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GIG ECONOMY PLATFORMS: BOON OR BANE?

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ABSTRACT/RÉSUME

Gig economy platforms: Boon or bane?

The rapid emergence of gig economy platforms that use digital technologies to intermediate labour on a per-task basis has triggered an intense policy debate about the economic and social implications. This paper takes stock of the emerging evidence. The results suggest that gig economy platforms' size remains modest (1-3 per cent of overall employment). Their growth has been most pronounced in a small number of services industries with high shares of own-account workers, suggesting that thus far they have been a substitute for traditional self-employment rather than dependent employment. New evidence provided in this paper is consistent with positive effects of platform growth on overall employment and small negative or insignificant effects on dependent employment and wages. While most empirical studies suggest that platforms are more efficient in matching workers to clients, reductions in barriers to work could offset such productivity-enhancing effects by creating employment opportunities for low-productivity workers. Fully reaping the potential benefits from gig economy platforms while protecting workers and consumers requires adapting existing policy settings in product and labour markets and applying them to traditional businesses and platforms on an equal footing.

JEL Classification codes: J21, J40, J48

Keywords: gig economy, public policy

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Les plateformes pour l'économie des petits boulots : Aubaine ou déveine ?

L'émergence rapide de plateformes pour l'économie des petits boulots utilisant les technologies numériques, afin de jouer un rôle d'intermédiaire pour le travail à la tâche, a provoqué un débat intense sur les politiques et leurs implications économiques et sociales. Ce papier fait le point sur les preuves émergentes. D'après les résultats, la taille des plates-formes pour l'économie des petits boulots reste modeste (1 à 3% de l'emploi total). Leur croissance a été plus marquée dans un petit nombre de services où la proportion de travailleurs pour leur propre compte est élevée, ce qui semble indiquer qu'elles ont jusqu'à présent remplacé le travail indépendant traditionnel plutôt que l'emploi salarié. Les nouvelles preuves présentées dans ce papier concordent avec les effets positifs de la croissance des plateformes sur l'emploi total et avec de légers effets négatifs ou non significatifs sur l'emploi salarié et les salaires. Alors que la plupart des études empiriques suggèrent que les plateformes sont plus efficaces pour associer les travailleurs aux clients, réduire les obstacles au travail pourrait compenser ces effets favorables à la productivité en créant des opportunités d'emploi pour les travailleurs à faible productivité. Tirer pleinement parti des avantages potentiels des plates-formes pour l'économie des petits boulots tout en protégeant les travailleurs et les consommateurs nécessite d'adapter les paramètres de politique existants sur les marchés des produits et du travail et de les appliquer aux entreprises traditionnelles et aux plates-formes sur un pied d'égalité.

Classification JEL: J21, J40, J48

Mots-clés: économie des petits boulots, politiques publiques

Table of contents

Tables

Figures

Boxes

Gig economy platforms: Boon or bane?

By Cyrille Schwellnus, Assaf Geva, Mathilde Pak and Rafael Veiel[1]

1. Introduction

1. Over recent years, the rapid rise of gig economy platforms that use digital technologies to intermediate labour on a per-task basis has triggered an intense debate about the economic and public policy implications. One narrative holds that gig economy platforms that use digital technologies to match workers with clients on a per task ("gig") basis are a boon to productivity and provide much-needed flexibility to workers and businesses. A competing narrative asserts that the rapid rise of gig economy platforms reflects the exploitation of regulatory and legal loopholes and the imposition of one-sided flexibility on workers rather than superior business models.

2. This paper contributes to this debate by establishing a number of stylised facts, developing a conceptual framework and providing empirical evidence based on a review of the emerging literature and new analysis. The results suggest that gig economy platforms' size remains modest (1-3 per cent of overall employment), but that they have been growing fast, partly reflecting innovation in business models that facilitates direct transactions between platform participants as well as reductions in barriers to work in regulated services industries. Growth of gig economy platforms has been most pronounced in a small number of services industries with high shares of own-account workers, suggesting that thus far they have been a substitute for traditional self-employment rather than dependent employment. New evidence provided in this paper is consistent with positive effects of platform growth on overall employment and small negative or insignificant effects on dependent employment and wages. While most empirical studies suggest that platforms are more efficient in matching workers to clients, reductions in barriers to work could offset such productivity-enhancing effects by creating employment opportunities for low-productivity workers.

