

Individual-contextual determinants of entrepreneurial service provision in the platform-based collaborative economy

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Structured abstract

Purpose: This article examines the nature of service provision in the platform-based collaborative economy from the perspective of entrepreneurship theories. It departs from a knowledge gap about the individual and contextual determinants of service provision through digital platforms. By exploring these determinants for service provision in two main sectors of the collaborative economy, transportation and accommodation, the study provides a first conceptual introduction of these activities and their nature for the existing entrepreneurship research.

Design/methodology/approach: The analysis is based upon Eurobarometer microdata (2018), covering 28 European countries with about 27,000 observations, and uses a seemingly unrelated Probit model.

Findings: The likelihood of service provision through platforms in the collaborative economy is highest for individuals aged 25-34 years but decreases continuously with age. Occupation, gender and population density of the place of residence are other relevant determinants. In contrast, the regulatory system and GDP *per capita* of the region are not relevant.

Research implications: The findings illuminate the under-studied individual and contextual determinants related to individuals engaging in entrepreneurial activities in the collaborative economy. Future research should investigate the role of previous self-employment, skills and spatial context.

Practical implications: The collaborative economy is still a marginal sector in Europe that is likely to grow bigger. Particularly the young, highly educated, entrepreneurial persons located in urban regions may spur this expected growth. Supporting policy measures aimed at this social stratum might foster digital entrepreneurship and contribute to growth in the digital economy.

Keywords: Collaborative economy, service provision, digital platforms, digital entrepreneurship, seemingly unrelated Probit model

Article classification: Empirical research.

Introduction

Despite a burgeoning interest in entrepreneurship *via* the platform-based collaborative economy,^[1] several open questions revolve around the entrepreneurial aspects of individuals providing services through the platform economy (*cf.*, Nambisan and Baron, 2021; Parker *et al.*, 2017). One of these unresolved questions is whether the individual service providers using such platforms should be predominantly seen as income-maximising private households (Delacroix *et al.*, 2019; Zaheer *et al.*, 2019), or as self-employed entrepreneurs (Ravenelle, 2017; Hsieh and Wu, 2019). Nambisan (2017, p. 1030) finds that “digitization has led to less predefinition of the locus of entrepreneurial agency (*i.e.*, where the ability to garner entrepreneurial ideas and the resources to develop them is situated) as it increasingly involves a broader, more diverse, and often continuously evolving set of actors”. The platform economy provides individuals using the platforms with entrepreneurial opportunities at low cost (Kraus *et al.*, 2018; Standing and Mattsson, 2018; Parker *et al.*, 2016) and gives them access to large communities of users or buyers through digital technologies (*e.g.*, peer-to-peer online platforms, apps, and Internet-based social media). However, this argument, which resides at the core of the digital entrepreneurship literature (*e.g.*, Berger *et al.*, 2021; Nambisan and Baron, 2021; Nambisan, 2017), has only been poorly connected with existing entrepreneurship accounts, particularly Shane’s (2003) individual-opportunity nexus that conceptualises the interplay of individual- and context-level determinants for the identification and exploitation of entrepreneurial opportunities.

[1] Platform-based entrepreneurship is often referred to as ‘digital entrepreneurship’ (*cf.*, Berger *et al.*, 2021; Kraus *et al.*, 2018; Nambisan, 2017). In the present paper, we use the term ‘collaborative economy’ to denote platforms through which individuals share resources. The term stresses the collective and sustainable character of the origins of the sharing economy (*cf.*, Frenken and Schor, 2017). This idea is further related to peer-to-peer platforms, such as Airbnb, Uber, *etc.*, and, in general, Internet-based digital technologies.

In addition to this theoretical knowledge gap, we observe a corresponding lack of empirical research on the entrepreneurial determinants of service-providing individuals using collaborative-economy platforms because most empirical studies on the collaborative economy focus on the consumer perspective (Sthapit and Björk, 2019; Dann *et al.*, 2019; Lutz and Newlands, 2018; Tussyadiah and Park, 2018). In contrast, a comprehensive and systematic exploration of individual (*e.g.*, socio-economic) and contextual factors (such as regional-specific and institutional influences) that influence the supply-side of the platform-based markets is missing in the literature. In fact, many studies do not address the individual service providers as the unit of analysis (*e.g.*, Yeon *et al.*, 2020; Yang and Mao; 2019; Kim *et al.*, 2018). An exception can be found in Berger *et al.* (2019), who study the individual characteristics of Uber drivers. In addition, none of the previous empirical studies has addressed the differences between providers and non-providers in the platform-based collaborative economy.

Motivated by this twofold knowledge gap, this paper attempts to provide greater conceptual clarity about *the determinants of entrepreneurial service provision in the platform-based collaborative economy by empirically studying selected individual-level (socio-economic and demographic) and contextual/aggregate-level (institutional-regional) determinants*. Drawing on Shane's (2003) individual-opportunity nexus, the paper, firstly, departs from the link between individual service provision and the macro-economic context, as formulated in traditional entrepreneurship theories; subsequently, the paper reflects upon the determinants of individual service provision in the platform markets studied by discussing the contemporary literature on digital entrepreneurship (Berger *et al.*, 2021; Nambisan, 2017) and platform ecosystems (Eckhardt *et al.*, 2018; Parker *et al.*, 2017). A seemingly unrelated (bivariate) Probit

model is used to analyse heuristically the individual and contextual factors determining the service provision through collaborative-economy platforms in the two most important sectors of the collaborative economy: transportation and accommodation. The analysis is based upon Eurobarometer (2018) microdata covering the then 28 EU countries for 2018 with about 27,000 observations.

The paper makes the following contributions to the extant research on the platform economy and digital entrepreneurship: firstly, it provides empirical insights into the incidence and multi-level determinants of the individual service provision through collaborative platforms by using a representative and large dataset that encompasses all European residents. The large, novel, internationally comparable and representative cross-country survey data used allow for a more precise description of the individual and contextual factors that drive the service provision on the supply-side of the collaborative-economy markets, compared to the previous smaller and country-specific individual surveys (Dann *et al.*, 2019). For instance, the commonly-used Airdna data on Airbnb providers (Gunter, 2018) or original Airbnb supply data (Zervas *et al.*, 2017) do not contain information on non-providers through this platform, which would enable a comparison between providers and non-providers in the sector. Secondly, since the empirical analysis presented in this paper jointly models the factors that affect service provision in transportation and accommodation, it also explores the provision of multiple services in accommodation, transportation, or both service sectors, while previous studies have typically focused on one only (Dann *et al.*, 2019; Chen *et al.*, 2019; Berger *et al.* 2019). Thirdly, the paper links foundational entrepreneurship approaches that model individual and contextual determinants (Shane, 2003) with the contemporary digital entrepreneurship and platform economy research (*cf.*, Berger *et al.*, 2021; Lang *et al.*, 2021; Eckhardt *et al.*, 2018; Nambisan,

2017; Parker *et al.*, 2017). Although we do not ultimately answer the question of whether service providers through collaborative-economy platforms represent entrepreneurs, or not, the paper informs scholars about the importance of the individual-contextual determinants that shape the more favourable or less favourable settings for the various entrepreneurial activities observed with digital platforms, such as opportunity- and necessity-driven entrepreneurship (Delacroix *et al.*, 2019; Eckhardt *et al.*, 2018).

The remainder of this paper is organised as follows: Section 2 presents the related literature and theoretical background for the study, including the hypotheses. The following Section (3) provides the empirical model, while Section 4 describes the dataset. The empirical results are revealed in Section 5, while Section 6 concludes and gives the implications and a research outlook.

