

Article

Sustainable Platform Economy: Connections with the Sustainable Development Goals

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Received: 30 July 2020; Accepted: 14 September 2020; Published: 16 September 2020



Abstract: The platform economy is growing exponentially while creating expectations for its potential to contribute to a sustainable development. However, research aimed at showing the potential contribution of each platform's business model to sustainable development is needed. The Sustainable Development Goals (SDGs) are driving the policy agenda, but it remains unclear how far they encourage a sustainable platform economy. First, this article aims to study how each different type of platform contributes to sustainable development. Second, it analyses if and how the factors that contribute to the sustainable design of platforms are considered in SDGs. The paper departs from a framework of sustainable democratic qualities of the platform economy that considers governance, economic sustainability, technological and data policies, social responsibility, and external impact dimensions. The study is based on an empirical analysis of 60 platforms. The results show that a sustainable design of a platform economy promotes sustainable development. Furthermore, the contributions of the sustainable dimensions of a platform to SDGs are mainly connected to the impact and responsibility and the economic model, but governance and data dimensions are not present in the SDGs. This suggests that SDGs should improve their digital perspective to intertwine better with the sustainable platforms.

Keywords: platform economy; SDGs; sustainable development; agenda 2030; sustainability

1. Introduction

1.1. Platform Economy Sustainability

The platform economy (also known as collaborative platform economy or sharing economy) is used as a floating signifier for interactions among distributed groups of people supported by digital platforms that enable them to exchange (matching supply and demand), share, and collaborate in the consumption and production of activities leveraging capital and goods. It is growing rapidly and exponentially, creating great interest while also becoming a top priority for governments around the globe [1,2].

At the same time that the platform economy is creating high sustainability expectations for its potential to contribute to a sustainable development of society [3–5], there is confusion about the platforms that present themselves as collaborative when, actually, they are not; there are similar uncertainties and ambiguities associated with diverse models. The disruptive impact of the best-known platform economy models, those of Unicorn extractionist corporation platforms like Uber and Airbnb, is provoking huge controversy [1]. The activity generated by global platforms such as Uber or Airbnb is considered as a new form of extractive capitalism, regulated by a digital platform, in what is called

“platform capitalism” [6], while the alternative, generated around cooperativism and the Social and Solidarity Economy (SSE), is shaped as “platform cooperativism” [7]. The Social Solidarity Economy is conceptualized as an alternative to capitalism and aims to transform the social and economic system, which includes public, private, and third sectors. Beyond a theoretical approach, “SSE has the ability to take the best practices that exist in our present system (such as efficiency, use of technology, and knowledge) and transform them to serve the welfare of the community based on different values and goals” [8]. In this sense, platform cooperativism adopts the principles of cooperativism and the values of SSE to promote an alternative to platform capitalism. While successful alternative and truly collaborative models exist, such as open commons, platform cooperativism, and decentralized organizations based on a social economy and open knowledge, they have received limited policy and research attention. The empirical analysis of the platform economy (except for paradigmatic cases such as the FLOSS and Wikipedia communities) and public debate are mainly focused on the study of global platforms such as Deliveroo, Uber, and Airbnb [9,10]. Another lack in alternative collaborative models studies is that they have focused mostly on providing frameworks for analysis or organizational principles [7,11], but few are the studies that have empirical case analyses, and those performed have mainly focused on highly paradigmatic projects such as Fairbnb [12,13] or SMart [14]. In this regard, Como et al. [15] developed an exploratory analysis based on interviews with cooperatives, first in Italy and then in nine other European countries, on the attitudes of cooperatives toward the platform economy and a mapping of online surveys of cooperatives that are implementing innovations in the platform economy field [16]. Later, Martinelli et al. [17] published an investigation in which they presented different cases of platform cooperatives, realizing their potential to create and promote quality jobs using digital platforms but without depending exclusively on their adoption. However, the article does not analyze how each of the organizations presented achieves, or does not achieve, improved working conditions and the other democratic qualities, it only glimpses its potential (ibid).

In order to cover this lack of assessment of platform economy sustainability, there has been little research performed. On the basis of the democratic qualities of the platform economy [18], the Multidisciplinary Balance of Platform Economy proposes a holistic analysis of the key elements that constitute a platform and its impact on the goal to characterize the different models of platform economy [19]. The results of its application found a correlation between governance and technology and data models, and it further demonstrated that governance, which plays a central role, is correlated with the economic model.

1.2. Platform Economy and Sustainable Development Goals (SDGs) Literature Review

The history of sustainable development promoted by the United Nations has a long path, starting in 1972 at the United Nations Conference on the Human Environment held in Stockholm; it focused on delineating the “rights” of the human family to a healthy and productive environment [20]. In 2000, eight international Millennium Development Goals (MDGs) for the year 2015 were established, following the adoption of the United Nations Millennium Declaration. The MDGs lead to the Sustainable Development Goals (SDGs), a collection of 17 global goals designed to be a “blueprint to achieve a better and more sustainable future for all”, which succeeded the MDGs [21]. The SDGs, set in 2015 by the United Nations General Assembly and intended to be achieved by the year 2030, are part of UN Resolution 70/1, the 2030 Agenda [22].

Based on a recent content analysis of 74 papers from the database Web of Science, which focused on the relationships between the platform economy, sustainability, and SDGs, Boar et al. [23] conclude that the sharing economy has an impact on the three dimensions of sustainability also related to the SDGs: social (improving the quality of life), economic (new opportunities for companies), and environmental (the reduction of emissions and waste). However, the research highlights three main elements: (1) Despite platform economy studies reinforcing the opportunity for better sustainability, there are some controversial aspects, such as the lack of regulation and social conflicts to be solved; (2) the majority of papers are focused on the economic and social dimensions, and there is a gap in the literature about

the environmental implications of the platform economy to the SDGs; (3) the research performed on the platform economy and SDGs is mainly focused on accommodation and entrepreneurship, missing some important areas such as mobility or collaborative consumption.

From a digital perspective, despite it being demonstrated that organizations can take advantage of their data understanding and preparation to align with overall business sustainability [24], the SDGs declaration shows a lack of attention to the critical role of ICTs in shaping contemporary development [25]. ICTs are not mentioned directly in any of the SDGs and are only mentioned in but 4 of the 169 targets. Indeed, in a further analysis, Unwin indicates that the Sustainable Development Goals give less attention to ICT4D than did the expired Millennium Development Goals promoted in 2000 [26] (p. 17). This disinterest in ICTs is a symptom of a total disdain for governance emancipation in terms of democracy, political participation, deliberation, and co-decision [27].

On the other hand, to study the potential of the platform economy for sustainable value creation, Laukkanen and Tura [28] introduced a specified categorization of different platform economy models and a conceptual framework based on the sustainable value creation and sustainability business principles [29] and cross-checked them with the 17 SDGs to help analyze their sustainable value creation potential. The results of this research emphasize that managing P2P business models requires special attention to human resources and governance policies. Furthermore, commons-oriented business organizations based on the Social and Solidarity Economy, can contribute to extending the scope of SDGs as horizontal enabling innovators [30]. At the same time, SDGs can benefit from responsible innovation in the transformation of their business models [30,31].

1.3. Research Proposal

This paper aims to contribute to the debate and state of the art of digitalization of SDGs by providing an analytical framework of how a sustainable design of the platform economy could contribute to the SDGs. In addition, it applies it to study how far the different platform economy models have unlike implications in terms of sustainability. In order to develop an analysis of the connection between a platform economy and SDGs, the research takes advantage of the Multidisciplinary Balance of Platform Economy that considers the dimensions of governance, economic strategy, technological base, knowledge policies, impacts, and social responsibility toward the externalities of the platforms [19]. In the following section, each variable of these six sustainable platform economy dimensions has been analyzed to study how it can contribute to achieving the objectives of the Sustainable Development Goals.

From this new framework, also adapted to labor intensive platforms, the article crosses the analysis of 60 platform economy cases belonging to four main areas of platform socioeconomic impact—networked hospitality, taxi services, urban food delivery, and domestic services—with the contributions that they provide to the SDGs.

2. Framework of the Analysis

The present work links the democratic qualities of the platform economy [18] to overcome the aforementioned challenges promoted by the SDGs. The Multidisciplinary Balance of Platform Economy [19] enables researchers and policymakers to analyze digital platforms and compare different models by exploring the platform economy initiatives in terms of their democratic and sustainable features. The quality balance examines the economic strategy, governance, technology, data policy, impact, and social responsibility toward platform externalities (Figure 1).

These dimensions take into consideration the democratic qualities that come from the cooperative literature, [32] which, in response to capitalism, point to the importance of the link between governance and the economic model, as well as the impact and responsibility of social studies. They also take advantage of commons studies, such as the commons of the Ostrom school that emphasizes governance [33] and the Cyber Scholar school that emphasizes the conditions of access and knowledge property policies [34–36].

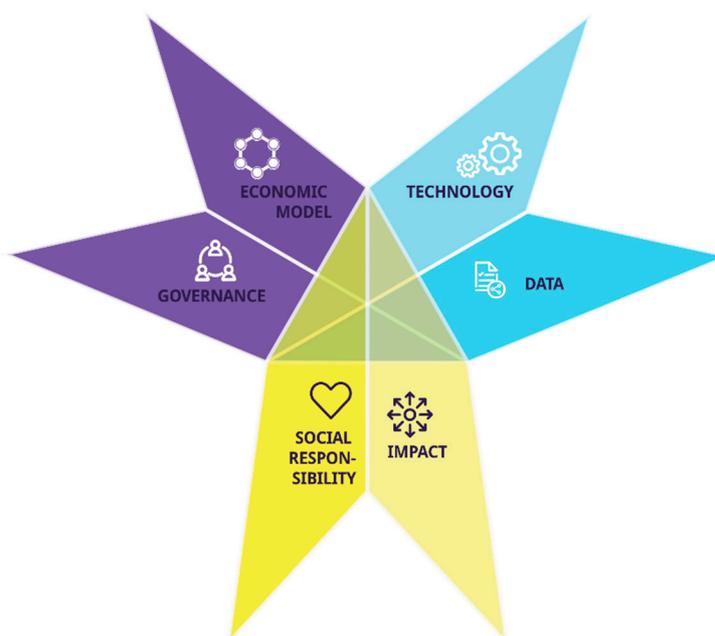


Figure 1. Multidisciplinary Balance of Platform Economy (Fuster Morell and Espelt, 2019).