3. Over all, the analysis in this paper suggests that gig economy platforms are a potential boon, but taking full advantage of their potential to raise productivity and employment will require adapting product and labour market policies. Platform-driven technological and organisational innovations have reduced the prevalence of market failures in the services market, suggesting that a number of existing product market rules have become obsolete. But the emergence of platforms also poses new challenges for product market policies, including the promotion of strong competition between platforms in the presence of large network effects. Strong product market competition would go some way toward limiting the risk of the emergence of dominant players in the labour market, but improving working conditions for platform workers will additionally require

[1] Cyrille Schwellnus and Mathilde Pak are members of the Economics Department of the OECD. Assaf Geva and Rafael Veiel were members of the Economics Department of the OECD while preparing this paper. The authors would like to thank Luiz de Mello, Alain de Serres, Giuseppe Nicoletti (from the Economics Department), Stijn Broecke, Andrew Green and Duncan Macdonald (from the Directorate for Employment, Labour and Social Affairs). The support of Sarah Michelson (also from the Economics Department) in putting together the document is gratefully acknowledged.

adapting labour market regulation, rules on collective bargaining, social protection and training. This includes the setting of minimum standards on the removal from platforms; the revision of legal provisions that prevent platform workers from bargaining collectively; as well as facilitating access to social protection and training.

4. The remainder of the paper is organised as follows. Section 2 sets the scene by briefly describing gig economy platforms' business models, assessing their current size and recent growth as well as working conditions for platform workers. Section 3 develops a conceptual framework to think about the effects of the emergence of gig economy platforms on productivity, consumer welfare, employment and wages. It further briefly reviews the emerging evidence on labour market effects and provides new evidence based on county-level data for the United States. Section 3 discusses implications for product market regulation and competition policy, labour market policy as well as tax policy. Section 4 concludes.

2. Setting the scene

2.1. Scope

5. This paper focuses on gig economy platforms rather than the sharing economy more broadly. Gig economy platforms are defined as two-sided digital platforms that match workers on one side of the market to customers (final consumers or businesses) on the other side on a per-service ("gig") basis. This definition excludes one-sided business-to-consumer platforms such as *Amazon* (trading of goods) and two-sided platforms that do not intermediate labour such as *Airbnb* (intermediation of accommodation services). As such, gig economy platforms are a subset of the "platform economy" (encompassing any type of one-sided or multi-sided digital platform) and the "sharing economy" (encompassing any type of multi-sided peer-to-peer platform).[2]

6. A common feature of gig economy platforms is that they resort to trust-building mechanisms to promote an environment that facilitates direct transactions between workers and customers (Table 1). Reputation rating mechanisms by which participants can rate each other are one way of reducing information asymmetries that may prevent such direct transactions. Although there is some evidence suggesting that reputation rating systems produce inflated ratings because unsatisfied customers are reluctant to provide negative feedback (Horton and Golden, 2015[1]; Nosko and Tadelis, 2015[2]), the evidence generally suggests that reputation rating systems work reasonably well in the sense that higher ratings are associated with higher prices and more transactions (Jin and Kato, 2006[3]; Resnick et al., 2006[4]). Other trust-building mechanisms used by gig economy platforms include the setting of basic requirements for workers to enter the platform, the intermediation of payments, centralised customer support and the provision of insurance to customers.

[2] See OECD (2019[53]) for a typology of online platforms.

Table 1. Business model features of selected gig economy platforms

Feature	Uber	Handy	Upwork	Mechanical Turk
Main service	Ride-hailing services	Cleaning services	On-line business services	Micro tasks
Platform				
Sets basic entry requirements for workers	✓	✓	✓	×
Provides a reputation rating mechanism	✓	✓	✓	✓
Offers central customer support	✓	✓	✓	✓
Offers clients insurance	✓	✓	×	×
Intermediates payments	✓	✓	✓	✓
Charges a fee to workers	✓	✓	✓	✓
Uses fully automated matching algorithm	✓	×	✓	×
Surge pricing	✓	✓	×	×
Price is set by:	Platform	Platform	Bargaining/Worker	Client
Worker				
Requires a professional diploma	×	×	✓	×
Worker is usually self-employed[1]	✓	✓	✓	✓
Task is routine	✓	✓	×	✓
Client				
Customer chooses specific provider	×	✓	✓	×
Service is provided on-line	×	×	✓	✓
Client is usually an individual	✓	✓	×	×

Note: The businesses in the table provide illustrative examples of gig economy platforms, but many other gig economy platforms provide similar services (Table A.1).
1. Workers may be classified differently across countries, where classification depends on established labour law or, in the absence of clear labour law categories, on civil law rulings (Adams, Freedman and Prassl, 2018[5]).