Related literature and theoretical framework

Who are the entrepreneurial service providers in the platform-based collaborative economy?

A recent report of the European Commission (2016, p. 9) documents the relationship between self-employment and the usage of collaborative platforms, which points to some degree of entrepreneurial engagement through service provision in the platform-based collaborative economy. Empirical studies on platform-based work and entrepreneurship report a continuum of entrepreneurial aspects, which includes necessity-driven subsistence entrepreneurs (Delacroix *et al.*, 2019; Ashford *et al.*, 2018), individuals with entrepreneurial growth aspirations in precarious circumstances (Webster and Zhang, 2020; Ravenelle, 2017), as well

as opportunity-driven entrepreneurs in high-skilled professions (Richter and Richter, 2020; Mancinelli, 2020; Parker *et al.*, 2017). Hence, collaborative-economy platforms include various entrepreneurial aspects, which are – at least partly – dependent upon the platform technology as the organising framework (Burtch *et al.*, 2018; von Briel *et al.*, 2018; Parker *et al.*, 2017).

Given this broad variety, a conceptual description of the various individual service providers through the lens of mainstream entrepreneurship theories encounters some important challenges: as a matter-of-fact, service providers through platforms relate to some elements that are typically associated with entrepreneurs, such as the recognition and exploitation of market opportunities (Kuckertz *et al.*, 2017; Dyer *et al.*, 2008), risk acceptance (or, aversion, *cf.* Brockhaus, 1980), the management of uncertainty (Alvarez and Barney, 2005), and growth orientation after the start-up phase (Gundry and Welsh, 2001). However, even self-employed, and *de iure* independent, individuals that use the existing digital platforms in the collaborative economy for their entrepreneurship are *de facto* platform-dependent. They thus resemble necessity-driven, rather than opportunity-driven, growth-oriented entrepreneurs (Aparicio *et al.*, 2016; Giacomini *et al.*, 2011) who wish to scale up their entrepreneurial activities. Finally, another complexity is that individual service providers through collaborative-economy platforms include various stakeholders from the platform ecosystems, such as “user entrepreneurs” (Sussan and Acs, 2017) and IT developers (Parker *et al.*, 2017) who do not only consume services on platforms but simultaneously provide feedback for product development, leading to blurred roles between provider (that is, the entrepreneur) and user (Lang *et al.*, 2021).

To shed light on the individual determinants of service providers through collaborative-economy platforms, the determinants of the probability of an individual's entrepreneurial

decision are estimated as the following model: the individual that considers service provision through the platform-based collaborative economy faces the choice of self-employment in this sector or a combination of traditional wage employment and self-employment. Both alternatives provide a hypothetical benefit to the individual, with the level of benefit being determined by the flows of expected income from the two states and the idiosyncratic characteristics of the individual, which will be described below. Individuals who offer services in the collaborative economy through platforms might have then either wage employment and a wish to increase their disposable household income by occasionally selling through platforms (Delacroix *et al.*, 2019), or they represent professionals, who are already self-employed and use collaborative-economy platforms for their self-employment (Webster and Zhang, 2020; Parker *et al.*, 2017).

What services are provided in the platform-based collaborative economy?

Botsman and Rogers (2010, pp. 159-160) coined the notion of the sharing economy, which is closely associated with the understanding of the collaborative economy used in this paper; they define it broadly as “*traditional sharing, bartering, lending, trading, renting, gifting, and swapping, redefined through technology and peer communities*”. The sharing economy, according to them, involves both providers and consumers of goods and services, as well as platforms defined as websites and apps that “*enable, facilitate and mediate exchanges and sharing between peers to create alternate and stable marketplaces*” (de Rivera *et al.*, 2017, p.12).

In this paper, we focus on two sectors with individual service provision through collaborative-economy marketplaces: transport and accommodation. These sectors represent the predominant service domains in the platform-based collaborative economy (Dolnicar and Zare, 2020; Cramer and Krueger, 2016). Other services which are also offered through such collaborative-economy platforms are food-related services (home deliveries, food sharing), household services (gardening, repairs, childcare), professional services (IT services, accounting), and financial services (peer-to-peer lending or crowdfunding) (Parker *et al.*, 2016).

In reality, the scope of these service provisions is, however, usually very limited, because they are not yet used by a majority of the wage-employed or self-employed persons. Taken from the Eurobarometer (2018) survey data, the share of providers of other services through collaborative platforms² ranges from 0.5 per cent for financial services (*e.g.*, peer-to-peer lending or crowdfunding) and 1 per cent for household services (*e.g.*, gardening, repairs, childcare) to 2.1 per cent for accommodation services and 2.7 per cent for transport services. Food-related services account for 0.6 per cent, and professional services for 0.8 per cent of usage. Thus, the platform-based collaborative economy represents a marginal sector across European economies and is mostly prevalent in the two sectors that this study focuses upon.

Which factors influence entrepreneurial service providers in the platform-based collaborative economy?

[²] Weighted percentages.

Entrepreneurship represents a process in which the enterprising individual responds to and exploits opportunities he or she identifies (Shane, 2003).³ This process of opportunity-identification and opportunity-exploitation is shaped by the interplay of individual-level factors associated with the enterprising individual, such as the personality traits, socio-economic and demographic background, and contextual factors, for example, the national or regional institutional-political settings, in which the individual operates (Shane, 2003). With the advent of the digital platform economy (Berger *et al.*, 2021; Eckardt *et al.*, 2018; Nambisan, 2017; Sussan and Acs, 2017), technological progress affects the entrepreneurial process on two levels: through the identification and exploitation of opportunities by potential entrepreneurs, which is further enhanced by information diffusion (Shane, 2000), and through the political-institutional settings in which this entrepreneurship process takes place. This, in turn, resonates with Shane's (2003) claims on the individual-opportunity nexus.

Hence, the opportunity-exploiting (that is, entrepreneurial) behaviour of individuals providing services on collaborative-economy platforms can be explained in relation to both individual and contextual factors. According to von Briel *et al.* (2018) and Eckhardt *et al.* (2018), digital technologies are key enablers of the opportunity identification and opportunity exploitation by enterprising individuals. The literature on digital entrepreneurship sheds light on *some* relevant factors on the level of the individual, such as stress, work engagement, and role conflicts of individuals (Nambisan and Baron, 2021), or the motivations to provide services (Zhang *et al.*, 2019). However, the bulk of the more fundamental factors pertaining to an enterprising individual's demographic and socio-economic background have remained under-studied.

[³] This perspective differs from other approaches which equate entrepreneurship with self-employment (*cf.*, Casson, 2005).

With respect to *contextual factors*, the empirical entrepreneurship literature (for instance, Civera *et al.*, 2020; Kachlami *et al.*, 2018; Aparicio *et al.*, 2016; Bosma and Sternberg, 2014) has generally confirmed the influence of country-level and institutional (*e.g.*, legal-regulatory) factors on individual entrepreneurship (*cf.*, Welter, 2011), while other contextual factors, such as governance, cultural influences and institutional issues, are somewhat under-explored in relation to platforms and platform ecosystems as organising systems for enterprising individuals (with the exception of Weitzenboeck, 2021).

To illuminate a broader set of determinants that influence the probability of the entrepreneurial service provision in the platform-based collaborative economy, we include the following factors in this study: *individual determinants*, including demographic and socio-economic factors (*cf.*, Simoes *et al.*, 2016; Elam and Terjesen, 2010; Bönnte and Piegeler, 2013), and *regional-national and institutional contextual factors* (*cf.*, Welter, 2011), as relevant aggregate-level determinants of such service provision. With regard to the collaborative economy, we argue that changes in any of these variables can alter the likelihood that an individual will be active as a service provider through collaborative platforms.

