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End of previous Forum article

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# The Impact of the Platform Economy on Job Creation

Over the past ten years, the platform economy has become a topic of great interest in Europe. It has been cited as a force for economic growth and innovation, lower-cost goods and services, and low-barrier employment opportunities. At the same time, platforms have been criticised for potentially expanding the number of workers in precarious jobs. Thus, stakeholders – including policymakers, social partners, workers and platforms – have sought to better understand the platform economy, as evidenced by the growing body of literature surrounding platform issues.

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Online platforms have the potential to drastically change the economy and the world of work. In some industries, such as transportation, they already have had a disruptive impact on existing companies and workers. Nevertheless, academic discussions of the platform economy

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are significantly hampered by at least three interrelated issues.

First, platforms and the platform economy are poorly defined. This is reflected in the plethora of terms for identical or similar concepts: sharing economy, collaborative economy, gig economy, etc. This lack of a clear definition, combined with a lack of data, not only makes it difficult to grasp the platform economy, but also complicates policymaking in this domain.

Second, the size of the platform economy is unknown. The absolute and relative size of the platform economy, as well as its growth, are important to understand in order to assess the impact of platforms on the broader economy and labour markets, including their added value and possible displacement effects. The literature shows broad consensus about a few ideas: i) the platform economy represents a fairly small portion of the overall economy, both in terms of revenues and workers; ii) the platform economy is less developed in Europe than in the US; iii) the platform economy is rapidly growing; and iv) a few "giants" such as Uber and Airbnb comprise a very large portion of the platform economy.[1] Beyond these four general facts, estimates of the platform economy differ greatly, owing to methodological and theoretical challenges.

With regards to size estimates, the high level of heterogeneity in the platform economy requires special treatment. The tasks intermediated by platforms range from low-skill digital tasks (clickwork) and low-skill local work (e.g. domestic cleaning) to high-skill digital tasks (e.g. programming and graphic design). Activity itself is a poor indicator for value, and thus calculating revenue is more complicated than simply knowing the amount of tasks completed or service providers active. As described in the methodology section, we identify platforms with similar characteristics using clustering techniques.

One of the most widely cited studies on the size of the platform economy estimated that the five key platform economy sectors – travel, car sharing, financing, staffing, and music and video streaming – showed global revenues of $15 billion in 2015 (€14 billion).[2] This number was predicted to grow to $335 billion by 2025 (€313 billion). However, few studies have attempted to estimate the size of the platform economy in Europe in revenue terms. An important consideration relates to the second issue, the size of the workforce. In this regard, there are a number of surveys that document the participation of EU citizens in the platform economy as users or workers.[3] However, the findings obtained from these surveys are rather divergent, depending on the methodology used (e.g. online, offline or mixed survey). Against this background, while it is clear that the platform economy is still small today, given its huge potential and rapid development, methods are needed to track its size and progress in order to assess platforms' economic impact.

This paper applies a new method to estimate the size of the crowd employment platforms in terms of revenue and the number of active workers. These platforms intermediate what Eurofound calls crowd employment:

> an employment form that uses an online platform to enable organisations or individuals to access an indefinite and unknown group of other organisations or individuals to solve specific problems or to provide specific services or products in exchange for payments.[4]

Therefore, this study only attempts to estimate the size of the platform economy based on platforms with a significant element of paid labour. This paper utilises a triangulation approach to estimate the size of European crowd employment, finding that EU crowd employment platforms represented around €4.5 billion in gross revenue and 12.8 million active workers in 2016.

## Literature

To date, understanding the size of the platform economy in terms of revenue and the number of active workers has in particular been hampered by an absence of official statistics and the lack of a uniform definition of platforms. The existing estimations are based on one or a combination of the following three methods: surveys, administrative data and big data.

In lieu of official statistics, surveys have frequently been used to estimate the size of the platform economy. Surveys have a number of advantages, such as being fairly straightforward and flexible, but they also suffer from methodological issues. For example, online surveys tend to overestimate the amount of platform activity. Crowd workers, who are used to performing small online tasks in

1 See e.g. Z. Kilhoffer, K. Lenaerts, M. Beblavý: The Platform Economy and Industrial Relations: Applying the old framework to the new reality, CEPS Research Report No. 2017/12, Centre for European Policy Studies, August 2017.