7. Digital technologies and the reliance on self-employed contractors allow gig economy platforms to rapidly adjust the supply of workers to fluctuations in demand. A fundamental characteristic of any two-sided digital platform being to match customers to providers directly rather than organising specialised providers in a firm, platforms overwhelmingly resort to self-employed contractors rather than employees to provide services. The reliance on self-employed contractors provides gig economy platforms with more employment flexibility than traditional service providers that rely on dependent employees. At the same time, the algorithms matching workers to customers can rapidly identify imbalances in labour supply and demand and adjust prices accordingly. In principle, this provides a mechanism allowing the sharing of the benefits of flexibility between platforms and workers. Indeed, many platforms provide some form of "surge pricing" by which prices increase when demand for services exceeds supply (Table 1).

8. Despite these common features, there is significant diversity in gig economy platforms' business models, which needs to be accounted for in the economic and policy analysis (Table 1). A key element of differentiation is whether the service is provided physically or online. In case of physical provision, platforms draw from the local pool of workers whereas online provision draws on a global pool of workers, with different implications for employment and wages. There are also differences in the way workers are matched to clients, with some platforms relying on fully automated algorithms while others allow for more complex procedures such as job interviews. More complex

matching procedures, in turn, allow some gig economy platforms to cover non-routine task intensive services such as graphic and web design or information and communication services.

9. While most gig economy platforms target final consumers, small and medium-sized businesses that have adopted digital technologies could use them to connect with specialised workers in order to reduce fixed costs. For example, *Upwork* functions as a marketplace for free-lance workers who offer services such as graphic design, translation and public relations and *Catalant* functions as a market place for consultancy services, with both platforms mainly used by businesses rather than final consumers. Some gig economy platforms such as *Amazon Mechanical Turk* and *Spare5* focus on the provision of micro tasks to businesses, such as looking at a short video to determine if it contains sensitive content, adding keywords to describe a picture or transcribing a short media segment into text.

2.2. Size of gig economy platforms

10. Statistical offices typically do not use specifically-designed surveys to measure work for gig economy platforms so that existing estimates are generally based on *ad-hoc* surveys conducted by researchers or private businesses.[3] Apart from general survey design issues such as representativeness, such *ad-hoc* surveys raise a number of additional reliability and comparability issues (O'Farrell and Montagnier, 2018[6]). Firstly, existing surveys typically do not distinguish between full-time platform workers and occasional ones who perform platform work only a few times during the week or the month. Secondly, platform workers may falsely classify themselves as employees despite being self-employed contractors, especially if platform work is second or third source of income (Abraham et al., 2018[7]). Thirdly, some surveys distinguish between gig economy platforms like *Uber* and platforms that intermediate other services like *Airbnb* (BLS, 2018[8]; Boeri et al., 2018[9]; Bonin, 2017[10]; Katz and Krueger, 2016[11]; Pesole et al., 2018[12]), whereas others make no such distinction (Balaram, Warden and Wallace-Stephens, 2017[13]; Statistics Finland, 2018[14]). Finally, there is evidence that survey participants give different answers depending on whether the data are collected face-to-face, online or by telephone (Balaram, Warden and Wallace-Stephens, 2017[13]).

11. The most reliable estimates suggest that gig economy platforms' employment share remains modest – ranging between 1-3 per cent of total employment – but there are indications that this share has been growing fast.[4] Estimates based on labour force surveys for France and for the United States suggest that platform workers account for around 1% of total employment in these countries (Gazier and Babet, 2018[15]; BLS, 2018[8])[5]. Estimates based on similar data for Germany, Italy and the United Kingdom suggest

[3] Canada and Finland currently include questions on platform work (Statistics Canada, 2017[51]; Statistics Finland, 2018[14]). France added an ad-hoc module to the 2017 Labour Force Survey (Gazier and Babet, 2018[15]) The United States has recently released data on platform work ("electronically mediated work"), but there is no survey measuring this type of work at regular intervals (BLS, 2018[8]). Switzerland will include questions on platform work in the Labour Force Survey in 2019 (OECD, 2019[19]).

[4] The main estimates on the employment share of gig economy platforms are summarised in Table A.2.

[5] Previous estimates for the United States based on a similar survey suggest an employment share of platform workers of around 0.5% (Katz and Krueger, 2016[11]).

employment shares of around 3% (Boeri et al., 2018[9]; Bonin, 2017[10]). These estimates generally do not distinguish between workers who use platforms as their main source of income and those who use it only occasionally. Data from bank accounts at a major US bank suggests rapid growth over recent years, with the share of households who received income from gig economy platforms increasing from close to 0 to 1.1% over the period 2012-2018 (Farrell, Greig and Hamoudi, 2018[16]).