Demographic background

Age represents an important individual-level factor for service provision in the platform-based collaborative economy and, hence, a proxy for job experience. Evidence based upon a previous Eurobarometer dataset suggests that the use of platforms in the collaborative economy is highest

among young and middle-aged cohorts in Europe (from 25 to mid-fifties) and lowest among very young (under 24) or older (over mid-fifties) age cohorts (European Commission 2016, p. 9). However, this survey does not distinguish by type of services. Notwithstanding, its findings are consistent with evidence on the demographics of the workforce in the platform-based collaborative economy (De Groen et al., 2016, p. 5) and observations from other studies that the age group of 25 to 55 years is the one in which most business creation occurs in an economy: Storey (1994) notes that individuals aged 25 to 45 are most likely to become entrepreneurs; Evans and Leighton (1989) point to an increase in self-employment rates up to the early forties and constant rates thereafter. Similarly, Lévesque and Minniti (2006) emphasise that the percentage of individuals with entrepreneurial activities is highest between the ages of 25 and 35. In light of this, we follow the general assumption that age correlates positively, albeit not linearly, with the probability of choosing self-employment (Bönte *et al.*, 2009). This effect is consistent with the expectation that individuals accumulate both human and financial capital over time, and thereby increase their probability of becoming entrepreneurs. Shane (2003) points at the negative effect of age for opportunity exploitation related to both opportunity costs and uncertainty premiums increasing with age. Finally, Lévesque and Minniti (2011) argue that the demographic age distribution in the economy influences entrepreneurship as an aggregate variable.

Another important aspect is gender. Koellinger *et al.* (2013) show that the lower propensity of female individuals to become entrepreneurs, as compared to males, is one possible explanation for the observed gender gap (Bönte and Piegeler, 2013), *i.e.*, the differences in the rate of female entrepreneurs, compared to male entrepreneurs, who choose a self-employed profession. Moreover, male and female entrepreneurs have a preference for different occupational fields

(Reskin, 1993; Blau *et al.*, 2013; Hsieh *et al.*, 2019). In general, female entrepreneurs are over-represented in areas such as health, education, and professional and personal services. However, the degree of gender-based occupational segregation has declined in developed countries in recent decades. A gender gap may also apply to the likelihood of providing services through collaborative platforms, as De Groen *et al.* (2016, pp. 4-5) confirm: the average share of male service providers in the platform economy is higher than that of female providers; thus, gender seems to be a relevant individual factor for service provision in the platform-based collaborative economy.

Educational skills and occupational status

The literature suggests that higher education is not only a decisive factor in the potential success of self-employed persons, but also a crucial determinant for entry into self-employment, at least in non-agricultural sectors (Robinson and Sexton, 1994; Luber *et al.*, 2000). Better educated people are said to be more likely to exploit entrepreneurial opportunities because the information and skills that education provides increase their entrepreneurial judgements and expected returns (Shane, 2003). Concerning the platform-based collaborative economy, the role of educational and professional skills for the provision of services, *e.g.*, in accommodation and transport, is not prominently addressed (except for Fossen and Sorgner, 2021). As a matter-of-fact, none of these economic activities requires *per se* advanced formal education (Burtch *et al.*, 2018). However, empirical evidence shows that the provision of services through platforms, such as the letting of housing space and cars, depends upon a certain level of trained and acquired skills, including communication, marketing, and negotiation skills (Christensen, 2020; Xie and Mao, 2017). Hence, we assume that a high-level occupation, that is commonly

grounded in formal education, tends to be positively related to the prevalence of service provision through platforms in the collaborative economy because the entrepreneurial opportunities, based upon technological opportunities, including high-skilled self-employment, are the more abundant, the higher skilled an individual with entrepreneurial aspirations is (*cf.*, Fossen and Sorgner, 2021).

Given the considerations above, the following hypotheses can be formulated:

H1: The probability of service provision through the platform-based collaborative economy depends upon socio-economic and demographic factors.

H1.1: Middle-aged cohorts (between 25 and 54 years of age) will exhibit a higher probability of service provision in the platform-based collaborative economy than younger and older age cohorts, respectively.

H1.2: Male individuals will exhibit a higher probability of service provision in the platform-based collaborative economy than female individuals.

H1.3: Individuals with a high level of formal education or a skilled occupation will exhibit a higher probability of service provision in the platform-based collaborative economy than individuals with a lower level of education or occupational skills, respectively.

Although platform-based transport and accommodation services are categorised under the same umbrella of collaborative-economy platforms, they are significantly different service domains with regard to resource requirements, such as material resources, capital investment and human capital (*cf.*, Berger *et al.*, 2019; Gunter, 2018). Acquiring housing space to rent out on a platform is generally more expensive than buying a car to be used for platform-based car-sharing.

Moreover, the sectors differ in terms of the human resources needed to deliver the service. While transportation services require more standardised work, the offering of rental space – similar to any other accommodation provision – is associated with less standardised work modes, requiring more customer contacts and customisation of the services provided. For the individual service provider, the accumulated capital that is necessary for the provision of accommodation, in particular, is thus likely to be associated with a higher age of the individual, of male gender, compared to a female provider, and a relatively high level of education and skilled work. Thus, it is possible to expect the following:

H2: The importance of individual characteristics differs with the type of service offered through collaborative-economy platforms.

Regional-national and institutional contextual factors

Altogether, the service provision in the platform-based collaborative economy represents a global phenomenon, and individual providers have become as independent of regional-specific and institutional factors as never before. In this sense, service provision in the collaborative economy differs from more traditional entrepreneurship because, as a partly virtual phenomenon, it is more detached from the regional and national physical and regulatory environment. Institutional and regional-specific factors, such as platform restrictions, regulation on platform usage, and hostile enforcement of such rules, are also likely to influence service provision in the platform-based collaborative economy (Frenken *et al.*, 2020; Vinogradov *et al.*, 2020; Yang and Mao, 2019). Even though specific legal rules and regulations on this level are either non-existent (which is the case for many services in the collaborative

economy) or can be successfully avoided by the individual service provider (*cf.*, Vinogradov *et al.*, 2020; Constantiou *et al.*, 2017), it seems more probable to assume that regulation as a contextual factor will have an influence on the likelihood of individual service provision on collaborative-economy platforms. In addition, the overall economic situation in a region has a twofold effect on entrepreneurship: income growth reduces the level of opportunity exploitation by increasing the opportunity costs for potential entrepreneurs, on the one hand, but economic growth also provides additional opportunities and raises the turnover expectations among novel entrepreneurs (Shane, 2003), on the other. In line with this thought, and as for all kinds of entrepreneurship (*cf.*, Bosma and Sternberg, 2014), the evidence points to urbanisation as a factor determining individual entrepreneurial activities in the collaborative economy (Cohen *et al.*, 2016). Thus, it is more probable to expect a higher prevalence of entrepreneurial activities through collaborative-economy platforms in cities and urban-metropolitan regions with their urban amenities and higher income levels, compared to, *e.g.*, rural areas (*cf.*, Vinogradov *et al.*, 2020; Muñoz and Cohen, 2016). The following hypotheses summarise this section:

H3: The regulatory regime (as an institutional factor) and regional-specific characteristics are relevant to service provision in the platform-based collaborative economy.

H3.1: Laws and regulatory regimes for the platform-based collaborative economy will influence the probability of service provision in this sector.

H3.2: Regional-specific characteristics (such as the GDP per capita) will influence the probability of service provision in the platform-based collaborative economy.

