entrepreneurs) or 42 months after the	Individual	Individual-level predictors	Self-efficacy	Implies whether the respondents possess the knowledge, skills and experience needed to start a firm (0 5 no; 15 yes)	+++
							Fear of failure	Is measured by questioning respondents whether fear of failure prevents starting a new venture (0 5 yes; 1 5 no)	+++

(continued)

Study	Countries (no.)	Period	Method	Proxy for the entrepreneurship rate	Determinants' categories	Independent variables	Proxy for the independent variables	Description	Results
				birth of a business unit (owner-managers of new companies)			Perceived opportunity	Is determined by creating a variable in response to the following question: "In the next six months will there be good opportunities for starting a business in the area where you live?" (0 5 no; 1 5 yes)	+++
					Institutional	Country-level predictors	Regulatory condition	The regulatory pillar is measured by the average scores for seven questions about government policies, laws, support programmes and regulations associated with entrepreneurship	– –
							Normative condition	Regulates individual behaviour by defining what is expected and appropriate in a social situation, it affects an individual's cognition of pursuing an entrepreneurial activity as a career by rendering that choice socially legitimate	0
							Cognitive condition	The cultural-cognitive pillar is measured using the quality of countries' higher education systems with respect to	0

(continued)

Study	Countries (no.)	Period	Method	Proxy for the entrepreneurship rate	Determinants' categories	Independent variables	Proxy for the independent variables	Description	Results
								entrepreneurship by looking at aspects such as education about firm formation, start-up education and management education	
Pinillos and Reyes (2011)	52	1999–2007	OLS	Total entrepreneurial activity rate (TEA) – the percentage of the population able to develop a professional activity that is actively involved in setting up a business, whether in business start-ups (nascent entrepreneurs) or 42 months after the birth of a business unit (owner-managers of new companies)	Macroeconomic	Macroeconomic	Gross domestic product per capita at the country level	The variable GDPPC measures the mean GDPPC, expressed in constant US$2,000	– –
					Institutional	Institutional	Individualist–collectivist national culture	The I–C index takes values between 0 and 100. Higher values indicate countries with individualist cultures, while lower values indicate more collectivist cultures	+++
Ghosh (2017)	79	2001–2012	Panel data (fixed effects)	Total early-stage entrepreneurship (TEA)	Institutional	Institutional	Regulation	Regulation is a measure of restrictions that impede credit, labor, and product market activities. It includes credit market regulations, labor regulations and business regulations	++
							Freedom to trade internationally	Emphasizes the different measures that increase the cost of engaging in international trade.	– – –

(continued)

Table A1.

Study	Countries (no.)	Period	Method	Proxy for the entrepreneurship rate	Determinants' categories	Independent variables	Proxy for the independent variables	Description	Results
								This takes into account measures of taxation on international trade, barriers to trade (like tariffs and quotas), size of the trade sector, international capital market controls, etc	
Gautam and Lal (2021)	20	2001-2016	Fixed effect estimators in a panel regression	Total early-stage entrepreneurship (TEA)	Macroeconomic	Economic growth	GDP per capita (adjusted PPP)	It is adjusted by using purchasing power parity per us dollar	+++
						Competitiveness	Growth competitiveness index	GCI is based on three relevant pillars, namely, technological index, public institution index and macroeconomic environmental index	+++

Note: +++(+++)[+]/−−−(−−)[−] positive/negative statistically significant at 1% (5%) [10%]; 0: not significant
Source: Own elaboration

	Ln TEA	Refugees per 1,000 population	Years of schooling (active population)	Female share	Population aged 20–39 years old	Population aged 40–59 years old	Population growth
Obs	903	3,029	3,120	3,112	2,384	2,384	3,112
Mean	2.252742	0.994977	1.968477	3.910401	3.395369	3.036045	2.431209
Std. dev.	0.613291	1.023195	0.526009	0.079597	0.13284	0.330746	0.134255
Min	0.335939	0	0.09531	3.147984	3.020658	2.146406	-0.08408
Max	3.724654	5.228249	2.653242	3.999389	4.081705	3.705566	3.314584
TEA	1						
Refugees per 1,000 population	-0.1141*	1					
Years of schooling (active population)	-0.4619*	-0.1036*	1				
Female share	-0.0422	0.0642*	-0.0035	1			
Population aged 20–39 years old	0.3067*	-0.2718*	0.0859*	-0.5603*	1		
Population aged 40–59 years old	-0.5230*	-0.0938*	0.7735*	0.1038*	0.0377*	1	
Population growth	0.3764*	0.1474*	-0.4769*	-0.4688*	0.2624*	-0.5446*	1
GDP	-0.4912*	-0.0315*	0.7883*	-0.2377*	0.0972*	0.7361*	-0.2874*
Unemployment rate	-0.1798*	0.1616*	0.0868*	0.3469*	-0.1564*	0.0805*	-0.2773*
Inflation rate	0.2677*	0.0088	-0.0506*	0.0281	0.0690*	-0.0508*	-0.0067
Private credit available	-0.3975*	-0.0353*	0.6652*	-0.0347*	-0.0116	0.6547*	-0.4103*
FDI inflows	-0.0563*	0.0675*	0.0810*	0.0389*	-0.0482*	0.0826*	-0.0374*
Regulation quality	-0.3866*	-0.0938*	0.4526*	-0.0464*	-0.1360*	0.4355*	-0.2230*
Corruption control	-0.4376*	-0.0758*	0.4653*	-0.0765*	-0.0946*	0.4791*	-0.2352*
Time to contract	0.1508*	0.0525*	-0.2682*	-0.0623*	-0.0550*	-0.2204*	0.1706*