12. Incentives to organise work through a platform are particularly large for own-account workers (self-employed workers without employees), suggesting that in the short term platform work could grow without necessarily substituting for dependent employment. From the perspective of own-account workers, gig economy platforms set only basic requirements to participate in platform work while performing similar functions as traditional firms in the sense that they match workers with customers and reduce issues of asymmetric information. The share of own-account workers being around 10% on average across OECD countries in 2016 – well above current estimates of the share of platform workers – platform work may have some scope for growing without substituting for dependent employment.

2.3. Industrial and occupational structure of platform activity

13. Thus far, gig economy platforms have mostly entered the personal transport and personal services industries as well as crafts (e.g. electricians and plumbers). By contrast, in manufacturing, natural resources and a broad range of services industries, including public services, there is thus far no gig economy platform activity. Personal transport services is the industry in which gig economy presence is most pronounced. *Uber*, *Ola*, *DiDi*, *Lyft* and many other platforms offer personal transport services around the world. There is also significant platform activity in courier services[6], with platforms offering food deliveries (e.g. *Deliveroo*, *Foodora*) or deliveries from selected shops (e.g. *Glovo*, *Postmates*). Other than transport services, gig economy platforms offer a wide range of personal services such as cleaning (e.g. *Handy*, *Helpling*), babysitting (e.g. *Bambino*, *Bubble*) as well as handyman services (e.g. *Handy*, *Listminut*, *TaskRabbit*).[7]

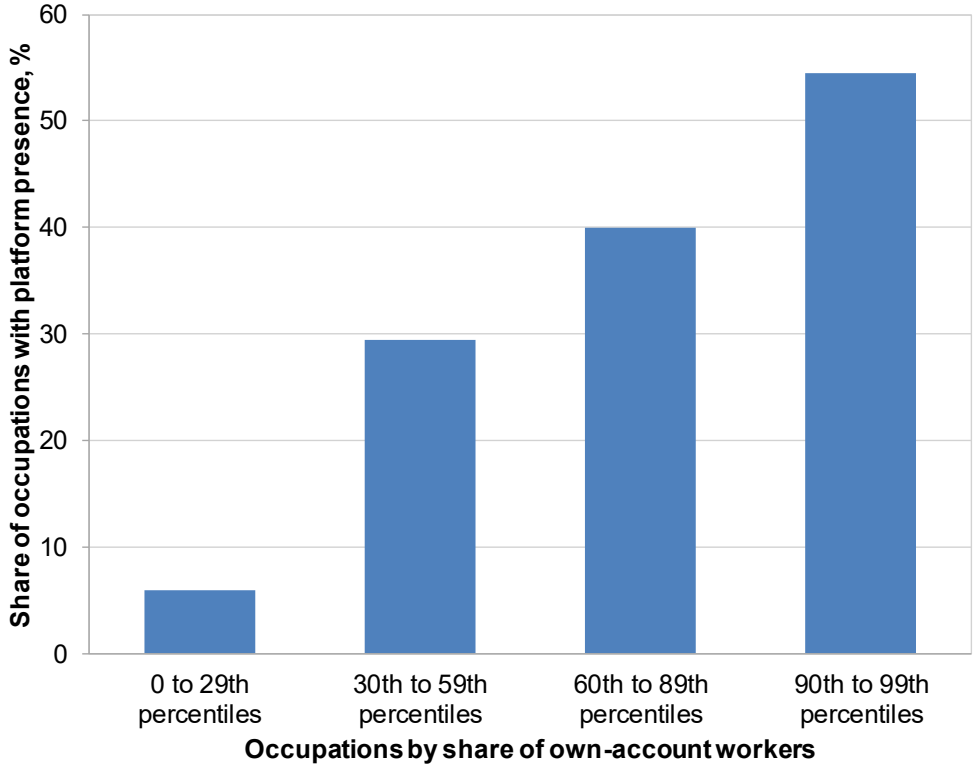
14. Gig economy platforms are present in more than half of the occupations in which the share of own-account workers (self-employed workers without employees) is above the 90th percentile of the distribution of occupations based on the share of own-account workers (Figure 1). In occupations with shares of own-account workers below the 30th percentile, gig economy platforms are essentially absent.

[6] Courier services such as home delivery services are included in the transport industry.

[7] See Table A.1 for more detailed information on these gig economy platforms.

Figure 1. High platform presence in occupations with high shares of own-account workers

Platform presence by distribution of occupations based on the share of own-account workers, in %



Note: The vertical axis shows the share of occupations with known platform presence (Table A.3). On the horizontal axis, occupations are ordered by the share of own-account workers.
Source: Eurostat, BLS, Labour Force Surveys of Canada.