Methodology

The empirical model identifies the provision of services *via* a collaborative-economy platform for transport and accommodation services as a function of the aforementioned socio-economic, demographic, and regional-specific variables (the country of residence and population density in the country of residence). The focus is on accommodation – the letting of property, such as an entire house, a flat, or a room – and transportation in terms of offering one’s own car for rent or providing ride services with a car through collaborative-economy platforms. It can be assumed that individuals with higher incomes have more resources to engage in platform-based service provision, as this engagement requires an initial investment before a return can be realised.

The determinants of the two types of service provisions are modelled by a seemingly unrelated Probit model where the two latent variables are assumed to be a linear function of a set of explanatory variables X . Generally, the probability of an event occurring – in this case, the probability of an individual providing services *via* the platform-based collaborative economy for the service domains studied – depends upon an unobserved index determined by a set of independent variables. By using a Probit model with a standard normal cumulative distribution function, Φ , the probabilities of having a person offering short-term transport services, $TRANSPORT_i^*$ and letting properties for short-term rentals $ACCOMMODATION_i^*$ are specified as follows:

$$P(TRANSPORT_i^* = 1|X) = \Phi(\alpha_1 + X_i\beta_1) \quad (1)$$

$$P(ACCOMMODATION_i^* = 1|X) = \Phi(\alpha_2 + X_i\beta_2) \quad (2)$$

where i denotes the individual respondent, α_1 and α_2 are the constants, and β_1 and β_2 are the two vectors of parameters to be estimated. The relationship between the latent and observed perception variables is expressed as follows:

$$TRANSPORT_i = \begin{cases} 1 & TRANSPORT_i^* > 0 \\ 0 & otherwise \end{cases}$$

$$ACCOMMODATION_i = \begin{cases} 1 & ACCOMMODATION_i^* > 0 \\ 0 & otherwise \end{cases}.$$

Given that the provision of both transport and accommodation services through collaborative-economy platforms are correlated, the two equations can be written as a system where the correlation between the error terms ε_1 and ε_2 is captured by coefficient ρ :

$$\begin{cases} TRANSPORT_i^* = \alpha_1 + X_i\beta_1 + \varepsilon_1 \\ ACCOMMODATION_i^* = \alpha_2 + X_i\beta_2 + \varepsilon_2 \end{cases} \quad (3)$$

$$\begin{bmatrix} \varepsilon_1 \\ \varepsilon_2 \end{bmatrix} \sim N \left(\begin{bmatrix} 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 & \rho \\ \rho & 1 \end{bmatrix} \right).$$

The seemingly unrelated bivariate Probit model is employed to estimate the determinants of the two forms of service (Greene, 2018). Based upon the estimates, the marginal effects with four different combinations can be calculated (two joint probabilities and two probabilities for each choice only). The model is estimated by maximum likelihood, using robust standard errors.

With the conceptual considerations that were outlined above in mind, the probability of providing the two types of service is specified as a function of the location of the residents and several socio-economic and demographic, as well as regional-specific determinants:

$$Y_i^* = \alpha_0 + \sum_{O=1}^{15} \beta_O \text{Occupation}_{Oi} + \sum_{A=1}^5 \beta_A \text{Ageclass}_{Ai} + \beta_W \text{Gender}_{Wi} + \sum_{C=1}^{27} \beta_C \text{Country}_{Ci} \\ + \sum_{L=1}^2 \beta_L \text{Popdensity}_{Li} + \beta_G \ln(\text{GDPcap})_i + \beta_R \text{Regulation}_i + u_i,$$

where i is the respondent and $\ln(\)$ is the natural logarithm, Y_i^* is the latent response variable representing either the provision of transport services or accommodation services, α_0 is the constant, and u_i is the error term. *Occupation* includes a set of dummy variables measuring the occupation of the respondents. *Ageclass* is a set of dummy variables measuring the age of the individuals, and *Gender* is a dummy variable equal to one for female entrepreneurs and zero otherwise. *Country* is the set of country dummy variables based upon the residence of the respondent, and *Popdensity* consists of two dummy measures for the population density of the respondent (towns and suburbs/small urban area, cities/large urban areas, with rural areas as the reference group). *GDPcap* measures regional GDP *per capita* and *Regulation* is a dummy variable equal to one if there are regulations on platform-based car-sharing and accommodation services, *e.g.*, Uber or Airbnb as the most prominent platforms that service providers use, in the region of the individual provider, and zero otherwise.

Data

The data for this analysis originate from the Eurobarometer (2018) database “Flash Eurobarometer 467: The Use of the Collaborative Economy”, which provides information on citizens from the age of 15 years onwards in the then 28 Member States of the European Union. The underlying dependent variables are drawn from two questions: “*Have you ever offered services occasionally as a private individual via traditional channels?*”, and “*In which of the following sectors have you provided a service via a collaborative platform?*”, with six possible answer categories: i) transport (e.g., car-sharing), ii) accommodation (e.g., letting an apartment), iii) food-related services (e.g., home delivery, food sharing), iv) household services (e.g., gardening, repairs, child care), v) professional services (e.g., IT services, accounting), and vi) collaborative finance (peer-to-peer lending or crowdfunding).

In the survey, collaborative platforms are defined as specialist Internet-based websites or apps that provide an open marketplace in which consumers can connect with service providers. The people offering services can be private individuals providing occasional services or professionals. Hence, the data match the underlying idea of the individual who can be both an income-increasing private household and a self-employed individual. The dataset covers a wide range of socio-economic and demographic characteristics. Age categories are defined in the dataset as follows: 15-24, 25-34, 35-44, 45-54, 55-64, and 65+ (*cf.*, De Groen *et al.*, 2016). There is also information on age in years that can be used as an alternative measure. Given that income is not available as a variable, employment and regional GDP *per capita* are used as proxies in this paper. The data on the GDP *per capita* in current prices (Euro) for the year 2018 at the regional level (NUTS 2) were retrieved from Eurostat (<https://ec.europa.eu/eurostat/>). In the Eurobarometer (2018) survey, regional information is available at the NUTS-3 level for

some countries. To complement this information with the other countries, GDP *per capita* data were used from the respective national statistical offices. Finally, information on restrictions on short-term rentals was retrieved from the Airbnb homepage and Wikipedia. In 2018, restrictions for short-term rentals through Airbnb were still limited to a few cities and regions (Barcelona, Paris, London, Amsterdam, Berlin, and Copenhagen). Restrictions on Uber occur in eight European countries (Bulgaria, Germany, Denmark, France, Greece, Hungary, The Netherlands, and Portugal) as well as in the capital region of Belgium. Since regulatory systems vary in strength across the regions, we follow Nieuwland and Van Melik (2020) in defining short-term regulation; they find that the strongest regulations of Airbnb exist in Barcelona, Paris, London, Amsterdam, and Berlin.

Table I provides the descriptive statistics, showing that the proportion of individuals offering transportation and accommodation services through collaborative-economy platforms is higher for younger persons, people who are already self-employed, and residents living in larger cities. Moreover, Pearson's Chi-square test in Table A I, which is commonly used to test associations between two categorical responses, highlights that the socio-economic and demographic variables, as well as population density and country of residence, are significant for each of the two types of service provision (at the one per cent level in nine out of ten cases). An exception is GDP *per capita* (measured in categories), which is not significant at the five per cent level.

Table I

Empirical results

Results

Table II shows that the two types of service provisions through platforms in the collaborative economy depend significantly upon a mix of socio-economic and demographic determinants, and the country of residence of the service provider as a contextual factor. By contrast, regulation as another contextual factor is not significant at the five per cent level or shows the opposite expected sign and is consequently not included in the final regression.