For this research, the 17 Sustainable Development Goals (SDGs) promoted by the United Nations have been linked to the Multidisciplinary Balance of Platform Economy. Our analysis of the results looks in depth at the apparent connections that have been established between the platform design level (regarding the sustainable democratic qualities) [19] and how they relate to global goals defined in the SDG.

The governance dimension of the framework evaluates governance concerning platform provision (transparency, policies of participation, and legal constitution) as well as governance at the platform interaction level (matching platform functionalities with the grade in which users can participate). In this case, there are no connections between the indicators used to assess platform governance and the targets developed in the different SDGs' goals.

The economic dimension studies the relationship between the economic benefits (distribution and destination) and their social impact (labor conditions and rights and type of growth); the economic sustainability of the project and their financial models were considered as well. Several indicators of the democratic qualities of the platform economy that refer to the economic model (growth model, job creation, juridical recognition, working conditions, earnings maximization and income security, minimum salary, salary equality, right to log off, workers' caring support, health workers' safety, and gender equality) are mainly embedded in goal 8 (promote inclusive and sustainable economic growth, employment, and decent work for all) but also have connections with goals 1 (end poverty in all its forms everywhere), 3 (ensure healthy lives and promote well-being for all at all ages), and 4 (quality education).

The openness of technological policies refers to technological architecture and software (considering the grade of reproducibility) that favors openness and freedom (categorizing the type of platform license), which links with goal 9 (build resilient infrastructure, promote sustainable industrialization, and foster innovation). Two elements of platform knowledge policies are adopted, data (access to user-generated data) and content (user-generated content license), to assess the democratic sustainable qualities of a platform economy. On these terms, there are not any SDGs that consider platform knowledge.

Social responsibility and impact relate to awareness or responsibility toward the negative implications of the platform economy, including social inequalities and social exclusion. They also concern equal access to the platform regardless of gender, social class, or income. In addition to this, social responsibility and impact involves the common good of the city, the preservation of

inhabitants' rights to the city, the impact of the platform economy in terms of the environment and policy, compliance with health and safety standards, and the protection of public space and human rights. Social responsibility and impact dimensions match with the majority of the SDGs: 1 (end poverty in all its forms everywhere), 2 (zero hunger), 3 (ensure healthy lives and promote well-being for all at all ages), 5 (achieve gender equality and empower all women and girls), 7 (ensure access to affordable, reliable, sustainable, and modern energy), 8 (promote inclusive and sustainable economic growth, employment, and decent work for all), 9 (build resilient infrastructure, promote sustainable industrialization, and foster innovation), 10 (reduce inequality within and among countries), 11 (make cities inclusive, safe, resilient, and sustainable), 12 (ensure sustainable consumption and production patterns), 13 (take urgent action to combat climate change and its impacts), 14 (conserve and sustainably use the oceans, seas, and marine resources), 15 (sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss), 16 (promote just, peaceful, and inclusive societies), and 17 (revitalize the global partnership for sustainable development). Figure 2 shows the connection between the democratic qualities of the platform economy and the SDGs.

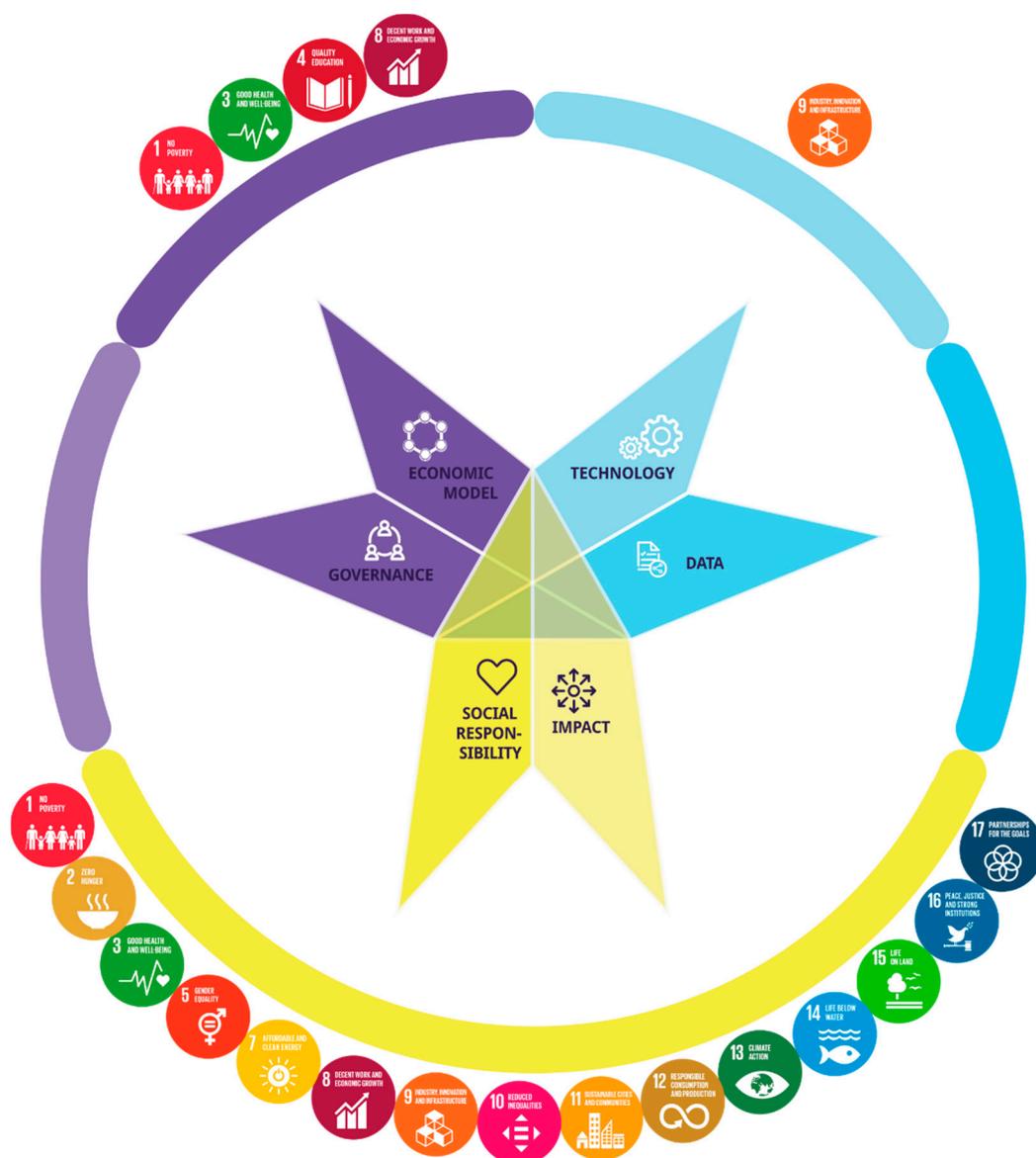


Figure 2. The Star of Democratic Qualities of Digital Platforms with the Sustainable Development Goals incorporated.

3. Methodology

3.1. Sample

The sample is formed by a total of 60 cases (see Appendix A). The selection has been guided by three main criteria:

- (1) First, the selected platforms are related to four working areas: networked hospitality, taxi services, urban food delivery, and domestic services. In order to develop cluster analysis among cases of the same area, 15 cases per area have been selected.
- (2) Second, to be able to gather up the different models that coexist in the platform economy, the sample includes diverse platform models. Indeed, 30% of the global sample was formed by models that aim to become an alternative to for-profit platforms. This allows us to compare different models in terms of economic goals and differentiating among the fourth sectors of the study.
- (3) Finally, although for the sample (Table 1) we account for a proportionally higher amount of for-profit business models, it is the reverse in the 20 cases studied in depth, where more than 50% of the cases (11 out of 20) were non-profit business models. This implies that this study offers a deeper knowledge about non-profit business initiatives in the four sectors studied than of for-profit business models (see Table A1 for detailed information about cases selection by sector and type of platform).

Table 1. Sample grid for categories considering unicorns versus alternatives.

Sector	Number of Platforms	Unicorn	Alternatives
Networked hospitality business	15	9	6
Taxi and car-sharing services	15	12	3
Urban food delivery	15	7	8
On-demand home services and care	15	11	4
Total	60	40	20

3.2. Data Collection and Data Analysis

A “codebook” (see Appendix B) for data collection—a set of indicators related to the analysis variables—was employed. The codebook departs from the Multidisciplinary Balance of Platform Economy framework. The design from the outset is based on multidisciplinary analysis of the state of the art of the platform economy from economical, technological, environmental, gender and inclusion, and legal and policy perspectives.

Data collection was based on two methods: web collection and a structured interview. Web collection was based on digital ethnography of the web platforms and was applied to all 60 cases. In addition, we also performed a structured interview with 20 of these 60 cases. We tried to reach as many projects as possible through a snowball sample strategy. However, reaching out to these cases was easier with some than others. In short, it was easier to obtain participation from non-profit business models than for-profit business models. Another noticeable behavior was that the bigger the business models (normally also for-profit), the more time they needed to make a decision.

Finally, during data collection, “field notes” of general impressions were kept in a field book to have detailed qualitative data about study cases.

A single researcher collected the data. To guarantee the reliability of the sample, two other researchers tested the indicators of the codebook with a set of cases and verified the information collected for a number of cases by the main data collector. In this way, we controlled the quality of our data.

First, the same researcher that collected the data reviewed all of it to detect any possible mistakes during its collection. Later, some of the indicators that had been used were adapted to include answer

options that had not been previously considered. For example, regarding the labor model of the platforms, two options had been previously used: “self-employed workforce” or “paid-employment workforce”. After this revision, and thanks to the notes collected during the interviews, a new option of “mixed model” was included. The database was used to develop descriptive statistics (percentages and proportion of cases) of the several variables gathered during both web and phone data collection.