2.4. Workers in the gig economy

15. On average, platform workers tend to be male, young and more educated than the general population, which partly reflects the industry structure of gig economy activity (Boeri et al., 2018[9]; De Groen, Maselli and Fabo, 2016[17]; Hall and Krueger, 2016[18]; OECD, 2019[19]). For instance, Hall and Krueger (2016[18]) find that both among *Uber* drivers and traditional taxi drivers the share of men is well above 70%. The young age of Italian workers for the food delivery platforms *Deliveroo* and *Foodora* is partly explained by the flexibility of work schedules, with around one third of couriers working while studying (INPS, 2018[20]). The evidence further suggests that a significant share of platform workers in European countries provide skill-intensive professional services such as legal and accountancy services, software development and translation (Pesole et al., 2018[12]).

16. The most common motives to work for gig economy platforms are additional income and work flexibility (Berger et al., 2018[21]; Boeri et al., 2018[9]; CIPD, 2017[22]; Pesole et al., 2018[12]). Overall, most gig workers are satisfied with their job and working for gig economy platforms appears to reflect mainly voluntary choices rather than the lack of other options. However, a significant minority of platform workers (around 20%) uses platforms because they are not able to find work as dependent employees (Boeri et al., 2018[9]; INPS, 2018[20]; OECD, 2019[19]).

17. Platform workers typically work low numbers of hours per week, reflecting the high incidence of platform work as a secondary source of income and, in some cases, the lack of opportunities to work more hours. In European countries, around 80% of platform workers declare platform work to be a secondary or tertiary source of income (Boeri et al., 2018[9]; Pesole et al., 2018[12]). Even when platform work is the main source of income, the number of working hours is often low. In Italy, for instance, around 60% of workers for whom platform work is their main job work less than 15 hours per week (INPS, 2018[20]). While for some platform workers low working hours are a voluntary choice, about half of the surveyed platform workers in Italy wish to work more hours.

18. There is large dispersion in hourly pay of platform workers, which partly reflects large differences in task characteristics within and between platforms. Platform work includes both elementary tasks (e.g. "human intelligence tasks" such as adding keywords to describe a picture) for which hourly pay is often very low and highly-qualified tasks (e.g. graphic design) for which pay is well above average wages of dependent employees. In Italy, for instance, average hourly platform pay is around 12 euros, with workers at the first decile of the distribution earning only around 1 euro per hour, but those at the 95th percentile earning around 50 euros per hour (INPS, 2018[20]). Overall, the evidence does not suggest that at given task characteristics hourly pay for physically provided services is lower for platform workers than non-platform workers, although there is some evidence that in high-income countries this may be the case for services provided online (Hall and Krueger, 2016[18]; Sundararajan, 2016[23]; Zoepf et al., 2018[24]).[8]

3. The economic impacts of gig economy platforms: Framework and some evidence

19. A key feature that needs to be accounted for in the analysis of possible economic effects from the emergence of gig economy platforms is their ability to efficiently match workers to clients. Gig economy platforms typically develop innovative matching algorithms that use digital technology to simultaneously track demand for services at a very disaggregate level and labour supply. Empirical evidence from the personal transport industry suggests that the resulting increases in matching efficiency can be large. For instance, a study for the United States finds that capacity utilisation (as measured by the fraction of time or mileage a driver has a paying customer) is up to 50% higher for *Uber* drivers than for traditional taxi drivers (Cramer and Krueger, 2016[25]). Similarly, waiting times for customers appear to be significantly shorter for *Uber* customers than for traditional taxi customers (Rayle et al., 2016[26]; Nistal and Regidor, 2016[27]).[9]

[8] Hall and Krueger (2016[18]) estimate that average hourly earnings net of expenses for vehicle maintenance and fuel costs of *Uber* drivers are almost 50% higher than wages of taxi drivers who are dependent employees, but Zoepf et al. (2018[24]) provide significantly lower estimates. Sundarajan (2016[23]) compares the average hourly wages of platform workers to non-platform equivalents in San Francisco, finding that for physically provided services (e.g. plumbing, cleaning and painting), the hourly wages of platform workers are higher than those of their non-gig equivalents, whereas for services provided online (e.g. graphic design and computer user support) the hourly wages of gig economy workers are lower compared to their non-platform equivalents. Lower hourly pay for platform services provided online may partly reflect competition from workers in low-income countries.

[9] Rayle et al. (2016[26]) find that 39% of taxi customers waited less than 10 minutes for a taxi during week-days and 16% during the weekend, compared to 93% and 88% respectively for *Uber*

20. Another key feature of gig economy platforms is low barriers for workers to enter platform work. Standard employment often requires professional diploma and other formal qualifications while entry into traditional self-employment requires paying the costs of creating a business and developing a network of clients. In many cases, entry into traditional self-employment is additionally constrained through licencing requirements. The emergence of gig economy platforms can reduce such barriers to work since platforms have developed alternatives to formal qualifications to signal quality of providers, such as reputation rating mechanisms, and workers typically do not incur the cost of creating a business.