Table II about here

The correlation coefficient between the error terms in the Probit model (0.68) is significant at the 1 per cent level, and it indicates a high degree of correlation between the two types of services. A Wald test of the hypothesis that the two types of service provision are unrelated can be rejected at the 1 per cent significance level. Consequently, separate univariate Probit models are rejected in favour of the bivariate (seemingly unrelated) Probit model.

Based upon the joint estimations of two different latent variables, different marginal effects are furthermore calculated for: (i) the probability that the individual is offering transport services (*e.g.*, car-sharing) but not accommodation services, (ii) the probability that the person is offering accommodation services (short-term rentals) but not transport services, and (iii) the probability that the person is offering both services. The marginal effects of the remaining

combination are not calculated because they are implicitly given by the residual of the three other ones.

The most common form of service provision *via* collaborative-economy platforms is either transport service combined with no accommodation services (with 1.2 per cent active) or accommodation services with no transport service at the same time (also 1.2 per cent active). The provision of both services through platforms by one and the same person is relatively rare (0.5 per cent).

Concerning the *individual-level socio-economic and demographic determinants*, the likelihood that a person provides accommodation through these platforms (in combination with no transport service) is significantly higher for female persons and individuals aged between 25-34 years of age (the latter is significant at the 6 per cent level). As expected, female persons are less likely to provide transport services (with a difference of almost one percentage point). Age is highly significant, with the highest probability in the 25-34 age group, and then falling steadily with age. The difference between the young age group and the oldest age group is almost two percentage points.

The occupation of the individuals is significantly related to the provision of accommodation services (with or without a combination of transport services) on platforms in the collaborative economy, while it is less relevant for transport services alone. In particular, the likelihood of offering accommodation services (not in combination with transport services) is significantly related to those who are already self-employed with marginal effects ranging between 0.014 and 0.020. This pattern can also be observed for the marginal effects of both types of services;

however, the marginal effects are slightly lower. The occupation (the reference category is non-employed individuals) has a strong influence on the likelihood of offering accommodation services with professionals (such as lawyers, doctors, accountants, architects, *etc.*), company managers, shopkeepers, and people who are already self-employed, the latter with the highest probability. Significant positive marginal effects can also be observed for company managers.

With regard to the *regional-specific and institutional contextual determinants*, the location of the individual has a strong influence on the likelihood of the provision of accommodation services on collaborative-economy platforms. Individuals living in large cities show between 0.3 and 0.7 percentage points higher probability of providing accommodation or transport services or both through platforms in the collaborative economy. The probability does not vary very much between the countries of residence, which suggests that the provision of accommodation services through collaborative-economy platforms is a universal phenomenon. The likelihood of persons providing transport services through such platforms (and not accommodation services) is highest in Denmark (+1 percentage point higher than in the reference category Germany) and France (+2 percentage points). This is somewhat surprising as the provision of transport services through collaborative-economy platforms is prohibited or severely restricted by law in both countries. The likelihood is also significantly higher in Luxembourg, Slovenia, and Latvia. Finally, the population density of the country of residence is highly significant, with larger aggregations being 0.4 percentage points more likely than in rural areas.

In addition, local regulations for short-term rentals of online booking platforms (Amsterdam, Berlin, Barcelona, London, and Paris) do not differ significantly from zero (coefficient of -.060

and z-stat -0.47).⁴ Therefore, the dummy variable for short-term rentals is not included in the final specification. This indicates that the provision of accommodation services is independent of the regulatory system. However, it may take some time for the provision of services to have a negative impact. Because of this, this result should be interpreted with caution. The regulatory dummy for the provision of transport services *via* collaborative-economy platforms is clearly positive with a z-stat of 3.17. However, the exclusion of the country dummy variables reduces the z-stat only to 1.7. This finding means that the provision of transport services through such platforms is higher in countries with regulations for such platform-based services, which could be related to the reverse causality, *i.e.*, regions with a high level of provision of transport services through platforms are more inclined to introduce regulations. However, since many of these arguments are only speculative, the regulation dummy is not included in the final specification.

Robustness check

A first robustness check (Table A III) concerns differences between those individuals who are already self-employed and those in wage employment. While the latter group may have limited opportunities for entrepreneurial engagement in terms of service provision through collaborative platforms, the self-employed service providers can show higher levels of engagement. Since the already self-employed are more likely not only to offer services *via* collaborative platforms, but also the type and scope of the services that they provide might differ from that of wage-dependent employees, Table A III illustrates separate estimates for

[⁴] The result is robust regardless of whether country dummy variables are included or not (Table A II).

wage-employed service providers (excluding the self-employed ones). This leads to a reduction of the sample by 2,589 self-employed persons, which corresponds to a self-employment rate of 9.8 per cent. The model results are similar with regard to the sign and significance of the basic variables (age, gender, occupation, location, and country of origin), except for occupation, which is then reduced in the number of categories.

A second robustness check concerns the specification of the age variable as two separate variables, (i) age, and (ii) age squared, both transformed into a natural logarithm. Table A IV shows the non-linear relationship between age and the two types of service provision with a large negative coefficient of the squared term. The marginal effects for the different combinations of service provision show that provision gradually decreases with age, similar to the specification with age categories. However, the strength of the age dependence is more pronounced. The difference in probabilities between young and older persons is between three and four percentage points.

Since the findings indicate clear differences in the relevance of service provision between rural and urban regions (*cf.*, Falk *et al.*, 2019), separate estimations are conducted for the different types of regions as another robustness check. They reveal that the magnitude and significance of the marginal effects of the main variables do not change much. Finally, an additional robustness check tests several interaction terms. For instance, an interaction term between regional GDP *per capita* and the type of region tests whether the determinants of the likelihood of different types of service provision in urban regions differ between wealthy and less wealthy regions. The unreported results also show that the interaction term is not significant.

Discussion

The overall finding is that hypotheses H1.1, H.1.3, and H2 are supported, while hypothesis H1.2 is partly supported, and hypotheses H3.1 and H3.2 cannot be confirmed. Hence, *individual economic and demographic determinants* (age, gender, and occupation) and residency in large cities in the individual's national country as a *regional-specific and institutional contextual determinant*, which is also indicative of the degree of urbanisation, determine the individual likelihood of the provision of accommodation and transportation services in the platform-based collaborative economy. By contrast, most contextual factors, such as the prosperity of the region where the service is provided and regulation for the collaborative economy, are less important.

More specifically, the *individual socio-economic and demographic determinants* are decisive predictors for this service provision in the platform-based collaborative economy. The likelihood of service provision is highest for individuals in the age cohort of 25-34 years and further decreases with age. Potential collaborative-economy entrepreneurs thus tend to be young, which seems in line with the observed preferences of millennials concerning service consumption and provision with the collaborative economy (Godelnik, 2017). In addition, the individual's occupation and gender are highly relevant: firstly, female individuals are more engaged in accommodation services, while male individuals are more active in transport services, which points to a gender bias across different service domains in the platform-based collaborative economy. In general, gender represents an under-researched factor with both the consumption and provision of services through collaborative-economy transactions (*cf.*,

Schoenbaum, 2016). Secondly, the likelihood of service provision is significantly higher for professionals with a high level of education (*cf.*, Fossen and Sorgner, 2021), such as lawyers, doctors, accountants, architects, company managers, and shopkeepers, as well as self-employed individuals who are already active as entrepreneurs in a broad sense. These individuals may capitalise on their trained or formally-acquired skills when providing services through the collaborative economy (*cf.*, Christensen, 2020; Xie and Mao, 2017). Notably, the finding that the already self-employed in their country of residence, and female and high-skilled professionals are more likely to offer accommodation services *via* platforms hints at the entrepreneurial aspirations of individuals using such platforms beyond an income-maximising motivation. This corresponds to Shane's (2003) argument about the opportunity-exploiting individual, which is enhanced with digital technologies (von Briel *et al.*, 2018; Eckhardt *et al.*, 2018).