2 PwC: The Sharing Economy, Consumer Intelligence Series, 2015.

3 See e.g. European Commission: The use of collaborative platforms, Flash Eurobarometer 438, 2016, available at http://ec.europa.eu/COMMFrontOffice/publicopinion/index.cfm/Survey/getSurveyDetail/instruments/FLASH/surveyKy/2112; U. Huws, N.H. Spencer, S. Joyce: Crowd work in Europe: Preliminary results from a survey in the UK, Sweden, Germany, Austria and the Netherlands, Brussels 2016, European Foundation for Progressive Studies.

4 Eurofound: New forms of employment, Luxembourg 2015, Publications Office of the European Union.

exchange for money, may be the most motivated to participate in online surveys that often pay for participation.[5]

As an example of online surveys, Huws et al. commissioned a representative online survey of about 8500 adults in Austria, the Netherlands, Sweden and the United Kingdom in early 2016.[6] The results indicated that between 11% and 23% of the populations in the four countries provide work via online platforms. This large figure ought to be taken with a pinch of salt, however, as the interpretation of work is quite broad. For example, between half and two-thirds of the participants indicated "work" such as selling goods on platforms such as Amazon and eBay.

Phone surveys based on random selection are more likely to produce reliable figures, and a relevant example is the Eurobarometer phone survey conducted in early 2016.[7] The definition used for this survey was broad, also including platforms intermediating assets and services with limited or no labour component, such as crowd lending and accommodation sharing. Nevertheless, the Eurobarometer results suggest that roughly five per cent of the EU population has been active in providing services in the platform economy.

The 2017 Eurostat labour force survey included questions on online platform usage for the first time.[8] However, these questions only concerned consumer-to-consumer platforms in the transport and accommodation sectors, which do not account for a good portion of activities in crowd employment. Furthermore, these types of surveys are not regarded as particularly accurate, given that platform-based services are used frequently or concern sensitive information such as undeclared labour.[9]

Data retrieved from surveys, whether conducted online or by phone, overestimates the size of the platform economy when compared to administrative data provided by the platforms themselves. For that reason, other research, including Lehdonvirta and Ernkvist, Kuek et al., and De Groen and Maselli,[10] has used a combination of interviews and data provided by platforms to estimate the size and growth rates of the platform economy. Kässi and Lehdonvirta used application programming interfaces (APIs) – a source of big data – of the largest online platforms intermediating digital services in the UK to gather this data.[11]

De Groen and Maselli's study is comparable to the present study in terms of thematic and geographic scope.[12] It estimated that the number of EU crowd workers at the end of 2015 was roughly 100 000, or 0.05% of all employees, of which roughly two-thirds were Uber drivers. They built on a range of previous studies covering different aspects of the platform economy.

Another study for the European Commission also made use of a variety of data sources.[13] These included statistical databases, financial statements, other secondary sources and expert views. The study suggests that the platform economy generated revenues of approximately €3.6 billion in 2015 – less than 0.1% of EU GDP. In terms of growth, the value of transactions in the platform economy grew by 56% in 2013 and 77% in 2014. This estimation is fairly broad, insofar as it captures sectors including accommodations and financial services, in which the labour component is relatively limited. However, the study did disaggregate into labour-intensive crowd employment activities, including transportation (€1.65 billion), household (€0.45 billion) and professional services (€0.10 billion).

In sum, a number of methods have been utilised to estimate the size of the platform economy, but most have significant issues ranging from methodological (e.g. online surveys) to thematic (e.g. very broad definitions). Furthermore, existing evidence finds that the platform economy is rapidly growing, which suggests the continued relevance of new attempts to measure the phenomenon. Lastly, new data sources have become available since previous attempts to measure the platform economy. For these reasons, the literature still stands to benefit from

5 W.P. De Groen, K. Lenaerts, R. Bosc, F. Paquier: Impact of digitalisation and the on-demand economy on labour markets and the consequences for employment and industrial relations, European Economic and Social Committee, 2017, available at http://www.eesc.europa.eu/sites/default/files/resources/docs/qe-02-17-763-en-n.pdf.

6 U. Huws et al., op. cit.

7 European Commission: Joint Research Centre Dataset of European Collaborative Economy Platforms, 2017.

8 Eurostat: Eurostat Annual Work Programme 2017 — Annex 3A, 2017, available at http://ec.europa.eu/eurostat/documents/747709/753176/AWP2017-3A-Overall-Priorities.pdf.