4. Results

In this section, the analysis of the cases through the Multidisciplinary Balance of Platform Economy framework is presented. The starting point is the recognition of the platform economy as a diverse and dynamic field. Considering this, the aim of this report is more related to mapping a plural “galaxy” than drafting a clear line of delimitation as to what each model of the platform economy is and what it is not. Each of the cases studied results from varied combinations of elements rather than a few established boundaries or formulas.

4.1. Typology of the Platform Economy

The analysis points to a diverse ecosystem in terms of geographical expansion of the cases studied in depth. In this regard, six of the 20 cases studied are operating outside of Europe, and four are operating in several European countries. Thus, 10 of the cases studied are operating internationally, of which five are alternative platforms to unicorn ones. Of these five platforms, four are not-for-profit business and just one project is a social business (framed under a commercial legal entity). Regarding the platforms that are operating in just one country or on a local level, 10 platforms have been studied, of which seven are not-for-profit business models. This implies that out of the nine for-profit business models studied, just three are operating at a country or local level, whereas out of the 11 not-for-profit business models, the number of businesses operating at a country or local level totals seven.

The analysis points out that the platform economy, with a special attention on lean platforms, does not rely completely on the platforms to function properly (Table 2). On the one hand, there are some organizations that are using the platform as a support for their daily activity (31.7%), but if the platform did not exist, they would still be able to continue functioning. On the other hand, other organizations rely completely on the digital platform (68.3%). In these cases, if the platform did not exist, the organization would be unable to continue operating. In other words, their business model relies completely on the existence of the platform.

Table 2. Type of connection with the digital environment (n = 60).

Type of Connection with the Digital Environment	Number	Percentage
Digital based	41	68.3%
Digital supported	19	31.7%

Of the 41 platforms that are what we called “Digital Based”, just six of are not-for-profit business models with no social oriented business. This means that from a total of 18 alternative models, for just 33% is the platform a key component upon which their business model depends. This is not the same for for-profit business models; out of the 42 cases studied, 85% depend on the platform to be able to function properly as a business.

Finally, regarding the type of interaction between the users, most of the 60 organizations studied (85%) are Business to Consumer (B2C). Three platforms are Business to Business (B2B) and six are Peer to Peer (P2P).

4.2. Governance

Regarding platform governance, both the informal and formal mechanisms that shape platforms’ governance dimensions have been evaluated. First, the informal mechanisms are measured by

evaluating: (1) the relationships with platform users (this means consumers, producers, workers, and collaborators, among other types of users); (2) the existence of workers' or producers' spaces for self-organization; and (3) decision-making processes (from the most democratic to the least). Consideration is then given to the formal mechanisms that give shape to the platform governance and are included as main dimensions: (1) the platform's legal constitution and (2) policies for participation and economic transparency.

4.2.1. Informal Mechanisms

Analysis regarding informal mechanisms shows that 14 out of the 20 platforms studied consider that they are enabling workers' spaces for organization. In this case, 13 of them are alternative business models (beyond platform cooperatives, for-profit social businesses are included). It is important to note that one for-profit platform (Case 19) considers that the company is providing spaces to workers' organization, as they are able to meet in the streets during working hours, but explained that this is something that the company does not want to foster.

Similarly, in one of the for-profit business cases studied (Case 29), when a manager of the platform was asked about the provision of spaces for workers' organization, they argued that workers (the participant referred to them as "collaborators") have a specific space to provide comments about each of the services performed and that the platform does not see their comments. The participant later explained that although they would like to have closer contact with collaborators to improve the service, they did not do so because they wished to make clear the non-dependent working relationship between the parties, where legal requirements specific to a paid employee do not apply.

Another indicator included in the informal mechanisms analysis aims to measure the existence of a decision-making democratic process. In order to do so, the participants are asked if the platform is using any type of technologically enabled tool for decision-making, if it relies on traditional mechanisms such as a postal vote, or, lastly, if it is not using any type of mechanism. Consequently, it is differentiated between the cases that have established a democratic decision-making system (formalized to include both traditional and technology enabled tools) and informal accounting for those cases in which there is no type of protocol established. In this regard, 11 of the 20 platforms studied have established a democratic decision-making system, all of which are considered as alternative models to unicorn platforms. Of those that have not (nine cases), two are considered as alternative business models. It is important to note that one of these cases is a not-for-profit model (Case 50) that has only recently been created, and the other is a for-profit social business (Case 31). This implies that all the for-profit business models studied in depth and considered as unicorns (or potential unicorns) have not established any type of system for democratic decision-making.

4.2.2. Formal Mechanisms

Concerning formal mechanisms, one of the key indicators is the legal format of the platforms studied. The analysis shows that the platform economy has a varied makeup that goes beyond for-profit models, as shown in Table 3. Of the platforms studied, 71.7% are commercial companies, while 28.3% are based on not-for-profit legal formats.

Table 3. Legal entity of the platform.

Legal Entity of the Platform	Number	Percentage
Foundation	1	1.7%
Association	4	6.7%
Cooperative	12	20%
Commercial Legal Entity	43	71.7%

Regarding the user's involvement in formal rules and policies that govern the platform from a community interaction perspective, 14 out of 20 cases consider that users can participate in the

definition of formal rules and policies of the platform, while six consider that they cannot. Secondly, in almost half the sample (9 out of 20), those making decisions regarding the use and distribution of platform benefits are its owners, while the other half are all the members (nine out of 20) (Table 4).

Table 4. Workers as agents of decision making regarding the use and distribution of the platform's profit and loss results (n = 20).

Agent of Decision Regarding the Use and Distribution of the Platform P and L Result	Number	Percentage
Members	9	45%
Owners	9	45%
N/A	2	10%

Of the 14 cases that consider users able to participate in the definition of formal rules and policies, we find four in which owners are the agents of decision-making regarding the use and distribution of the profit and loss result. This implies that, although these platforms include users in the definition of formal rules and policies, they are less democratic than the other 10 cases, as not all the members have the right to vote formally guaranteed.

With respect to platforms' external economic transparency, most projects (17 out of 20) do not publish their financial statements openly on their websites, while the rest do. However, the level of internal economic transparency is also quite opaque, with 13 out of 20 projects not allowing all of the legal entity members to have access to the profit and loss account.

4.3. Economic Model

To be able to differentiate among different economic models in the platform economy, indicators from different aspects of platforms' economic models—economic orientation, economic sustainability, and financing models—are included.

4.3.1. Economic Orientation

Regarding the projects' economic orientation, we have taken into account the type of legal entity, the type of distribution of the economic benefits, the growth model, the commercial character of the platform, and the use (or not) of banking services ethics.

First, regarding the distribution of economic benefits, it has been considered whether they are either reinvested in the project, divided between the owners, or other options. In this case, 100% of the projects state that they are currently reinvesting all their benefits (if existing) in the project. Second, with regard to the growth model, it has been differentiated between models that aim to: (1) escalate without changing their governance model and without the idea of selling the platform in the future, (2) sell the platform in the future when there is a highly-profitable purchase offer, and (3) grow progressively, decentralizing the platform's governance. Nine out of the 20 projects studied in depth have it in mind to grow progressively, decentralizing governance. Seven out of the 20 projects studied aim at escalating without changing their governance model and without the idea of selling the platform in the future, and, finally, three projects out of the 20 have in mind selling the platform in the future. Thirdly, it has also been considered whether monetary exchanges between users are either never produced (four out of 20), almost never produced (zero out of 20), sometimes produced (two out of 20), often produced (four out of 20), or almost always produced (10 out of 20).

4.3.2. Economic Sustainability

Regarding economic sustainability, the analysis shows that most of the projects studied (75%) have still to reach the break-even point. Moreover, as detailed in Table 5, there does not seem to be a clear relation between legal entity and economic sustainability.

Table 5. Project economically sustainable. Break-even point reached (n = 20).

Legal Entity Type	Break-Even Point Reached	Proportion
Cooperative	1	1 out of 8
Association	2	2 out of 3
Commercial Company	2	2 out of 9
Total	5	5 out of 20

4.3.3. Platforms' Financing Sources

In this section, the results of the study on the resources used by platforms as funding are shown. The most commonly-used forms of funding by the overall sample of projects are “family savings” and “public funds”. Although proportionally a higher number of the cooperative projects studied have received public funds (five out of 8), a significant proportional amount of commercial cases has also received funding from public institutions (five out of 9). Moreover, the proportion of non-profit projects (the sum of the number of cooperatives and associations) is equal to the proportion of commercial companies that have received public funds.

Regarding investment from family savings, cooperatives had a lower incidence (three out of eight than commercial companies (six out of nine). It was also asked if the project relies on any type of equity investment. To simplify the analysis, both preferred stock (no right to vote) and common stock (right to vote) were included. The commercial companies studied rely more on this type of funding (five out of nine), whereas just one cooperative has used equity investment as a financing resource. There are also very similar results for the “debt investment” case, in which five out of nine of the commercial companies are using debt as an investment source, while just two out of eight cases of cooperative platforms are relying on this type of funding.

Regarding cooperatives, the most used sources of funding are public funds and non-monetary donations from the community, in five out of eight cases. Other important sources for the cooperatives studied are compulsory members' fees (four out of eight cases), followed by family savings, non-monetary donations from external actors, monetary donations, and direct micro-participation, all of which are used by three cases. Sources of funding less used by the cooperatives studied were debt investment and research grants (two cases out of eight), followed by equity investment and the sale of merchandising used by one case. Finally, neither advertising nor premium services and/or products are a source of funding for the eight cooperatives studied.

This is quite similar for the three associations studied that mainly rely on family savings and compulsory member fees (two out of three cases). Again, public funds, monetary donations, and non-monetary donations from the community (one out of three) are at least mentioned. Moreover, as in the case of cooperatives studied, a source of funding not mentioned is advertising.