Furthermore, the empirical results suggest that some *contextual determinants* are relatively more important for the prediction of individual service provision with the platform-based collaborative economy than others. Urbanisation associated with the individual's country of residence determines the individual's likelihood to use platforms in the collaborative economy for entrepreneurial engagement and seems to be related to specific lifestyle preferences manifest in urban regions (*cf.*, Artioli, 2018). Hence, this points to the role of the specific economic context for the development of the various platform-based entrepreneurial activities (Cohen *et al.*, 2016; *cf.*, Bosma and Sternberg, 2014).

Implications, limitations and conclusion

Theoretical implications

The finding that individual determinants of the service provision through collaborative-economy platforms are more important than contextual factors supports Shane's (2003) theory of the individual-opportunity nexus with its emphasis on the enterprising individual for opportunity-identification and opportunity-exploitation. By pointing to socio-economic characteristics and professional skills as determining factors for this service provision, the study also amends the digital entrepreneurship literature that focuses on behavioural traits and interactional attributes of enterprising individuals with digital platforms, such as stress, self-control, and role conflicts (Nambisan and Baron, 2021). However, in this paper, we do not claim to explore the underlying motives of individuals to engage on platforms, which points to the need to conduct future research on the individual determinants in connection with historical data on the previous employment/unemployment (Giacomin *et al.*, 2011). Closer attention to the motivation of individuals is particularly important since entrepreneurship does not seem to be a viable option for low-skilled individuals using digital tools, such as platforms (Fossen and Sorgner, 2021).

The study furthermore confirms that some the contextual factors drive the individual propensity of service provision through collaborative-economy platforms, notably, regional and national influences related to urbanisation (Cohen *et al.*, 2016). By contrast, institutional factors, such as regulation (Vinogradov *et al.*, 2020; Yang and Mao, 2019), do not prove to influence these entrepreneurial activities. This might not come as a surprise, given that digital platforms often have a global reach out, which allows providers and users to be located almost anywhere (at least, in theory). However, from a system perspective, both the spatial scales on which

individuals operate through collaborative-economy platforms (*cf.*, Sussan and Acs, 2017; Parker *et al.*, 2017) and the different spatial contexts in which the platforms and individuals are embedded (*cf.*, Müller and Korsgaard, 2018) matter for the governance of platforms and their ecosystems (Sussan and Acs, 2017; Parker *et al.*, 2017). Spatial scales and contexts are moreover important for the design of public-policy programmes or policy interventions (Weitzenboeck, 2021) when it comes to, for instance, the level of autonomy of individual providers within the platform framework or the scalability of their entrepreneurial activities (Tabascio and Brail, 2021). Further research should thus place include a platform ecosystems perspective to explore individual service provision and the interaction of service providers with other stakeholders within platform ecosystems in various spatial settings, including settings outside urban areas.

Managerial and public-policy implications

As a practical implication, individual characteristics related to the age, gender, and skill level of the enterprising individual point to some factors that managers can systematically develop to tap the full potential of entrepreneurship on collaborative-economy platforms. The finding that younger people are more likely than older people to provide these services means that the supply of these services is likely to increase in the near future. Since these economic activities are associated with a continuum of entrepreneurial aspects, managers should support the various variants of individual service provision identified. Users and consumers on collaborative-economy platforms may switch their role to turn into entrepreneurial service providers themselves (Sussan and Acs, 2017), which represents a trend that notably the managers of such platforms should carefully watch.

From a public-policy point of view, it is important to identify and develop opportunity-based entrepreneurs (Fossen and Sorgner, 2021; Bellesia *et al.*, 2019) among individuals providing services on platforms, notably high-end services (Nambisan and Baron, 2021), such as IT, project and management consulting (Richter and Richter, 2020), which are conducive to innovative start-ups. Although this study focuses only on the two most commonly used domains (transportation and accommodation), public-policy managers can extrapolate the growth potential residing especially in the opportunity-oriented entrepreneurial activities across all domains in the collaborative economy, which is currently still marginal in Europe (De Groen *et al.*, 2016). Another public-policy implication is that national regulation, which has not shown to be a relevant determinant of an individual's service provision in this study, can have a huge impact on region-specific platform-based economic activities and should be finetuned to the needs of the regional/national economies (Vinogradov *et al.*, 2020).

Limitations

The data used refer to the year 2018, before the outbreak of the COVID-19 pandemic. The ongoing governmental actions taken since the beginning of 2020 have proved to have a very negative impact on the demand for travel, accommodation, and transportation services in the collaborative economy. The demand for travel and hospitality services is particularly negatively affected in urban regions where collaborative-economy platforms have a significant market share, as shown by this paper. Besides creating challenges (Liñán and Jaén, 2020), the pandemic also provides entrepreneurial opportunities to individuals operating in digital environments or with digital technologies (Gavrila and De Lucas, 2021). Hence, the results provided in this

paper need to be replicated and compared in the post-COVID19 times to validate these findings. Furthermore, the data used are confined to two main domains of economic activities in the platform-based collaborative economy: transport and accommodation. Finally, although income seems to be a relevant determinant for individual service provision, the present dataset used in this paper does not contain income data for the unit of analysis studied.

Conclusions

The provision of services *via* collaborative-economy platforms represents a popular economic activity, and the burgeoning digital entrepreneurship and platform economy literature describes digital platforms as important facilitators of entrepreneurial opportunities (Berger *et al.*, 2021; von Briel *et al.*, 2018; Eckhardt *et al.*, 2018). Hitherto, the integration of these ideas in existing entrepreneurship accounts remains incomplete, which raises questions about the entrepreneurial aspects of individual service providers in the platform-based collaborative economy. The present paper attempts to move the conceptual debate one step forward by linking individual and contextual determinants for such entrepreneurial activities, based upon a simple model that considers service provision in isolated domains of this market, or their joint usage. The model is compatible with the various economic activities observed with collaborative-economy platforms and their entrepreneurial aspects, including necessity-driven entrepreneurship (Delacroix *et al.*, 2019), opportunity entrepreneurship in precarious (Webster and Zhang, 2019; Ravenelle, 2017), or less precarious contexts (Mancinelli, 2020). The bivariate Probit model also adds empirical knowledge on this topic by enabling a joint analysis of different entrepreneurial activities based upon a large, and internationally comparable, micro-dataset of around 27,000 European citizens in 2018 (Eurobarometer, 2018).