21. These features suggest that the emergence of gig economy platforms could raise consumer welfare, productivity and overall employment. The increase in the variety of services and the decline in prices triggered by the entry of gig economy platforms benefits consumers. Improved matching likely raises productivity although such positive effects may partly be offset by reduced barriers to work that create job opportunities for unemployed people and those with weak attachment to the labour market and thereby raise overall employment.

22. But the emergence of gig economy platforms could also reduce standard dependent employment and put downward pressure on wages as services provided through gig economy platforms substitute for services offered by traditional providers. For instance, rides provided by ride-hailing platforms may at least partly substitute for transport services provided by traditional taxi companies. By reducing product market rents the entry of gig economy platforms could put downward pressure on wages in the directly affected industries if rents are shared with workers. For instance, the evidence suggests that the entry of ride-hailing platforms reduces scarcity rents resulting from strict licencing requirements in the taxi business.[10]

23. To analyse the effects of platform entry on productivity, employment and wages it is useful to use the following conceptual framework. On the producer side, traditional employers, traditional self-employed and digital platforms maximise profits and produce imperfectly substitutable services using technologies that match workers to clients. Workers maximise earnings choosing between traditional employment earning the market wage; traditional self-employment earning a profit per service; and platform work earning a profit net of the platform fee per service.

24. Assuming that matching efficiency is lower for traditional employers and traditional self-employed than for platforms, this conceptual framework suggests that:[11]

- Platform entry strengthens competition and reduces the price of services. The price decline is more pronounced the larger is the fixed cost of entry into the traditional sector and the larger is the matching efficiency differential between platforms and traditional providers.

customers. Nistal and Regidor (2016[27]) find that 58% of taxi customers waited less than 10 minutes to receive service compared to 87% of *Uber* customers.

[10] According to data collected by the New York City Taxi and Limousine Commission, the price of a taxi licence has fallen from above 1 million US dollars in 2013 to below 200 thousand US dollars in 2018 (NYCTLC, 2018[52]).

[11] The formal model is underlying the following statements is available from the authors upon request.

- Platform entry has ambiguous effects on overall productivity measured as client-worker matches per worker. On the one hand, platform entry raises matching efficiency at given employment due to platforms' superior matching technology. On the other hand, platform entry tends to raise employment by reducing barriers to work, which reduces overall productivity. It can be shown that productivity effects are positive so long as the matching efficiency differential between platforms and traditional employers is sufficiently large and the fixed cost of entry into the traditional sector is sufficiently low, as at very high levels of the fixed cost employment creation effects of platform entry tend to erode productivity gains from higher matching efficiency.
- Platform entry has positive effects on overall employment but ambiguous effects on dependent employment and wages. The impact on dependent employment and wages depends on the relative size of a market expansion effect as prices fall and the traditional firm's output expands (thereby raising labour demand) and a market substitution effect by which platform services substitute for traditional services. When worker-client matches are highly sensitive to changes in demand for services, the positive market expansion effect on dependent employment and wages may fully offset or even dominate the adverse market substitution effect.
- Platform work substitutes for traditional self-employment and reduces their earnings as platform workers are mainly drawn from the pool of traditional self-employed people and from the pool of unemployed. Since competition from platforms reduces traditional self-employed workers' profits, their earnings unambiguously decline.

25. This conceptual framework can be extended to account for the fact that the economic impact of platform entry may depend on whether the platform provides services physically or online. In high-income countries, the emergence of platforms providing services online, such as *Amazon Mechanical Turk* and *Upwork*, may lead to off-shoring of work currently performed by traditionally self-employed workers. Instead of drawing from the same pool of workers as the traditional sector, online platforms may draw from a pool workers with lower reservation wages located abroad. Compared with the results from the original model, this extension implies that platform entry has larger downward effects on prices; more negative effects on employment; and more negative effects on wages in the offshoring country.

26. Existing empirical estimates of the impact of the emergence of gig economy platforms are consistent with positive effects on productivity and overall employment, and insignificant or small negative effects on employment and wages of incumbent workers. Empirical studies using US data typically find that platforms have higher rates of capacity utilisation and that platform entry raises employment of self-employed taxi drivers (the aggregate number of traditional taxi drivers and platform drivers), has no statistically significant impact on employment of dependent taxi drivers, and has only small negative or statistically insignificant effects on wages of dependent taxi drivers (Hathaway and Muro, 2016[28]; Berger, Chen and Frey, 2017[29]). New empirical work conducted for this paper is consistent with positive overall employment effects and insignificant effects on dependent employment of the entry of gig economy platforms (Box 1).