Perhaps not surprisingly, the picture looks quite different for the commercial companies studied (Figure 3). In this case, the most used source of funding by the projects interviewed is family savings, used by six out of nine. Other important sources of funding are equity investment, debt investment, and public funds. All four sources of funding are used by five out of nine cases. These main sources are followed by the offering of premium services and/or products through the platform (four out of nine), compulsory fees (three out of nine), the sale of merchandising and advertising (two out of nine), and research grants (one out of nine). Finally, sources of funding that are important for not-for-profit models remain either insignificant or almost insignificant for for-profit models. Regarding non-monetary donations from the community, non-monetary donations from the external actors, monetary donations, and direct micro-participation, only the latter is mentioned, but only by one project out of nine.

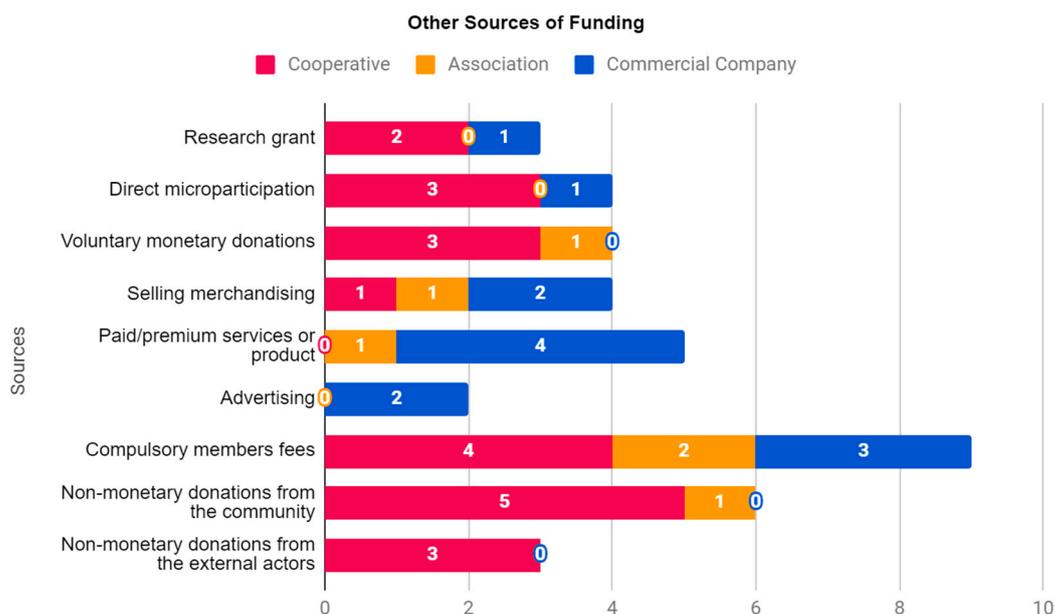


Figure 3. Platforms' other sources of funding (n = 20).

4.3.4. Platforms' Labor Models and Working Conditions

Regarding a platform's labor model and working conditions, several indicators have been evaluated. In the first subsection, the juridical status of platform workers and whether they are paid a fixed income per hour or if pay is dependent on the number of tasks and/or deliveries completed are evaluated. In the second subsection, several indicators are evaluated, related to platform managers' subjective valuation of platform workers' working conditions, such as whether they are working in a safe physical environment, developing high skills, performing short, repetitive tasks, and so forth. Finally, in the third subsection, indicators related to geolocation, algorithmic management, and the use of gamification techniques are included.

A. Juridical Status Differentiating Per Business Model

Out of the 20 cases studied, in a total of five cases platform workers are considered paid-employment contractual figures, four are self-employed figures, 10 have a mixed model, and in one case they are not considered as a worker, as that case relies on 100% voluntary work.

In this regard, it is found that among unicorn or extractivist business models, the most used model is the mixed one (four out of seven), followed by a complete reliance on self-employed workers (two out of seven) and paid employment (one out of seven). In contrast, despite the fact that alternative business models studied also rely mainly on mixed models (6 out of 13 cases), an important number of cases consider workers as having paid-employment recognitions (four out of 13).

The most popular type of model among the sample of cases is a mixed model, applying to 10 out of the 20 cases studied in depth. This means that, in the platform economy, we find not just binary models, relying solely on either paid employees or on a self-employed workforce, but a combination of these two juridical recognitions. In addition, this mixed model also gathers up those cases where platform workers (those who perform commercial activities through the platform) are not considered as workers of the platforms' legal entities. This is the scenario for almost all of the cases included in the Networked Hospitality Business, a sector in which all the platforms involve a commercial activity but where there is no monetary exchange between hosts and guests, who are referred to as "users".

However, it is important to state that in the sample studied just one unicorn platform that considers workers in a paid-employment framework, whereas a greater number of alternative platforms consider platform workers as having paid-employment juridical recognitions.

Regarding the question of whether workers are paid an amount of fixed income per hour or if it is dependent on the number of tasks and/or deliveries completed, the results vary a lot depending on the type of labor recognition of platform workers. First, among those recognized as a self-employed workforce, there are two different models: a first model in which workers are paid per hour or units of time (three out of four), and a second model in which they are paid per the amount of deliveries or tasks completed (one case out of four). Second, among those business models in which workers are considered paid employees (five out of 20), all of them paid their workers per hour or equivalent units of time. Lastly, among those business models in which a self-employed workforce and a paid-employment workforce coexist with non-consideration of, for example, hosts as workforce, different models are again found.

First, according to the results, a combination of a self-employed workforce and a paid-employment workforce is made as an adaptation to local laws and agreements. This means that, in one territory, platform workers are considered self-employed, while in another territory, people who are doing the same tasks are considered paid-employment figures. Case 19 and Case 27, both for-profit platforms in on-demand home services and the urban food delivery sector, follow this model clearly.

However, other platforms depend on a combination of a self-employed and paid-employment workforce as an adaptation to local laws—platform workers having different recognition depending on the territory. Otherwise, each platform worker is treated as an independent case (e.g., Case 43).

In other cases studied, platforms decided to rely on Business to Business (B2B) relations to manage the platform's workforce. For example, Case 11 in Spain depends on a directly self-employed workforce of 3%, with the remainder subcontracted to other businesses—the participant suggested the figure of 400 businesses in Spain alone. This strategy can be seen as an answer to current public debates around the juridical recognition of platform workers. In this case, by subcontracting the workforce to other companies the platform passes the risk of following a misrecognition strategy to these companies, reducing the possibility of any legal consequences. The platform does not know how these workers are recognized, and, more importantly, it is not required by law to know it.

Lastly, there are cases in which platform workers (hosts, couriers, car drivers, cleaners, and so forth) are not considered as a “workforce” by the platform but instead are seen as “providers” or “producers”, with the platform simply acting as an intermediary in which the different users can interact within each other. Several alternative models that are formed by different local instances comment that in each local instance or each node, members decide the type of juridical recognition that they want to give to their workers and do not consider those that are under the daily development and maintaining of the platform (usually members of the cooperative) as a “workforce”.

B. Working Conditions and Future Options

Platform managers for each case were asked their subjective valuation of platform workers' working conditions (hosts, platform couriers, car drivers, and so forth). Of the 20 platforms studied, 15 managers believed that platform workers are working in a safe physical environment, while just four managers stated that conditions were unsafe. In addition, it was also found that most of the platforms studied (13 out of 20) consider that platform workers are developing high skills or learning new abilities while completing tasks, while seven out of 20 failed to give a positive answer. Third, in 13 out of 20 platforms studied, platform managers felt that platform workers are not dependent on tight deadlines, while five believed that their platform workers are dependent on them. Finally, half of the sample studied (10 out of 20 cases) agreed that platform workers are performing short-repetitive tasks, with eight out of 20 platforms stating that they were not.

In half of the cases studied (10 out of 20), platform workers are unable to work from home, while in seven cases they are. In Figure 4 it is observed that, in 14 out of 20 cases studied, platform managers state that platform workers are earning a salary per hour over the minimum wage, but in the six other cases they were not. Regarding wage equality, quite a polarized ecosystem can be seen. In almost half of the cases studied (nine out of 20), any legal member is earning at least twice as much as other

members, and for almost the same number of platforms (eight out of 20), there is at least one legal member who is earning at least twice as much as other members.

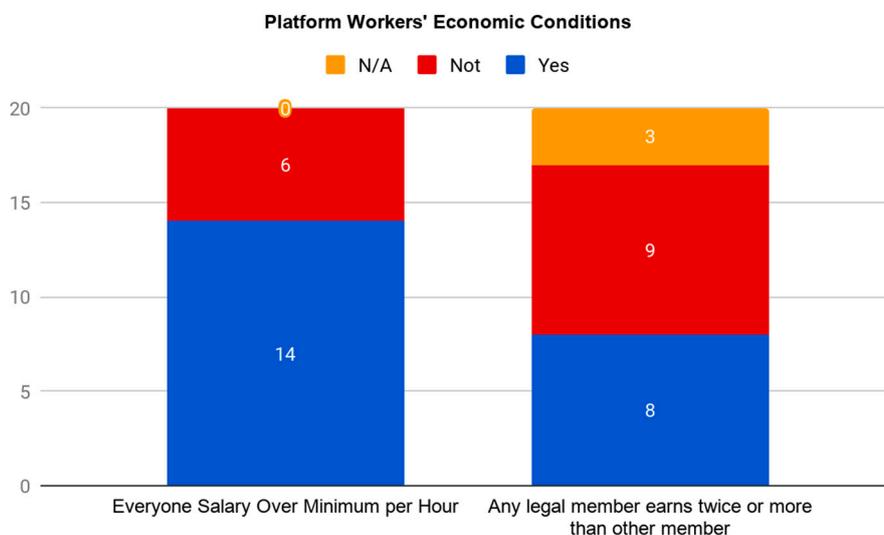


Figure 4. Platform workers' economic conditions (n = 20).

Regarding platform workers uncertainty and alternative job options, we asked managers whether they considered that “platform workers may lose current sources of income precedent from the platform activity in the next six months” and if they considered that “platform workers could easily find another job with a similar salary”. In the first case, 13 out of 20 cases consider that platform workers should not be afraid of losing the platform as a source of income in a half year view, while just two platforms out of 20 consider that they should be afraid. In the second case, nine platforms out of 20 considered that platform workers would easily find a job with a similar salary. However, it should be noted that almost half of the sample failed to give an answer to this question, while two cases stated that it would not be easy for them to find alternative options.