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Table I: Descriptive statistics: Provision of transport and accommodation services via collaborative-economy platforms (in percentage)

	Transport services	Accommodation services
	means	
<i>Sex</i>		
Female	1.9	2.1
Male	3.4	2.1
<i>Age</i>		
Age 15-24	3.9	1.8
Age 25-34	6.9	4.6
Age 35-44	2.9	3.4
Age 45-54	1.8	1.9
Age 55-64	1.9	1.3
Age 65+	0.4	0.7
<i>Occupation</i>		
Farmer, forester, fisherman (self-employed)	0.3	2.7
Owner of shop, craftsman (self-employed)	4.0	5.3
Professional (self-employed lawyer, med)	3.7	6.2
Manager of a company (self-employed)	6.1	4.9
Other (Self-employed)	1.6	4.2
Professional (employed doctor, lawyer,	4.2	2.3
General management, director or top man	5.9	7.8
Middle management	4.3	3.8
Civil servant	5.2	3.2
Office clerk, salesman, nurse	3.2	1.6
Supervisor\ foreman (team manager, ...)	1.0	1.8
Manual workers	2.0	1.3
Looking after home	0.7	0.9
Student	3.8	2.2
Retired	0.6	0.8
Other	2.5	2.5
<i>Location</i>		
Rural area or village	2.0	1.6
Small and medium sized city	2.5	1.7
Large city	3.5	3.3
<i>Country</i>		
AT	1.8	2.0
BE	2.3	1.5
BG	2.0	2.2
CY	0.3	1.2
CZ	2.5	1.1
DE	1.6	1.2
DK	3.6	2.3
EE	0.9	1.3
ES	3.6	3.4
FI	0.2	1.8
FR	8.1	4.0
GB	0.3	1.0
GR	0.5	1.7
HR	1.8	3.6
HU	1.0	1.9
IE	1.0	3.8
IT	1.8	2.5
LT	1.4	0.5

LU	4.2	2.8
LV	6.1	3.0
MT	0.9	1.0
NL	1.1	1.8
PL	3.5	1.6
PT	0.8	1.3
RO	2.3	2.1
SE	1.2	2.8
SI	4.4	1.8
SK	1.9	1.8
<i>GDP per capita at the regional level in Euro in 2018</i>		
GDP per capita<13600	2.5	1.8
13,600 <= GDP per capita<24,300	2.0	2.2
24,300 <= GDP per capita<38,500	3.7	2.5
GDP per capita>=38,500	1.7	1.8

Note: Means of the dummy variables are calculated based upon individual data and multiplied by 100. The median regional Gross Domestic Product (GDP) at market prices (in Euros) per inhabitant in logarithm in 2018 is 10.1 (=24,300 Euros) with a standard deviation of 0.63. The 75th and 25th percentiles of GDP per capita in logarithm are 10.6 and 9.5 respectively (equivalent to 38,500 and 13,900 Euros). Source: Eurobarometer (2018).

Table II: Determinants of provision of transport and accommodation services via collaborative-economy platforms (bivariate Probit estimations – marginal effects)

	Transport services & no accommodation service		Accommodation services & transport service		Accommodation services & no transport service	
	dy/dx	z-stat	dy/dx	z-stat	dy/dx	z-stat
<i>Individual characteristics</i>						
Sex (reference category: male)						
Female	-0.008 ***	-6.30	-0.001 ***	-2.89	0.003 ***	2.64
Age (reference category: 15-24)						
Age 25-34	0.005 *	1.67	0.003 ***	2.70	0.007 *	1.94
Age 35-44	-0.005	-1.63	0.000	-0.11	0.004	1.16
Age 45-54	-0.010 ***	-3.15	-0.003 **	-2.31	-0.001	-0.30
Age 55-64	-0.010 ***	-3.07	-0.003 **	-2.40	-0.002	-0.47
Age 65+	-0.019 ***	-4.16	-0.008 ***	-4.53	-0.010 **	-2.28
Occupation (reference category unemployed/without a profession activity)						
Farmer, forester, fisherman (self-employed)	-0.006	-0.85	-0.001	-0.39	0.002	0.38
Owner of shop, craftsman (self-employed)	-0.001	-0.15	0.004 ***	2.67	0.016 ***	3.75
Professional (self-employed lawyer, doctor, ...)	0.001	0.14	0.004 ***	2.86	0.014 ***	3.71
Manager of a company (self-employed)	0.008 **	1.96	0.008 ***	5.20	0.020 ***	5.07
Other (Self-employed)	0.002	0.40	0.005 ***	2.71	0.015 ***	3.05
Professional (employed doctor, lawyer, ...)	0.005	1.53	0.003 **	2.25	0.005	1.41
General management, director or top man	0.010 **	2.28	0.007 ***	3.90	0.013 ***	3.19
Middle management	0.005	1.28	0.002 *	1.77	0.004	1.03
Civil servant	0.008 **	2.23	0.003 **	2.16	0.002	0.60
Office clerk, salesman, nurse	0.003	1.09	0.000	0.20	-0.003	-0.78
Supervisor/foreman (team manager, ...)	0.005	0.78	0.002	0.97	0.004	0.51
Manual workers	-0.005	-1.30	-0.002	-1.64	-0.003	-0.83
Looking after home	-0.004	-0.89	-0.002	-1.26	-0.003	-0.73
Student	-0.001	-0.15	0.000	-0.14	0.000	-0.03
Retired	-0.004	-0.94	-0.001	-0.50	0.001	0.35
<i>Contextual characteristics</i>						
Population density (reference category: rural)						
Small and medium sized city	0.001	0.66	0.001	1.53	0.002	1.27
Large city	0.004 ***	2.59	0.003 ***	5.04	0.007 ***	4.35
Log GDP per capita	-0.001	-0.60	-0.001	-1.27	-0.002	-1.06
Place of residence (country([reference category: DE])						
AT	0.000	-0.01	0.001	0.82	0.005	1.00
BE	0.009 *	1.89	0.003	1.53	0.001	0.14
BG	0.002	0.38	-0.001	-0.53	-0.006	-0.97
CY	-0.030 ***	-2.91	-0.008 ***	-2.67	0.001	0.10
CZ	0.005	1.08	-0.001	-0.79	-0.010 *	-1.74
DK	0.010 **	2.15	0.004 **	2.39	0.004	0.80
EE	-0.011	-1.64	-0.005 **	-2.29	-0.006	-1.09
ES	0.009 *	1.88	0.005 ***	2.71	0.008	1.57
FI	-0.015 *	-1.86	-0.001	-0.49	0.011 *	1.92
FR	0.022 ***	5.08	0.007 ***	4.39	0.004	0.91
GB	-0.011	-1.58	-0.004 *	-1.90	-0.004	-0.67
GR	-0.011 *	-1.78	-0.003	-1.35	0.001	0.21
HR	-0.004	-0.62	0.002	0.94	0.010 *	1.81
HU	-0.005	-0.90	-0.001	-0.29	0.003	0.54
IE	-0.012 *	-1.91	0.000	0.11	0.012 **	2.44
IT	0.002	0.31	0.002	1.18	0.006	1.12
LT	-0.003	-0.60	-0.007 ***	-3.14	-0.022 ***	-3.02
LU	0.016 ***	3.00	0.006 ***	2.89	0.006	1.07

LV	0.017 ***	3.58	0.005 ***	2.61	0.000	-0.02
MT	-0.013	-1.52	-0.004	-1.43	0.000	0.00
NL	-0.004	-0.68	0.000	-0.02	0.003	0.66
PL	0.006	1.13	0.000	0.00	-0.006	-0.98
PT	-0.006	-1.11	-0.003	-1.31	-0.003	-0.53
RO	0.003	0.50	0.000	0.13	-0.002	-0.31
SE	-0.002	-0.39	0.001	0.44	0.005	0.94
SI	0.011 **	2.32	0.002	1.26	-0.003	-0.50
SK	0.002	0.42	0.001	0.30	0.000	-0.03

Notes: Asterisks ***, ** and * denote statistical significance at the 1, 5, and 10 percent level. Standard errors are based on robust standard errors. The average marginal effects (dy/dx) are calculated based upon sample means. The number of observations is 26,500.