Source: Own elaboration

(*continued*)

Table A2.
Correlation matrix –
TEA (all countries)

	GDP	Unemployment rate	Inflation rate	Private credit available	FDI inflows	Regulation quality	Corruption control	Time to contract
Obs	3,042	2,405	3,090	2,707	3,052	3,093	3,098	3,080
Mean	9.098388	1.844518	4.369718	3.567967	4.151576	3.674665	3.550498	6.375529
Std. dev.	1.236942	0.821267	0.224372	0.971432	0.166998	0.841746	0.916774	0.438464
Min	6.075521	−5.24133	−1.30564	0	−0.38991	0	−0.72271	5.347107
Max	11.86101	3.813362	11.089	5.736503	6.230644	4.61512	4.60517	7.487174
TEA								
Refugees per 1,000 population								
Years of schooling (active population)								
Female share								
Population aged 20–39 years old								
Population aged 40–59 years old								
Population growth								
GDP	1							
Unemployment rate	−0.0215	1						
Inflation rate	−0.1673*	0.0706*	1					
Private credit available	0.7289*	−0.0575*	−0.1917*	1				
FDI inflows	0.0525*	0.0308	−0.0153	0.1203*	1			
Regulation quality	0.6096*	0.0705*	−0.2364*	0.6660*	0.0885*	1		
Corruption control	0.6152*	0.0577*	−0.1891*	0.6693*	0.0751*	0.7944*	1	
Time to contract	−0.1791*	0.1154*	0.0273	−0.2164*	−0.0388*	−0.1400*	−0.1543*	1

Table A2.

Variable	Ln self-employment	Refugees per 1,000 population	Years of schooling (active population)	Female share	Population aged 20–39 years old	Population aged 40–59 years old	Population growth
Obs	3,120	3,029	3,120	3,112	2,384	2,384	3,112
Mean	3.446382	0.994977	1.968477	3.910401	3.395369	3.036045	2.431209
Std. Dev.	0.879636	1.023195	0.526009	0.079597	0.13284	0.330746	0.134255
Min	−0.8916	0	0.09531	3.147984	3.020658	2.146406	−0.08408
Max	4.555244	5.228249	2.653242	3.999389	4.081705	3.705566	3.314584
Self-employment	1						
Refugees per 1,000 population	0.0533*	1					
Years of schooling (active population)	−0.6448*	−0.1036*	1				
Female share	0.4338*	0.0642*	−0.0035	1			
Population aged 20–39 years old	−0.2298*	−0.2718*	0.0859*	−0.5603*	1		
Population aged 40–59 years old	−0.5259*	−0.0938*	0.7735*	0.1038*	0.0377*	1	
Population growth	0.1432*	0.1474*	−0.4769*	−0.4688*	0.2624*	−0.5446*	1
GDP	−0.8320*	−0.0315*	0.7883*	−0.2377*	0.0972*	0.7361*	−0.2874*
Unemployment rate	0.1339*	0.1616*	0.0868*	0.3469*	−0.1564*	0.0805*	−0.2773*
Inflation rate	0.0859*	0.0088	−0.0506*	0.0281	0.0690*	−0.0508*	−0.0067
Private credit available	−0.5826*	−0.0353*	0.6652*	−0.0347*	−0.0116	0.6547*	−0.4103*
FDI inflows	−0.0352*	0.0675*	0.0810*	0.0389*	−0.0482*	0.0826*	−0.0374*
Regulation quality	−0.4864*	−0.0938*	0.4526*	−0.0464*	−0.1360*	0.4355*	−0.2230*
Corruption control	−0.5502*	−0.0758*	0.4653*	−0.0765*	−0.0946*	0.4791*	−0.2352*
Time to contract	0.2048*	0.0525*	−0.2682*	−0.0623*	−0.0550*	−0.2204*	0.1706*

Source: Own elaboration

(continued)

Table A3.
Correlation matrix –
Self-employment (all
countries)

Table A3.

Variable	GDP	Unemployment rate	Inflation rate	Private credit available	FDI inflows	Regulation quality	Corruption control	Time to contract
Obs	3,042	2,405	3,090	2,707	3,052	3,093	3,098	3,080
Mean	9.098388	1.844518	4.369718	3.567967	4.151576	3.674665	3.550498	6.375529
Std. Dev.	1.236942	0.821267	0.224372	0.971432	0.166998	0.841746	0.916774	0.438464
Min	6.075521	−5.24133	−1.30564	0	−0.38991	0	−0.72271	5.347107
Max	11.86101	3.813362	11.089	5.736503	6.230644	4.61512	4.60517	7.487174
Self-employment								
Refugees per 1,000 population								
Years of schooling (active population)								
Female share								
Population aged 20–39 years old								
Population aged 40–59 years old								
Population growth								
GDP	1							
Unemployment rate	−0.0215	1						
Inflation rate	−0.1673*	0.0706*	1					
Private credit available	0.7289*	−0.0575*	−0.1917*	1				
FDI inflows	0.0525*	0.0308	−0.0153	0.1203*	1			
Regulation quality	0.6096*	0.0705*	−0.2364*	0.6660*	0.0885*	1		
Corruption control	0.6152*	0.0577*	−0.1891*	0.6693*	0.0751*	0.7944*	1	
Time to contract	−0.1791*	0.1154*	0.0273	−0.2164*	−0.0388*	−0.1400*	−0.1543*	1