In most of the platforms studied (15 out of 20), consumer demand has peak hours or suffers from huge variations depending on the day of the week. However, in just one platform, the participant stated that platform workers are penalized if not working during these hours, while in most of the cases (14 out of 20), platform managers stated that workers were not.

Related to demand peak hours is modifying prices according to demand changes—also called “surge pricing”—which, in turn, can have an impact on a platform worker's income and its volatility. In this regard, seven out of 20 platforms stated that they change prices according to demand changes. However, in most of the cases studied (10 out of 20), platforms do not use this pricing technique.

C. Geolocation, Algorithmic Management, and Gamification Techniques

Regarding the use of geolocation techniques, it is found that most of the platforms (11 out of 20) are not using them, and between those that do, seven out of 20 stated that they are only using them during platform workers' working hours. None stated that they are constantly monitoring platform workers, i.e., even when they are not working, while two platforms did not give an answer to this question.

Between those 11 platforms that are not using geolocation techniques, we find seven alternative platforms in the networked hospitality business (three out of three alternative platforms studied in this sector), urban food delivery (three out of six alternative platforms studied on this sector), and the on-demand home services and care (one out of the two alternative platforms studied in this sector). It is also observed that four out of five lean platforms studied in the on-demand home services sector are also not using such geolocation techniques.

For algorithmic management techniques, a total of nine cases out of 20 are using them. However, here we find a clear difference between alternative business models and unicorn platforms. While just three out of 13 alternative platforms use algorithmic management, six out of seven unicorn platforms do, see Figure 5.

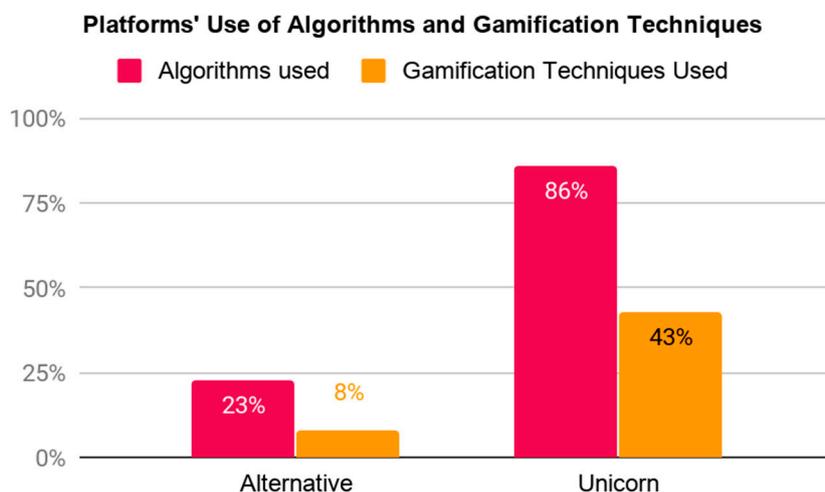


Figure 5. Platforms' use of algorithms and gamification techniques per platform type (n = 20).

In this regard, platforms were also asked what kind of variables they are introducing in algorithms and what weight each of them carries. Case 19, an urban food delivery unicorn platform, mentioned that among the variables that they are taking into account are the amount of time that the platform courier has used the platform, the number of deliveries done, if working in peak hours, and the consumer's score given to the platform courier service. Regarding the last variable, the participant commented that this score only affects couriers when it is their responsibility. For instance, if arriving late due to traffic, the platform courier is not penalized, but they are when providing bad service, such as yelling at a customer. Lastly, regarding peak hours, the participant advised that they are not penalized for not working them, as it has no impact upon their score. However, this specific case is considered as penalization. First, because it has a direct impact on the amount of hours worked/number of deliveries done by an individual, and, second, because it is not the fact that the courier's score is unaffected. Platform couriers have to be in a good position in the ranking made by an algorithm to be assigned a major number of deliveries and hours; if they decide not to work during peak hours, they go down the ranking, which will have a monetary penalty.

Moreover, it is also important to mention that while some platforms talk about "the algorithm" as if it was responsible for the whole management process, others do not. For instance, the participant from Case 32, an on-demand care services platform, explained some of the different variables that are taken into account. The participant commented that they are using more than 20 variables, but they do not accept criteria related to race or nationality. Between all these criteria, territorial proximity with the customer and previous experience with the pathology are found. From this information, the company derives a ranking of people, and then the company's human resources team decides who is allocated an initial interview with the customer. Ultimately, the customer will decide whose services to use (or not use) from those selected.

Another interesting example is an alternative taxi services platform, Case 12, in which they are using algorithms that try to give an equal distribution of the amount of work available to each driver. In addition, as most of the drivers are members of the legal entity, they have a right to vote on the whole algorithmic management system, including the variables that are considered. Moreover, the drivers in this case are not dependent on the platform, as they have the option to work without using its operation system.

On the other hand, regarding the use of gamification techniques (the use of game elements to incentivize platform workers toward certain behaviors), just four out of 20 platforms state that they are using them. More importantly, from these four platforms, three are unicorn platforms, while just one is an alternative model. This implies that out of the total amount of unicorn platforms studied, three out of seven are using gamification techniques compared to just one of the 13 alternative platforms studied.

Finally, just two of the 20 platforms states that platform workers can reject both algorithmic management and gamification techniques (where used) if they want to. More importantly, these two are both alternative platforms. This means that no unicorn platform has stated that platform workers are able to reject both algorithmic management and gamification techniques.

4.4. Technological Policies

Technological practices' and policies' openness refers to the adoption of software and technological architecture (Table 6) that favor freedom and openness.

Table 6. Platform's infrastructure architecture (n = 20).

Type of Infrastructure Architecture	Number	Percentage
Federated	1	5%
Centralized reproducible but not federated	1	5%
Centralized not reproducible	4	20%
Centralized in one entrance point	6	30%
N/A	8	40%

The results focusing on software openness show that 66.7% of the platforms use copyrighted software and 33.3% adopted open source.

4.5. Data Policies

Regarding knowledge platform policies, we have analyzed two elements: content and data. The content element refers to the type of user-generated content license and its categorization from more open or free to less. Table 7 shows that 95% of the platforms studied considered user-generated content under copyright license, whereas just two cases licensed it under open source. Moreover, one project stated on their website that user-created content is considered owned by the user when they have chosen to post it on the platform, specifying that users can control how the content they generate is shared through their visibility settings and preferences (Case 6).

Table 7. User-generated content license (n = 60).

User Generated Content License	Number	Percentage
CC-BY-SA	1	1.7%
CC-NY-NC	1	1.7%
No platform ownership	1	1.7%
Copyright	57	95%

Regarding data policies, the indicator adopted is the ability to access data generated by users, taking into consideration their agreement. Just one (1.7%) project out of 60 made it possible to obtain access to their data through a data commons license "CC BY-NC-ND" (Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International), the remainder (98.3%) did not specify a license on their website.

4.6. Social Responsibility and Impact

4.6.1. Level of Maturity

With respect to a platform's level of maturity, the results show that just two out of the 20 projects studied are functioning on a stable mode, are fully operational, and are the reference or main player in their domain (mature phase). Six of the platforms studied are in a phase of growth, so functioning on a stable mode but still in an expansive phase. Three of the platforms are in a medium phase, which means that they are in a validation stage and functioning on a stable mode. Most of the projects studied (eight out of 20) are in an early stage. This means that they have only recently been created and are in the initial stages of implementation of an idea or business model. Finally, just one project is no longer working (dead phase).

4.6.2. Social Use Value and Reputation Building

This section shows the results regarding analysis of the platforms' popularity in the digital space.

Information has been collected using several indicators of a platform's popularity, from which the average per sector of study has been calculated. In short, we gathered information for Alexa's Global Rank (Alexa rank is a measure of website popularity. It ranks millions of websites in order of popularity, with an Alexa Rank of 1 being the most popular. Alexa Rank reveals how a website is doing relative to all other sites, <https://bit.ly/2YHAL9O>), Google search results for all time, Google Backlinks (In search engine optimization (SEO) terminology a backlink is a hyperlink that links from a web page back to your own web page or website. Also called an Inbound Link (IBL), these links are important in determining the popularity (or importance) of your website. Some search engines, including Google, will consider websites with more backlinks more relevant in search results pages. <https://www.webopedia.com/TERM/B/backlink.html>), and the number of followers on the main social networks: Twitter, Facebook, and Instagram.

As shown in Table 8, regarding social use value of the platforms by sector, it can be seen that those with the highest values are the networked hospitality business sector (Alexa average global ranking value of 1,446,291 and Google search results average value of 64,553,161) and the taxi services sector (Alexa average global ranking value of 2,557,799 and Google search results average value of 73,085,121). This is followed by the urban food delivery sector, with an Alexa average global ranking value of 1,259,868 and total Google search results average value of 3,845,264, and finally by the on-demand home services and caring sector, with an Alexa Global Rank average value of 3,253,885 and total Google search results of 696,821.

Table 8. Social use value and reputation building by sector (n = 60).

	Alexa Traffic Global Rank	Google Search Results	Google Backlinks	Twitter Followers	Facebook Followers	Instagram Followers
Networked hospitality business	1,446,291	64,553,161	172,442	27,050	2,401,691	495,343
Taxi services	2,557,799	73,085,121	60,978	97,612	2,100,764	117,437
Urban food delivery	1,259,868	3,845,264	27,940	20,189	309,127	32,164
On-demand home services and caring	3,253,885	696,821	2952	984	28,652	1893

The sector with the highest average of Twitter followers is taxi services, followed by networked hospitality, then on-demand home services and caring, and finally urban food. In the case of Facebook and Instagram, we found that the most popular sector is networked hospitality business, followed by taxi services, urban food delivery, and, lastly, on-demand home services and caring.