9 Office for National Statistics: The feasibility of measuring the sharing economy, 2016, available at https://www.ons.gov.uk/economy/economicoutputandproductivity/output/articles/thefeasibilityofmeasuringthesharingeconomy/2016-04-05.

10 V. Lehdonvirta, M. Ernkvist: Knowledge map of the virtual economy, infoDev, 2011; S.C. Kuek, C. Paradi-Guilford, T. Fayomi, S. Imaizumi, P. Ipeirotis, P. Pina, M. Singh: The global opportunity in online outsourcing, Washington 2015, World Bank Group; W.P. De Groen, I. Maselli: The Impact of the Collaborative Economy on the Labour Market, CEPS Special Report No. 138, Centre for European Policy Studies, June 2016.

11 O. Kässi, V. Lehdonvirta: Online labour index: measuring the online gig economy for policy and research, 2016, available at http://ipp.oii.ox.ac.uk/sites/ipp/files/documents/OLI%25202016-09-19.pdf.

12 W.P. De Groen, I. Maselli, op. cit.

13 R. Vaughan, R. Daverio: Assessing the size and presence of the collaborative economy in Europe, European Commission, 2016, available at https://publications.europa.eu/en/publication-detail/-/publication/2acb7619-b544-11e7-837e-01aa75ed71a1/language-en.

new and up-to-date attempts at measuring the platform economy in the EU.

## Methodology

In this paper, a bottom-up approach is followed to estimate the size of the platform economy. Hence, the size of the online platform economy is estimated by aggregating the size of all the online platforms, which is in line with the European Commission study.[14] In order to use this approach, a list of platforms operating in the EU is needed, which is now available thanks to the recently compiled dataset of European Platforms from the Joint Research Centre (JRC).[15] This JRC dataset includes data on the characteristics and size of the 199 platforms active in the EU, including data on gross revenues and workers. Platforms included in this database that do not meet the definition of crowd employment specified above are omitted from the analysis, leaving 173 platforms for the estimation.

The size of the platform economy is estimated on the basis of the total annual gross revenues and the number of active workers. Gross revenues include both the compensation for the execution of the task, activity or job, as well as the fee charged by the online platform for the services provided for 2016. The active workers include both the employees and the service providers performing tasks via crowd employment platforms for 2016. The distinction is that platforms typically have some employees who are responsible for management, communications, IT, etc., while the service providers work via the platform's intermediation.

The JRC dataset contains data for the gross revenues and the number of active workers for only some of the platforms (extracted from primary and secondary sources). Moreover, they refer to the platform's global activities, if reported, which can contain data for tasks executed beyond the EU. This necessitates interpolating the data to scale the revenues from the global level to the EU level. When the data on platform revenues are provided for global activities, the data on global revenue are multiplied with the platform's share of unique visitors from the EU. This calculation assumes that the platform generates the same gross revenues per unique visitor across the globe.

To this end, the JRC database has been enriched with data for the number of unique visitors to a platform's website and location of visitors. This data comes from Amazon's Alexa for August 2017 and serves as a proxy for the amount of activity on a platform.

## Clustering

The crowd employment platforms are heterogeneous, requiring differentiation in the extrapolations to estimate missing data on revenues and the number of active workers. For example, differences between platforms, such as in the average transaction amount, are likely to lead to variation in average revenues per unique visitor. This heterogeneity is addressed by matching platforms for which earnings and the number of active workers is available with platforms for which this information is not available. Similar platforms are identified using clustering methodology.

The clusters are identified on the basis of five variables that where selected based on the literature and their availability in our database.[16] The first variable is skill level (of the crowd work intermediated through the platform), which is closely linked to the remuneration level. The second variable is location – whether the service is conducted virtually or physically – which is also found to be an important factor for the hourly remuneration. The third and fourth variables are the market sector and the types of services offered by the platform; both variables are related to the intensity and duration of tasks. The fifth variable indicates whether the platform intermediates a task via an app or not. The reasoning is that the revenues and number of workers must be extrapolated based on the number of unique website visitors, but many platforms use apps alongside websites. This means the number of unique website visitors does not capture all of the online activity of the platform.