Table A I: Pearson chi square test of differences in the provision of transportation or accommodation services across characteristics

	Pearson chi-square	Transportation	Accommodation
	<i>Degrees of freedom</i>	<i>P-value</i>	<i>P-value</i>
Sex	1	0.000	0.095
Age	5	0.000	0.000
Occupation	15	0.000	0.000
Population density	2	0.000	0.000
Country of residence	27	0.000	0.000
GDP per capita categories	3	0.309	0.633

Notes: The table provides results of the Pearson-Chi-Square test whether the differences in the provision of transportation or accommodation services are significant across the characteristics. The test is recommended for large sample sizes with 1,000 or more observations (McDonald, 2009) and requires that no more than 20 percent of the cells in the expected frequency table contain numbers smaller than five, and no cell should be smaller than one (Cochran, 1954).

Table A II: Determinants of provision of transport and accommodation services via collaborative-economy platforms (bivariate Probit estimations), inclusion of regulation dummy variables

	Transportation		Accommodation	
	<i>coeff.</i>	<i>z-stat</i>	<i>coeff.</i>	<i>z-stat</i>
Restrictions on Uber	0.717 ***	3.17		
Restrictions on short-term rentals			-0.061	-0.47
Socio-economic characteristics	yes		yes	
Population density	yes		yes	
Ln GDP <i>per capita</i>	yes		yes	
Country of residence	yes		yes	
Log pseudolikelihood	-3905			
Number of observations	26335			
	<i>coeff.</i>	<i>z-stat</i>	<i>coeff.</i>	<i>z-stat</i>
Restrictions on Uber	0.069 *	1.70		
Restrictions on short-term rentals			-0.074	-0.63
Socio-economic characteristics	yes		yes	
Population density	yes		yes	
Ln GDP <i>per capita</i>	yes		yes	
Country of residence	no		no	
Log pseudolikelihood	-4082			
Number of observations	26335			

Notes: This table reports the average marginal effects (dy/dx) for the regulation dummy variables including all socioeconomic characteristics. The number of observations is 26,500.

Table A III: Determinants of provision of transport and accommodation services via collaborative-economy platforms (bivariate Probit estimations), robustness check excluding self-employed

	Transport services & no accommodation service			Accommodation services & transport service			Accommodation services & no transport service		
	dy/dx		z-stat	dy/dx		z-stat	dy/dx		z-stat
Sex (reference category: male)									
Female	-0.008	***	-5.95	-0.001	**	-2.33	0.003	***	2.57
Age (reference category: 15-24)									
Age 25-34	0.004		1.28	0.003	**	2.39	0.006	*	1.85
Age 35-44	-0.006	*	-1.73	0.000		-0.14	0.004		1.10
Age 45-54	-0.010	***	-2.87	-0.003	*	-1.91	0.000		-0.14
Age 55-64	-0.010	***	-3.01	-0.003	**	-2.14	-0.001		-0.29
Age 65+	-0.020	***	-4.34	-0.008	***	-4.33	-0.008	**	-1.99
Occupation (reference category: unemployed/without a professional activity)									
Professionals (lawyer, medical)	0.005		1.50	0.003	**	2.15	0.004		1.32
General management, director or top management	0.009	**	2.20	0.006	***	3.83	0.011	***	3.16
Middle management	0.004		1.27	0.002	*	1.78	0.003		1.06
Civil servants	0.008	**	2.24	0.003	**	2.12	0.002		0.59
Office clerk, salesman, nurse	0.003		1.05	0.000		0.16	-0.002		-0.75
Supervisor, foreman (team manager)	0.005		0.74	0.002		0.87	0.003		0.42
Manual workers	-0.005		-1.37	-0.002	*	-1.76	-0.003		-0.93
Looking after home	-0.004		-0.88	-0.002		-1.22	-0.002		-0.68
Student	-0.001		-0.23	0.000		-0.18	0.000		-0.02
Retired	-0.003		-0.70	0.000		-0.27	0.001		0.37
Population density (reference category: rural)									
Small and medium sized city	0.001		0.71	0.001		1.60	0.002		1.30
Large city	0.004	**	2.27	0.003	***	4.78	0.007	***	4.27
Log GDP per capita	-0.001		-0.41	-0.001		-0.66	-0.001		-0.46
Place of residence (country([reference category: DE])									
AT	-0.004		-0.64	-0.001		-0.39	0.001		0.13
BE	0.010	**	2.19	0.002		1.14	-0.002		-0.41
BG	0.002		0.27	-0.001		-0.22	-0.003		-0.48
CY	-0.026	***	-2.57	-0.008	**	-2.38	-0.003		-0.52
CZ	0.005		0.94	-0.001		-0.48	-0.007		-1.22
DK	0.011	**	2.33	0.004	**	2.46	0.004		0.80
EE	-0.010		-1.38	-0.006	**	-2.43	-0.010		-1.60
ES	0.008	*	1.81	0.004	**	2.28	0.005		1.15
FI	-0.013	*	-1.69	0.000		-0.01	0.010	**	2.14
FR	0.021	***	4.84	0.007	***	4.07	0.004		0.92
GB	-0.011		-1.54	-0.005	**	-2.00	-0.005		-0.92
GR	-0.011	*	-1.65	-0.002		-0.98	0.002		0.48
HR	-0.004		-0.69	0.002		0.98	0.009	*	1.84
HU	-0.006		-1.01	0.000		-0.16	0.004		0.74
IE	-0.011	*	-1.70	0.000		-0.08	0.008	*	1.80
IT	-0.001		-0.12	0.001		0.83	0.005		1.07
LT	-0.004		-0.70	-0.006	***	-2.59	-0.014	**	-2.36
LU	0.015	***	2.92	0.006	***	2.88	0.007		1.29
LV	0.017	***	3.54	0.005	***	2.59	0.001		0.15
MT	-0.011		-1.31	-0.004		-1.50	-0.003		-0.44
NL	-0.002		-0.34	0.001		0.43	0.004		0.81
PL	0.007		1.29	0.001		0.40	-0.003		-0.58
PT	-0.006		-1.05	-0.002		-1.11	-0.002		-0.37
RO	0.005		0.79	0.001		0.68	0.001		0.12
SE	-0.005		-0.79	0.000		0.19	0.005		1.00
SI	0.010	**	2.15	0.002		0.94	-0.003		-0.58
SK	0.004		0.71	0.001		0.52	0.000		0.00

Notes: Asterisks ***, ** and * denote statistical significance at the 1, 5, and 10 percent level. Standard errors are based on robust standard errors. The average marginal effects (dy/dx) are calculated based upon sample means. The number of observations is 23,746.

Table A IV: Determinants of provision of transport and accommodation services via collaborative-economy platforms (bivariate Probit estimations), robustness check quadratic specification for age

		Transport services			Accommodation services			Accommodation services		
		& no accommodation service			& transport service			& no transport service		
		dy/dx		z-stat	dy/dx		z-stat	dy/dx		z-stat
Age	ln Age									
20	3.00	0.018		1.50	0.016	***	4.48	0.028	***	3.82
30	3.40	-0.017	**	-2.40	-0.004		-1.27	0.004		0.57
40	3.69	-0.031	***	-5.47	-0.016	***	-5.96	-0.020	***	-3.69
50	3.91	-0.032	***	-5.93	-0.017	***	-6.88	-0.030	***	-5.05
60	4.09	-0.025	***	-7.87	-0.012	***	-8.52	-0.029	***	-6.61
70	4.25	-0.018	***	-11.81	-0.007	***	-9.42	-0.023	***	-10.22
Socio-economic characteristics		Yes			Yes			Yes		
Population density		Yes			Yes			Yes		
Ln GDP per capita		Yes			Yes			Yes		
Country of residence		Yes			Yes			Yes		

Notes: Asterisks ***, ** and * denote statistical significance at the 1, 5, and 10 percent level. Standard errors are based on robust standard errors. The average marginal effects (dy/dx) are calculated based upon sample means and different values for ln age. The number of observations is 26,500.