Box 1. The impact of gig economy platforms on dependent employment: Empirical evidence from US counties

This box provides a case study of the impact of the emergence of gig economy platforms on dependent employment using US county-level data over 2011-16. The empirical analysis relates dependent employment growth at the county level to growth in non-employer businesses (a proxy for self-employed contractors) in industries in which there has been significant platform growth over the period (Farrell, Greig and Hamoudi, 2018[16]).[1] Focusing on the period 2011-16 and on this restricted subset of industries ensures that a significant part of the variation in growth of non-employer businesses reflects growth in platform work. A negative relation between growth in dependent employment and non-employer firms would thus suggest that platform work substitutes for dependent employment, whereas a positive coefficient would suggest complementarity.

Previous studies have either focused on individual platforms (Berger, Chen and Frey, 2017[29]) or provided descriptive evidence on correlations between dependent employment and non-employer businesses in specific sectors (Hathaway and Muro, 2016[28]). This box aims to complement these studies by covering a broader range of industries for which gig economy platforms are relevant and by providing a fully-fledged econometric analysis.

Methodology and data

The main challenges for the empirical analysis are to limit potential endogeneity issues and to isolate as much as possible the part of the variation in growth of non-employer businesses that reflects platform entry.[2] Endogeneity issues may arise because dependent employment and non-employer businesses are affected by some third factor omitted from the regression analysis. For instance, a positive demand shock at the county level may raise both dependent employment and the number of non-employer businesses, thereby biasing the coefficient on non-employer businesses upward if county-level demand is omitted from the regression analysis.

To address these challenges, the empirical analysis controls (i) for factors that may be correlated with both dependent employment and the number of non-employer businesses and (ii) develops an instrumental variable method that uses exclusively the variation in growth of non-employer businesses that is explained by initial mobile internet use at the county level. Gig economy platforms heavily rely on mobile apps to match workers to customers so that the instrumental variable method plausibly isolates the relevant part of variation in growth of non-employer businesses. By using initial values of mobile internet use rather than growth rates over the sample period the instrumental variable method additionally reduces endogeneity issues since initial mobile internet use is plausibly exogenous to dependent employment growth. To reduce the risk that an omitted factor correlated with both mobile internet use and dependent employment growth biases the coefficient on instrumented non-employer firm growth, the empirical setup additionally controls for initial income per capita as well as demographic structure.

The model is estimated by 2-stage least squares:

1st stage: $\Delta\ln(\mathrm{Gig}_{ij}) = \beta_1 \ln(\mathrm{MobInet}_{it_0}) + \beta_2 \Delta\ln(\mathrm{D}_i) + \beta_3 \mathrm{X}_{ij} + \alpha_j + \varepsilon_{ij}$,

2nd stage: $\Delta\ln(\mathrm{Y}_{ij}) = \gamma_1 \Delta\ln(\widehat{\mathrm{Gig}}_{ij}) + \gamma_2 \Delta\ln(\mathrm{D}_i) + \gamma_3 \mathrm{X}_{ij} + \delta_j + \mu_{ij}$,

where Δ denotes differences between 2011 and 2016; subscripts *i* and *j* denote, respectively counties and industries; Y_{ij}denotes dependent employment; Gig_{ij} denotes the number of

non-employer businesses; $\mathrm{MobInet}_{it_0}$ denotes the share of mobile internet users in 2011; D_i denotes proxies of the metropolitan area and industry-specific business cycle (metropolitan area value added growth in the industry); X_{ij} denotes other control variables such as dependent employment growth over the period 2007-11 to account for mean reversion, initial demographic structure (share of people aged between 15 and 29 to the total population in 2011) and initial income per capita at the metropolitan-area level; α_j denotes an industry fixed effect.

Data on dependent employment, non-employer businesses and demographic variables at the county level are from the US Census Bureau.[3] The measure of mobile internet use at the county level is from Tolbert and Mossberger ($2015_{[30]}$) and GDP at the metropolitan area level is from the US Bureau of Economic Analaysis.[4]

Results

Initial mobile internet use is a strong predictor of subsequent growth in the number of non-employer businesses, explaining around a fifth of the overall variation in growth in the number of non-employer businesses over 2011-16 and the F-statistic being well above conventional thresholds for instrument strength (Table 2, Panel A). Strikingly, the growth in non-employer firms appears to be acyclical in the sense that it is uncorrelated with GDP growth at the metropolitan area level. This could reflect the fact that direct effects of demand shocks are partly offset by movements into and out of non-employer businesses. For instance, the direct downward impact of an adverse demand shock on the number of non-employer businesses may partly be offset by people moving from dependent employment into self-employment as they are unable to find jobs in traditional businesses. Gig economy platforms may thus play a useful role as a labour market buffer during economic downturns.