When analyzing the same indicators of social value and reputation building by type of legal entity (Table 9), it is found that the most searched for cases are commercial companies, which are also those with the highest number of followers on the main social networks. The difference compared to the average for alternative models in each of the indicators is substantial. However, within alternative

models, there are also differences; cooperatives are the most popular models within not-for-profit legal entities, followed by associations and foundations.

Table 9. Social use value and reputation building by legal entity type (n = 60).

	Alexa Traffic Global Rank	Google Search	Google Backlinks	Twitter Followers	Facebook Followers	Instagram Followers
Commercial legal entity	1,606,473	49,567.953	85,001	45,998	1,733,223	254,851
Cooperative	4,438,583	93,059	1414	861	2150	758
Association	4,635,311	37,033	26,099	1562	4740	265
Foundation	598,438	18,700	13,405	600	5768	236
Average of alternative models	3,224,111	49,597	13,639	1008	4220	420

4.7. Community Building and Relational Capital

In this section, the different results obtained from indicators to measure economic impact in terms of community building and relational capital of platforms are shown.

The two types of stakeholders with which a greater number of platforms studied (12 out of 20) had engaged were civil society and economic, followed by public administration (8 out of 20) and research actors (5 out of 20).

Most platforms have more women than men as users, but the numerical difference in this type of profile is such that it can only be considered as insignificant. However, this starts to change when the proportion of men and women among platform workers is evaluated.

This can be explained by the fact that most of the cases studied are part of the urban food delivery sector (largely male represented) or the care and cleaning sector (largely female represented). However, importantly, there is a striking discrepancy when looking at gender representation of the owners of those platforms. Of those that agreed to answer this question (n = 13), only one had an equal representation in terms of gender, while the remainder had more men than women as platform owners (Figure 6). Moreover, most platforms are not taking concrete measures to change this situation. Just six of the 20 platforms mentioned having explicit policies to promote gender equality, and inside this group, platforms of all the legal types are found. In this regard, most of the policies established by platforms are focused on increasing women's participation in tech sectors.

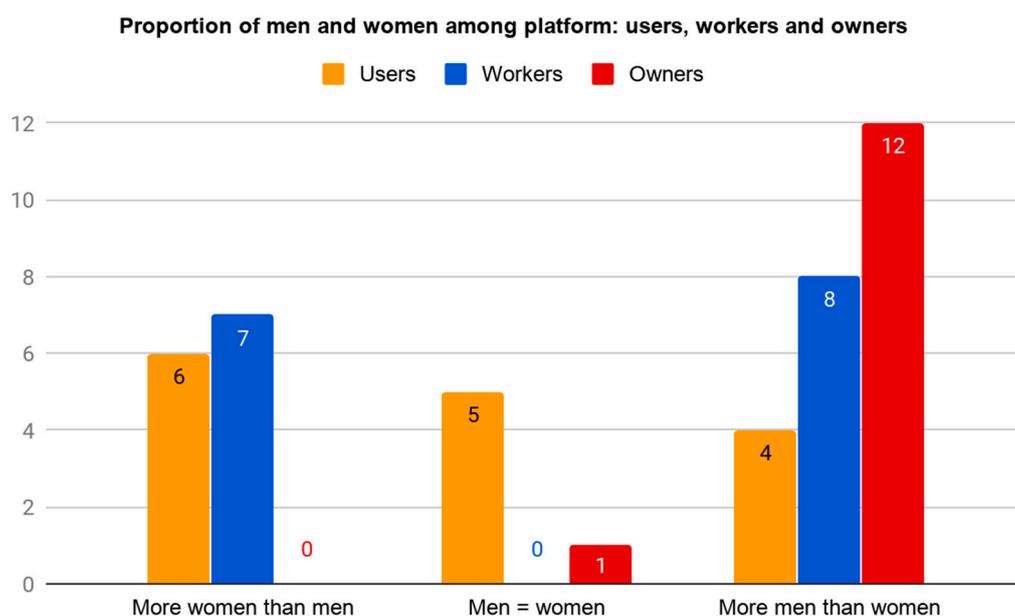


Figure 6. Proportion of men and women among platform users (n = 15), workers (n = 15), and owners (n = 13).

However, other innovative practices can be found, such as the approach expressed by Case 7, a networked hospitality cooperative, which can be highlighted as “best practice”. The participant explained that they operate under the principle that everyone has to be able to participate in meetings and in the community, but that when they hold meetings and assemblies, normally it is women who have more issues to consider, which make attendance problematic. For example, if a woman advises the community that she cannot be present because she has to take care of children, they invite her to bring them with her. Then the community, through a common budget, pays someone to take care of the children. Another example that the participant explained (though it had only occurred on one occasion) related to a member who told them that she would have to use holiday days in order to attend, and the community paid her by way of compensation.

Depending on the legal type of the platform, they differ in the social responsibility measures that have been taken. Firstly, while three out of the nine of the commercial platforms are adapted or available to people with functional diversity, six out of the 11 non-profit platforms (cooperatives and associations) are adapted. Second, eight out of the 11 non-profit platforms are promoting involvement of people with low incomes, while just three out of the nine for-profit platforms are doing so. Third, five out of nine of the commercial companies studied consider that they promote the involvement of people with just a basic education, while seven out of 11 for the non-profit models do.

Regarding environmental responsibility, six of the non-profit platforms promote the recycling and circularity of materials, compared to just two of the commercial platforms. Moreover, approximately the same proportion of platforms (two commercial companies and two alternative platforms), stated that their platforms are hosted on green energy servers. However, four of the non-profit platforms studied offer a type of service or product improving energy efficiency, and four of the commercial platforms studied do so. Finally, regarding the provision of educational materials in order to raise awareness about sustainable consumption, six of the non-profit platforms are active in this area, compared to just two of the commercial companies. In terms of concern over economic responsibility, clear differences are observed. For example, regarding prioritizing social responsibility when choosing service providers, it is found that nine of the non-profit platforms studied are doing so, as opposed to only two of the commercial platforms. As perhaps expected, eight out of nine commercial companies have designed or are using a system to control fake accounts, while just three out of 11 non-profit companies are taking similar measures. Finally, four commercial companies stated that they have asked permission to operate at a city level, compared to only one of the non-profit platforms.

5. Discussion and Conclusions

The platform economy is growing exponentially while it is creating expectations for its potential to contribute to a sustainable development. However, research aimed at showing each platform business model's potential to contribute to a sustainable development is needed. This paper has provided an analytical framework of how a sustainable design of the platform economy could contribute to the SDGs. Moreover, it has been applied to analyze how each platform economy model contributes to sustainability. In the following subsection, a summary is provided of the main results of the study. Then, in the subsequent subsections, the main theoretical and practical implications of this study are stated. Finally, the main limitations of this article and future avenues for research are introduced.

5.1. Interpretation and Summary of Results

5.1.1. Analysis of SDGs Alignment with Sustainability Qualities of the Platform Economy

This research has used the Multidisciplinary Balance of Platform Economy, which considers the dimensions of governance, economic strategy, technological base, knowledge policies, impacts, and social responsibility toward the externalities of the platforms [19] to analyze how sustainability qualities of the platform economy relate to Sustainable Development Goals (SDGs).

The results show that most of the SDGs (1, 2, 3, 5, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, and 17) are related to social responsibility and impact dimensions. For instance, the platform economy, through job creation, could help to end poverty (SDG 1) and foster employment and decent work (SDG 8). Moreover, the platform economy reinforces the global partnership for sustainable development (SDG 17), involving different types of quadruple helix actors (government, business, research, and civil society) while promoting cooperation among them. The Multidisciplinary Balance of Platform Economy also considers gender in terms of participation and platform ownership, which is correlated to promoting inclusive economic growth considering equality (SDG 1), such as education (SDG 5), decent work (SDG 8), and inclusive society (SDG 16). The Multidisciplinary Balance of Platform Economy also considers if the platform design is adapted or available to people with functional diversity, paying attention to the needs of disadvantaged and marginalized populations (SDG 10). Finally, social responsibility and impact also refers to political responsibility, ensuring city sovereignty, which links with the goal of making cities inclusive, safe, resilient, and sustainable (SDG 11).

Environmental responsibility is also incorporated, taking into account if the platform promotes recycling and circularity of materials (SDGs 2, 3, 7, 12, 13, 14, and 15), if it is hosted in green energy servers (SDGs 2, 3, 7, 9, 11, and 13), whether it offers a type of service or product improving energy efficiency (SDGs 2, 3, 7, 9, 11, and 13), or if it promotes sustainable mobility (SDGs 2, 7, 8, 9, 11, and 13).

A sustainable platform economy incorporates economic responsibility, prioritizing providers of Social and Solidarity Economy when a provider is needed. Therefore, this dimension corresponds with the following SDGs: ensuring sustainable consumption and production patterns (SDG 12) and resilient economies (SDG 13). The economic model defined by the sustainability qualities of the platform economy matches with the goal to ensure a sustainable livelihood (SDG 1), promoting well-being for all (SDG 3), providing a quality education (SDG 4), and inclusive and sustainable economic growth, employment, and decent work for all (SDG 8).

Regarding the technological policies, sustainable platform economy links with the goal to build resilient infrastructure to promote sustainability and foster innovation (SDG 9), supporting open software and decentralized platform infrastructure architecture. Finally, neither data policies nor governance elements are considered in the description of SDGs. Nevertheless, these are key elements and areas to take into account, as explained in the following subsections.

5.1.2. Platform Economy Models and Their Contribution to Sustainable Development

As stated in the introduction, there is confusion about the platforms that present themselves as collaborative, when actually they are not, and there are similar uncertainties and ambiguities associated with diverse models. In the article, the redefined the Multidisciplinary Balance of Platform Economy has been applied to analyze how each platform economy model contributes to sustainability in four sectoral areas. The main results of this analysis are thereupon synthesized.