There are various clustering techniques that could be used to categorise online platforms. In this analysis, hierarchal clustering is chosen because it provides the best clustering in the sense of the inertia gain. This clustering technique measures the differences between data points on the basis of the five variables. At the start of the clustering exercise, each data point is a cluster. Then, the closest data points are agglomerated, which creates clusters with several platforms. The aim of the hierarchal clustering is to minimise the total within-cluster heteroge-

14 Ibid.

15 See B. Fabo, M. Beblavý, Z. Kilhoffer, K. Lenaerts: Overview of European Platforms: Scope and Business Models, Joint Research Centre, European Commission (forthcoming).

16 See e.g. C. Codagnone, F. Biagi, F. Abadie: The Passions and the Interests: Unpacking the 'Sharing Economy', JRC Science for Policy Report, 2016; W.P. De Groen, I. Maselli, B. Fabo: The Digital Market for Local Services: A one-night stand for workers? An example from the on-demand economy, CEPS Special Report No. 133, Centre for European Policy Studies, April 2016; and W.P. De Groen, K. Lenaerts, R. Bosc, F. Paquier, op. cit.

Table 1
**Descriptive statistics for online platform clusters**

| Cluster | Examples | Skills | Location | Sector | Services | App |
|---|---|---|---|---|---|---|
| Cluster 1<br>Low-skilled physical platforms focusing on transportation<br>(44 obs.) | Uber, Taxify | Low (100%) | Physical (100%) | Transportation services (100%) | Transport of people (55%), transport of goods (32%), delivery of goods (14%)[1] | App (50%), No app (50%) |
| Cluster 2<br>Low-to-medium skilled physical platforms focusing on domestic and local services<br>(80 obs.) | Listminut, Taskrunner | Low-to-medium (43%) | Physical (99%) | Local services (74%), local tasks (13%), local and professional services (10%) | Various local services (24%), cleaning (14%), laundry services (10%), home maintenance (9%), food and dining (9%) | App (23%), No app (77%) |
| Cluster 3<br>High-skilled virtual platforms<br>(49 obs.) | GoPillar, Freelancer | High (67%), medium-to-high (25%) | Virtual (98%) | Professional services (100%) | Various professional services (33%), design and creativity (25%), IT services (18%), consulting services (10%), academic texts writing (8%) | App (10%), No app (90%) |

[1] Transport of goods is business-to-business (B2B), while delivery of goods is business-to-consumer (B2C) or consumer-to-consumer (C2C).

Source: Authors' elaboration.

neity and maximise the heterogeneity between clusters, which is measured by inertia gain.

The optimal number of clusters in hierarchal clustering is given by the inter-cluster inertia gain. When there is a clear-cut break in the inter-cluster inertia gain, adding a cluster may give more information but would prevent clear separation between clusters. In this analysis, the optimal number of clusters is six. However, using six clusters means some clusters are extremely small and have too little data on revenues and service providers, which makes it impossible to make an accurate estimation. Therefore, the second-most important break in the inertia gain is used to determine the ideal number of clusters. This occurs in the transition from three to four clusters. In the end, the 173 crowd employment platforms are divided into three groups.

## Results

There is a clear divide between the three remaining clusters (as detailed in Table 1). The variable coding for location is highly discriminating: 98% of virtual platforms are located in cluster 3, while the bulk of platforms in the other two clusters intermediate physical work. Another variable that helps to differentiate the clusters is the skill level of platform tasks. All platforms in cluster 1 are involved in low-skilled work, all platforms in cluster 3 intermediate high-skilled work, and the platforms in cluster 2 intermediate a mix of low- and medium-skilled tasks. The main differences between clusters 1 and 2 are the sectors and services. The platforms in cluster 1 intermediate transportation services, while those in cluster 2 deal with various other tasks, covering cleaning, laundry services, food and dining, home maintenance, and care services.