Regarding participation in terms of gender (SDGs 1, 5, 8, and 16), it has been stated that, as users, on average platforms are equal. However, no project that considered itself as having an equal representation in workforce gender terms has been found. Previous research performed by Huws, Spencer, and Coates [37] finds that male platform workers are dominant, even in domestic work (which includes jobs such as carpenter or plumber) in those countries studied, with the exception of Italy, where women are dominant in transport and delivery activities (6.3% compared to 5.4% men) and domestic work (9.8% compared to 8% male). This difference can be explained by the fact that most of the cases studied are part of the urban food delivery sector (largely male represented) or the care and cleaning sector (largely female represented). In this regard, most of the platforms studied in the care and cleaning sector do not include tasks related to jobs such as carpenter or plumber. Another important finding of this research relates to gender representation of the owners of the platforms. Only one platform had equal representation in terms of gender, while the remainder had more men than women as owners. Moreover, most platforms are not taking concrete measures to change this situation. Just six of the 20 platforms mentioned having explicit policies to promote gender equality.

Inside this group, platforms of all the legal types are found. In this regard, most of the policies established by platforms are focused on increasing women's participation in tech sectors.

In terms of inclusion (SDG 10), the results show that, depending on the type of legal form, platforms differ in the social responsibility measures. First, while three of the nine commercial platforms are adapted or available to people with functional diversity, six out of the 11 non-profit platforms (cooperatives and associations) are adapted. Second, eight out of the 11 non-profit platforms are promoting the involvement of people on low incomes, while just three out of the nine for-profit platforms are doing so. Third, five of the nine commercial companies studied consider that they promote the involvement of people with just a basic education, while seven out of 11 non-profit models were doing so.

Regarding environmental responsibility (SDGs 2, 3, 7, 8, 9,11, 12, 13, 14, and 15), the analysis displays that six of the non-profit platforms are promoting the recycling and circularity of materials, compared to just two commercial platforms. Moreover, approximately the same proportion of platforms (two commercial companies and two alternative platforms) stated that their platforms are hosted on green energy servers. However, four of the non-profit platforms studied are offering a type of service or product improving energy efficiency, and four of the commercial platforms studied are doing so. Finally, regarding the provision of educational materials to raise awareness about sustainable consumption, six of the non-profit platforms are active in this area, compared to just two of the commercial companies.

In terms of concern toward economic responsibility (SDGs 11, 12, and 13), the research indicates clear differences are observed according to the different platform economy models. For example, regarding prioritizing social responsibility when choosing service providers, it was found that nine of the non-profit platforms studied were actively doing so, as opposed to only two of the commercial platforms. Perhaps not surprisingly, eight out of nine commercial companies have designed or are using a system to control fake accounts, while just three out of 11 non-profit companies are taking similar measures. Finally, four commercial companies stated that they have asked permission to operate at city level, compared to only one non-profit platform.

In terms of an economic model (SDGs 1, 3, 4, and 8), the analysis shows that regarding legal entities there is also a diverse ecosystem. Although most cases studied have a commercial type of business entity, there are also a great number of platforms under non-profit legal forms. The analysis shows that most of the projects studied (75%) are still not economically sustainable. In this sense, there does not seem to be a clear relationship between legal entity and economic sustainability, and all the platforms analyzed plan to reinvest their benefits into the project rather than dividing it amongst its owners. Nevertheless, even though a limited number of cases have been analyzed, three recognized that the goal of the project is to grow as much as is possible in order to sell as a form of exit whereby the platform is sometimes seen as a way to speculate.

Despite that, there are some forms of funding shared by all the platforms, and the most used forms by the overall sample of projects are "family savings" and "public funds". The proportion of non-profit projects (the sum of the number of cooperatives and associations) is equal to the proportion of commercial companies that have received public funds. Apart from the main sources of funding mentioned above, nine out of the 20 cases studied rely on compulsory member fees, and six out of 20 use non-monetary donations. It has also been seen that five out of 20 offer premium products and services through their platform, four out of 20 have launched campaigns of direct micro-participation, and just four out of 20 have sold merchandising. Other sources of funding, such as research grants (three out of 20) or using the platform as a means for advertising companies (two out of 20), are relatively unused. This is the same for alternative sources of funding related to donations; considering the whole sample, six out of 20 had non-monetary donations from the community, three cases had non-monetary donations from the external actors, and four out of 20 cases had monetary donations.

When analyzing the various sources of funding used depending on the legal entity type, several differences are found. On the one hand, concerning non-profit business, the most used

sources of funding are public and non-monetary donations from the community. On the other hand, for the commercial companies studied, the most used sources of funding are family savings, equity investment, debt investment, and public funds. Regarding non-monetary donations from the community, non-monetary donations from external actors, monetary donations, and direct micro-participation, only the latter is mentioned, but by only one project out of nine.

Also related to the platform's economic model is their labor model. In this regard, it is found that the most followed type among both for-profit business and not-for-profit organizations is a mixed model with a combination of self-employed workforce and paid-employees (10 out of 20). We therefore have to consider that for "mixed models", those who perform commercial activities through the platform are not considered as workers of the platforms' legal entities.

According to the results, a combination of self-employed workforce and paid-employment workforce is sometimes made as an adaptation strategy to local laws and agreements. This means that in one territory, platform workers are considered self-employees, while in another territory, the workforce—doing the same tasks—is considered paid-employment figures. Lastly, as stated above, there are cases in which platform workers (hosts, platform couriers, car drivers, platform cleaners, and so forth) are not considered as workforce by the platform and instead are considered as "providers" or "producers", with the platform considering itself as an intermediary in which the different users can interact with each other. For instance, some alternative models formed by different local instances explained that in each local instance or each node, members independently decide the type of juridical recognition that they want to give to its workers, understanding that workers are the ones under the daily development and maintaining of the platform. Usually they are members of the cooperative, which does not consider platform workers as a workforce.

Regarding the use of new technologies such as geolocation, algorithmic management, and gamification techniques, several findings can be stated. First, between those 11 platforms that are not using geolocation techniques, we find seven alternative platforms in the networked hospitality business (three out of three alternative platforms studied in this sector), urban food delivery (three out of six alternative platforms studied on this sector), and in the on-demand home services and care (one out of the two alternative platforms studied in this sector). We also found that four out of five lean platforms studied in the on-demand home services sector are not using them. In this regard, most platforms, including non-profit ones, with variations depending on the sector, find geolocation techniques decisive for the platform's functioning. Second, regarding the use of algorithmic management, a total of nine cases out of 20 are using them. However, here there is a clear difference between alternative business models and unicorn platforms. While just three out of 13 alternative platforms use algorithmic management, 86% of the unicorn platforms (six out of seven) do. We highlight here Case 19, which mentioned that among the variables that they are taking into account are the amount of time that the platform courier has used the platform, the number of deliveries done, if working in peak hours, and the consumers score given to the platform courier service. Third, regarding the use of gamification techniques, three out of seven unicorn platforms are using them, compared to just one out of 13 of the alternative platforms studied. Finally, just two of the 20 platforms stated that platform workers can reject both algorithmic management and gamification techniques. More importantly, these two platforms are alternative platforms. No unicorn platform has stated that platform workers are able to reject both algorithmic management and gamification techniques.

Regarding the technological policies (SDGs 9), the results show that 66.7% of the platforms use copyrighted software, while 33.3% adopted open source technological infrastructures.

As it has been observed in the description of the framework of the analysis, SDGs do not focus at all on data policies. In addition, the results of the research demonstrate the lack of attention to the subject by the platform economy cases studied. First, there is a high level of copyright or non-licensing regarding website content, and second, only one out of the 60 platforms allows its content to be downloaded.

As well as data policies, governance is not considered in the description of SDGs. This lack of attention is relevant because the analysis points to several insights about platforms' governance models. First, it is found that the alternative platforms usually enable users' and/or workers' participation in the definition of formal rules and policies, as well as acting as spaces for workers' collective organization. Conversely, most lean business models do not consider that this is something they are participating in. Second, regarding participation processes, it is found that all the for-profit business models studied in depth have not established any type of system for democratic decision-making, while 11 out of 13 alternative business models have.

5.2. Theoretical Implications

Research analysing the platform economy contribution to sustainable development is still in its earliest days. This article contributes to previous studies that emphasize the platform economy potential to contribute to a sustainable development of society [3–5]. Specifically, it contributes to bringing light to the fact that different platform models coexist in the platform economy, and each of them contributes differently to sustainable development. In this regard, the Multidisciplinary Balance of Platform Economy [19] positions itself as a useful holistic tool to characterize the different models of platform economy and their contribution to sustainable development.

On the one hand, this article contributes to previous research about the assessment of SDGs appropriateness in the digital era. As stated through the article, it has been proved that SDGs are mainly connected to social responsibility, economic models, and platforms' impact, while governance and data dimensions are not present in the SDGs. This agrees with the so far limited research performed on digital perspective. Despite it being demonstrated that organizations can take advantage of their data understanding and preparation to align with overall business sustainability [24], the SDGs declaration shows a lack of attention to the critical role of ICTs in shaping contemporary development [25]. ICTs are not mentioned directly in any of the SDGs and are only mentioned in four of the 169 targets. Indeed, this agrees with Unwin's analysis, which indicates that the Sustainable Development Goals give less attention to ICT4D than did the expired Millennium Development Goals promoted in 2000 [26] (p. 17). These findings are also aligned with previous research, which claims that this disinterest for ICTs is a symptom of a general disdain for governance emancipation in terms of democracy, political participation, deliberation, and co-decision [27]. Therefore, the SDGs should improve their digital perspective to strengthen the relationship with the sustainable platform economy.

Regarding platform governance, the analysis regarding the interconnection between governance, sustainability, and data and technological policy dimensions reinforces the key position of the platform governance previously shown by Fuster Morell and Espelt [19]. Platform governance is related to both the economic and sustainability dimensions, as well as data and technological policies. Thus, a democratic governance favors a sustainable economic approach. The relevance of governance policies is also pointed out by Laukkanen and Tura [28] for sustainable value creation in managing P2P business models requiring special attention to human resources and governance policies in order to study the potential of the platform economy. Consequently, governance is also a key area for SDGs to improve.