## Estimation of gross revenues

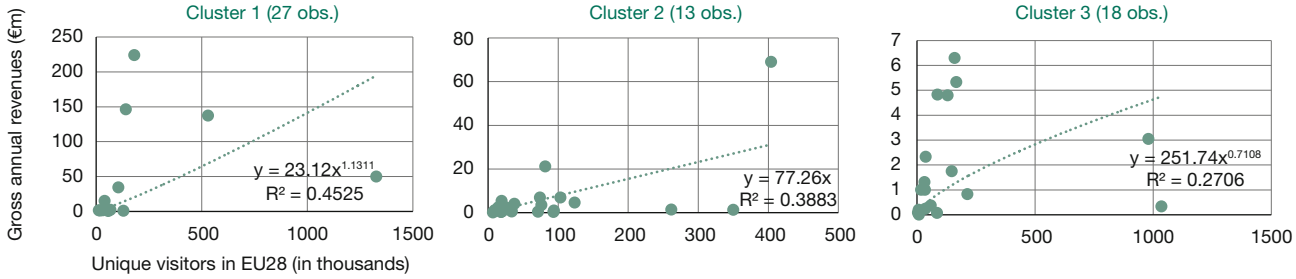
To arrive at the gross revenues for individual platforms for which this data is missing, an extrapolation is done with the number of unique visitors at hand. Many platforms are quite small, which is reflected in the absence of data on unique visitors in the Alexa database. Thus, only some of the platforms in each cluster were used to estimate trend lines, which express the relation between gross revenues and unique visitors for the platforms in each of the clusters. The least-squares method is used to estimate the coefficients of the function. To find the best fit (highest $R^2$), several functions are estimated, including linear, exponential and logarithmic. In general, one would expect a non-linear relation, because the more activity there is on the platform, the more likely it is that demand and supply will meet and lead to transactions.[17]

The number of unique visitors can only explain part of the gross turnover. The explanatory power of these trend lines expressed in share of variance explained ranges from low to fair ($R^2$ ranging between 0.27 and 0.45). The strongest predictor is for cluster 1, which is probably due to less variation in the types of tasks and services within the cluster.

The estimators for the trend lines are used to assess the gross revenues of the individual platforms in each of the

17 See e.g. W.P. De Groen, I. Maselli, B. Fabo, op. cit.

Figure 1
**Gross revenue trend lines**




Source: Authors' elaboration.

clusters (see Figure 1). The estimated results are compared to the gross revenues reported in the database. The information on gross revenues for various geographical areas and unique visitors was available for about a third of the platforms in each of the clusters. The estimation of the total revenues for all crowd work platforms is based on a combination of the estimations and the data in our dataset. If revenue data was available in the database, this data is used; if not, then the estimates are used instead.

For some platforms, there are large differences between the estimation results and the gross revenues in the database. This could be explained by the imprecision of the estimation, but also of the database. Hence, it is possible that the five variables that define the clusters only determine part of the revenues per unique visitor, and most of the information in the database is obtained from online sources such as the platform websites, for which the quality is uncertain. The data is often not subject to external audits or compliance with international accounting standards. Moreover, platforms might be inclined to present higher revenues to signal that the platform is successful.

Overall, the platforms had an estimated total gross revenue of about €4.5 billion for 2016 (see Table 2). This is quite similar to the findings of the study by Vaughan and Daverio, which estimated the European revenue of five sectors of the collaborative economy at €3.6 billion for 2015.[18] This increase could be interpreted as significant growth in this portion of the economy, which would align with expectations.

Table 2
**Gross revenues estimation**

| Cluster | Total gross revenue (€) | % of EU GDP |
|---|---|---|
| Cluster 1 | 1.65 billion | 0.011 |
| Cluster 2 | 2.56 billion | 0.017 |
| Cluster 3 | 0.27 billion | 0.002 |
| Total | 4.48 billion | 0.030 |

Source: Authors' calculation.

## Estimation of the number of active workers

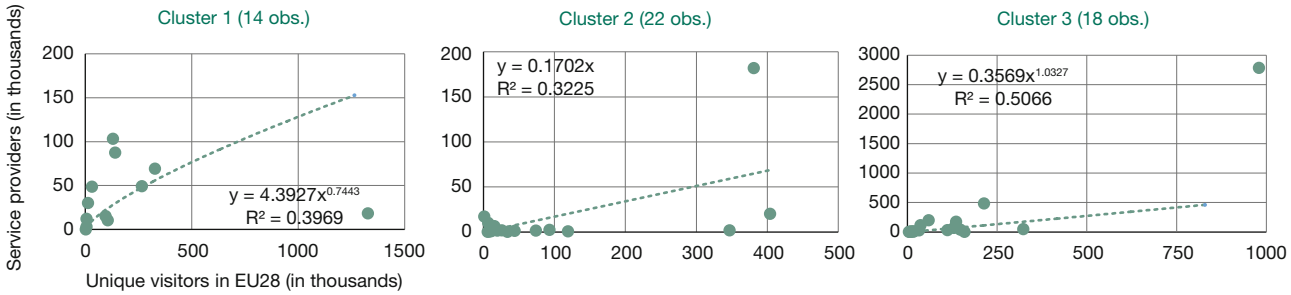
The estimation of the number of active workers includes employees of the platform and the service providers performing tasks via the platforms.[19] The number of service providers is sometimes reported in our database, while the number of employees is known for all platforms. However, the number of employees is provided in scales, for example 1-10 or 11-50. Summing up all the lower values and upper values, the platforms should have between 11 000 and 45 480 employees. Taking the most conservative estimate as a starting point, the number of employees working for platforms (not as service providers) in Europe is likely to be around 11 000.