On the other hand, this study contributes to previous research on platform model differentiation such as the study from Laukkanen and Tura [28], in which a specified categorization of different platform economy models and a conceptual framework based on the sustainable value creation and sustainability business principles were introduced [29] and cross-checked with the 17 SDGs to help analyze their sustainable value creation potential. The results of this research, in line with the ones from this article, emphasized that managing P2P business models requires special attention to human resources and governance policies.

This article also agrees with a central concern widely commented on in the literature about platform labor: the fact that many businesses classify their workers as self-employed contractors rather than employees in order to reduce labor costs and keep associated risks low for the company,

known as the misclassification strategy [38]. However, other platforms depend on a combination of self-employed workforce and paid-employment workforce, not as an adaptation to local laws (platform workers having different recognitions depending on the territory), but so that each platform worker is treated as an independent case.

The main findings also highlight important insights about platforms' governance models. First, it is found that the alternative platforms usually enable users' and/or workers' participation in the definition of formal rules and policies, as well as acting as spaces for workers' collective organization. Conversely, most lean business models do not consider that this is something they are participating in. Second, regarding participation processes, it is found that all the for-profit business models studied in depth have not established any type of system for democratic decision-making, while 11 out of 13 alternative business models have. Although even for non-profit organizations, improving economic transparency (especially for external actors) is a key element to improve, this report agrees with previous studies on social economy and cooperatives that point to the better working conditions of the cooperative models when compared with "traditional" businesses [39–41].

Regarding the use of new technologies such as geolocation, algorithmic management, and gamification techniques, the main findings agree with previous research on the Deliveroo app on the different variables that are taken into account to assess platform couriers, through which its workers receive regular, algorithmically-generated encouragement to improve their performance via the app [42]. Third, the use of gamification techniques' findings is related to previous research about the purpose of gamification in work, which lies in the attribution of game-like qualities to work tasks and is thought to increase productivity by introducing an emotional element to it [43,44]. In this regard, Case 19 comments on introducing gamification techniques as something that is freely followed by platform couriers just taking into account individual behaviors and impacts, although previous research has stated its impact on incentivizing competition amongst peers [45].

5.3. Practical Implications

This research has contributed to demonstrating that a sustainable design of a platform economy could contribute to the SDGs. The findings state the importance of distinguishing between the different models of platforms, because sustainable platform economies make a greater contribution to the aims of the SDG. However, through the results section, several insights are presented that, although not the main findings of this article, may also bring light to some important research and public policy areas. Nevertheless, as they are out of the scope of this article they have not been countered with previous research.

Firstly, according to the research performed, there does not seem to be a clear relation between legal entity and economic sustainability. Nonetheless, improving economic transparency (especially for external actors) is a key element to develop, even for non-profit organizations. In addition, although this research does not show the financial amount each of the projects has received thanks to public funding, it suggests that for-profit platforms, although usually causing some negative impacts on cities, are receiving public funds that enable their growth.

Secondly, related to working conditions and labor recognition, in some cases studied, the platforms decided to rely on Business to Business (B2B) relations to manage the platform's workforce. This strategy can be seen as an answer to current public debates around the juridical recognition of platform workers. By subcontracting the workforce to other companies, the platform passes the risk of following a misrecognition strategy, reducing the possibility of any legal consequences. The platform does not know how these workers are recognized and, more importantly, it is not required by law to know it.

Finally, this research signals this fact to be a significant challenge for the platform economy, including not-for-profit models, with regards to the expansion of the value of data commons (Data Commons Manifesto, developed by Digital Democracy Data Commons pilot in the framework of Decentralized Citizen Owned Data Ecosystem (DECODE) project <https://dddc.decodeproject.eu/processes/main/f/6/petitions/1>), in which alternative business models could find themselves comfortable.

5.4. Limitations and Future Work

One of the main limitations of this article is related to the sample composition. First, although the global sample was thought to include diverse platform models (30% of the global sample was formed by alternative models to for-profit platforms), more than 50% of the cases studied in depth (11 out of 20) were not-for-profit business models. This study offers a deeper knowledge about non-profit business initiatives in the four sectors studied than of for-profit business models (see Table A1 for detailed information about cases selection by sector and type of platform). Secondly, the sample is composed of platforms operating in just four sectors of impact, and there is an over representation of the urban delivery sector and the care and cleaning sector compared to the other sectors studied. Further research could be aimed at studying platform business differences in other economic sectors and/or expanding the number of cases studied. Nevertheless, despite these main limitations, the analyses performed contribute to identify the strengths and weaknesses of SDGs from a platform economy sustainability perspective.

The value of the analysis performed in this article transcends platform economy research. The platform economy has become a prominent issue in policy-makers agendas and for governments around the globe. However, public policy debates are mostly focused on regulation and miss differentiating between platform economy models. This article helps policy makers to differentiate hype from facts by providing empirical evidence regarding the existence of different platform models and their implications on sustainable development. In addition, the Multidisciplinary Balance of Platform Economy could be used by different platform economy stakeholders to assess platform economy models. Thus, this article contributes to align the platform economy toward the SDGs. Further research could then be performed around the empirical application of the Multidisciplinary Balance of Platform Economy in different empirical cases and policy-making contexts.

Author Contributions: Conceptualization: M.F.M. and R.E.; data curation: M.R.C.; formal analysis: M.R.C.; funding acquisition: M.F.M.; methodology: R.E.; project administration: M.F.M.; resources: M.F.M.; supervision: M.F.M.; validation: M.F.M.; writing—original draft: R.E. and M.R.C.; writing—review and editing: R.E. and M.R.C. All authors have read and agreed to the published version of the manuscript.

Funding: The research reported in this paper was funded by European Union, Horizon 2020 research and innovation programme, “Platform Labour in Urban Spaces: Fairness, Welfare, Development” (<https://project-plus.eu>), Grant Agreement No. 822638. The views and opinions expressed in this publication are the sole responsibility of the author(s) and do not necessarily reflect the views of the European Commission/Research Executive Agency.

Acknowledgments: We would like to thank C. Malpica for her help in data analysis as well as the 20 interviewees that agreed to participate in this research.

Conflicts of Interest: The authors declare no conflict of interest. The funders had no role in the design of the study; in the collection, analysis, or interpretation of data; in the writing of the manuscript, or in the decision to publish the results.

Appendix A

Table A1. List of cases.

ID	Legal Entity	Area of Activity	Type of Platform
1	Commercial legal entity	Networked hospitality business	Unicorn
2	Commercial legal entity	Networked hospitality business	Unicorn
3	Commercial legal entity	Networked hospitality business	Unicorn
4	Commercial legal entity	Networked hospitality business	Unicorn
5	Cooperative	Networked hospitality business	Alternative
6	Association	Networked hospitality business	Alternative
7	Cooperative	Networked hospitality business	Alternative
8	Commercial legal entity	Taxi services	Unicorn
9	Commercial legal entity	Taxi services	Unicorn
10	Commercial legal entity	Taxi services	Unicorn
11	Commercial legal entity	Taxi services	Unicorn
12	Cooperative	Taxi services	Alternative
13	Commercial legal entity	Taxi services	Unicorn
14	Cooperative	Taxi services	Alternative
15	Commercial legal entity	Taxi services	Alternative
16	Commercial legal entity	Urban food delivery	Unicorn
17	Commercial legal entity	Urban food delivery	Unicorn
18	Commercial legal entity	Urban food delivery	Unicorn
19	Commercial legal entity	Urban food delivery	Unicorn
20	Commercial legal entity	Urban food delivery	Unicorn
21	Cooperative	Urban food delivery	Alternative
22	Commercial legal entity	Urban food delivery	Alternative
23	Cooperative	Urban food delivery	Alternative
24	Commercial legal entity	Urban food delivery	Unicorn
25	Commercial legal entity	Urban food delivery	Unicorn
26	Cooperative	Urban food delivery	Alternative
27	Commercial legal entity	On-demand home services and caring	Unicorn
28	Commercial legal entity	On-demand home services and caring	Unicorn
29	Commercial legal entity	On-demand home services and caring	Unicorn
30	Commercial legal entity	On-demand home services and caring	Alternative
31	Commercial legal entity	On-demand home services and caring	Alternative
32	Commercial legal entity	On-demand home services and caring	Unicorn
33	Commercial legal entity	On-demand home services and caring	Unicorn
34	Cooperative	On-demand home services and caring	Alternative
35	Cooperative	On-demand home services and caring	Alternative
36	Commercial legal entity	On-demand home services and caring	Unicorn
37	Commercial legal entity	On-demand home services and caring	Unicorn
38	Commercial legal entity	On-demand home services and caring	Unicorn
39	Commercial legal entity	On-demand home services and caring	Unicorn
40	Commercial legal entity	On-demand home services and caring	Unicorn
41	Commercial legal entity	On-demand home services and caring	Unicorn
43	Commercial legal entity	Networked hospitality business	Alternative
45	Commercial legal entity	On-demand home services and caring	Unicorn
46	Commercial legal entity	Networked hospitality business	Unicorn
47	Commercial legal entity	Networked hospitality business	Unicorn
48	Commercial legal entity	Networked hospitality business	Unicorn
49	Cooperative	Networked hospitality business	Unicorn
50	Commercial legal entity	Networked hospitality business	Alternative
51	Commercial legal entity	Taxi services	Unicorn
52	Commercial legal entity	Taxi services	Unicorn
53	Commercial legal entity	Taxi services	Unicorn
54	Commercial legal entity	Taxi services	Unicorn
55	Commercial legal entity	Taxi services	Unicorn
56	Commercial legal entity	Taxi services	Unicorn
57	Association	Taxi services	Unicorn
59	Cooperative	Urban food delivery	Alternative
60	Cooperative	Urban food delivery	Alternative
61	Association	Urban food delivery	Alternative
62	Association	Urban food delivery	Alternative
63	Foundation	Networked hospitality business	Alternative

Appendix B

This is the open access link to the codebook used. This includes the description of Sharing Cities Declaration principles (SCD) and Sustainable Development Goals (SDG) and their connection with the indicators of the Star of Democratic Qualities of the Platform Economy.

http://dimmons.net/wp-content/uploads/2019/12/PLUS_CODEBOOK_WEB.ods.

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