Turning to the service providers, the estimation approach is highly similar to the approach used for gross revenues. As in the previous estimation, the estimators of the trend lines are used to determine the number of service providers of the platforms for which the information is available in each cluster. The data on number of service providers and unique visitors was available for roughly a third of the platforms in each of the clusters. For each cluster, the trend lines are estimated for platforms for which the number of service providers and unique visitors are known (see Figure 2). The explanatory power of these trend lines is similar to that of the

18 R. Vaughan, R. Daverio: Assessing the size and presence ..., op. cit.

19 The term "service providers" was used to distinguish between two types of platform users – customers (who need not necessarily pay for services, only receive them) and service providers, who perform work intermediated through the platform. See B. Fabo et al., op. cit.

Figure 2
**Service provider trend lines**




Source: Authors' elaboration.

gross revenues ($R^2$ ranging between 0.32 and 0.51). The estimates are added to the number of service providers indicated in our dataset to obtain the total for each respective cluster (see Table 3).

Overall, the surveyed platforms had 12.8 million active workers in the EU for 2016, which is equivalent to 5.9% of the total employment (ages 15-64). This is similar to the Eurobarometer,[20] which estimated the number of people who regularly provide services in the collaborative economy at roughly five per cent of the EU population. Still, as the Eurobarometer considered a much wider variety of platforms than the present study (e.g. accommodation, finance and e-commerce websites) and looked at whether people have ever worked via platforms, the present study's estimation would actually be considerably larger.

Compared to De Groen and Maselli,[21] which estimated that 100 000 service providers worked in the EU in 2015, this result is much higher. Part of the difference is likely due to the self-reporting on service providers, for which platforms have an incentive to inflate the actual numbers. Indeed, some numbers are highly suspicious. For example, one platform reported nearly 3 million service providers, which is incredible given that the site had fewer than 1 million unique visitors for the surveyed month. This platform alone accounted for some 40% of the service providers in cluster 3. Another consideration is that some active workers may be counted multiple times. Some overlap is inevitable since it is likely that providers offer services on multiple platforms.

20 European Commission: The use of collaborative platforms . . . , op. cit.
21 W.P. De Groen, I. Maselli, op. cit.

Table 3
**Active workers estimation**

| Cluster | Total active workers (million) | % of EU labour force |
|---|---|---|
| Cluster 1 | 3.4 | 1.58 |
| Cluster 2 | 2.5 | 1.15 |
| Cluster 3 | 6.9 | 3.15 |
| Total | 12.8 | 5.88 |

Source: Authors' calculation.

## Conclusion

With the platform economy rapidly advancing throughout the European Union, policymakers and academics have taken an interest in this phenomenon. A good understanding of the platform economy, its size and impact, however, is still lacking. This study analysed the platform economy in terms of time, geography and type of platform, with a view to present estimations on its size in terms of revenues and the number of active workers. In the EU28 in 2016, for platforms with a substantial element of labour, total gross revenues are estimated to be around €4.5 billion and the number of active workers is estimated at approximately 12.8 million individuals.

Future research can build on this approach in a number of ways. For example, this methodology used the assumption that revenue generated per user was identical across all countries, which is highly unlikely and can be further refined. It is likely that more administrative data, such as platform earnings, will become available in the coming years. This will make estimations more precise by reducing the number of missing values, although the extrapolation method presented in this study will remain valuable, as administrative data for unlisted platforms is often subject to delays in reporting. Having more data for more platforms will also enrich this study's method by, for example, allowing future studies to examine more clusters, thus yielding more accurate groupings of platforms and accompanying trend lines.