There is a weakly significant positive correlation between growth in the number of non-employer businesses and growth in dependent employment in a regression without controls for the business cycle or initial conditions, but this correlation becomes insignificant in the regression with controls (Table 2, Panel B, Columns 1 and 2). Factors that are positively correlated with both dependent employment growth and growth in the number of non-employer firms but omitted from the regression without controls bias the coefficient on non-employer businesses upward.

Over all, the analysis in this box suggests that for the covered industries entry of gig economy platforms has had no discernible impact on dependent employment, which would be consistent with the market-expanding effects of platform entry fully offsetting incumbents' losses in market shares.[5] The positive correlation between initial mobile internet use and growth of non-employer firms further suggests that platform growth raises overall self-employment (the aggregate of traditional self-employment and platform work). Instead of reducing demand for traditional businesses gig economy platforms may on balance be growing the market by reducing prices and making services more customer friendly so that demand for traditional service providers is unaffected.

Table 2. The impact of platform growth on dependent employment

	(1)	(2)
Panel A: 2SLS first stage estimation		
Dependent variable:	Non-employer growth	
Initial mobile internet use	0.18***	0.18***
	(0.05)	(0.05)
Initial GDP per capita	-0.08**	-0.08**
	(0.04)	(0.04)
Initial share of young people	-0.11	-0.11
	(0.08)	(0.08)
Metropolitan VA growth		0.05
		(0.06)
Past dependent employment growth		-0.03
		(0.03)
Panel B: 2SLS second stage estimation		
Dependent variable:	Dependent employment growth	
Non-employer firms growth	0.68*	0.62
	(0.39)	(0.38)
Initial GDP per capita	0.06	0.05
	(0.06)	(0.06)
Initial share of young people	-0.23**	-0.23**
	(0.11)	(0.10)
Metropolitan VA growth		0.22**
		(0.09)
Past dependent employment growth		-0.22***
		(0.05)
Industry fixed effects	YES	YES
F-statistic (exluded instrument)	12.95	12.25
Adjusted R^2 (2SLS first stage)	0.79	0.79
Observations	429	429
Number of counties	210	210
Number of industries	5	5

Note: 2SLS estimations. Standard errors are in parentheses. *, **, *** denote statistical significance at the 10%, 5% and 1% levels. For columns (1) and (2) in Panels A and B, county-level controls include employment growth in neighbouring counties and the average employment growth over 2007-2011.
Source: US Census Bureau County Business Patterns Database; US Census Bureau Nonemployer Statistics Database; US Census Bureau County Population by Characteristics Database; US Bureau of Economic Analaysis Database; Tolbert and Mossberger (2015[30]).

Notes:
1. The industries covered by the analysis are: taxi and limousines, couriers and messengers (excluding postal services), janitorial services, child day care services, personal and household goods repair and maintenance.
2. Non-employer businesses are defined as businesses that have no paid employment or payroll, are subject to federal income tax and have annual receipts over $1,000 ($1 for the construction sector).
3. Data on dependent employment are from the County Business Patterns for Businesses with Paid Employees database, on non-employer businesses from the Nonemployer Statistics Database and on demography from the County Population by Characteristics database.
4. Data on mobile internet use at the county level and GDP at the metropolitan area level are not available for rural and other small counties so that they are dropped from the analysis. The 210 remaining counties represent around 40% of total employment and are located in the largest metropolitan areas where gig economy platforms are likely to be present.
5. Unreported results from a regression model based on a Phillips curve suggest that platform growth had no discernible effect on wages of dependent employees, but the estimated Phillips curve only poorly fits the data so that it is omitted from the paper.

27. The theoretical framework and the empirical studies discussed above focus on the direct economic impacts of platform entry on the affected industry, but do not account for indirect effects through production linkages and the reallocation of demand. Higher matching efficiency and the reduction of barriers to employment for workers following platform entry typically drive down prices and wages in the affected industry. But direct industry effects are likely to percolate through the economy through backward and forward linkages. For instance, lower prices for design services provided by gig economy platforms may reduce costs and raise productivity of firms using such services as inputs. Moreover, lower prices raise households' real income and thereby generally raise demand for the output of other industries, with positive effects on employment and wages in these industries (Bessen, 2018[31]).

28. The theoretical framework developed above focuses on static economic efficiency rather than on the effects of platform entry on innovation and growth. On the one hand, enhanced competition may raise dynamic economic efficiency by promoting innovation and the diffusion of new technologies as incumbent firms need to adapt their business models to retain market shares. For instance, many traditional taxi businesses have adopted digital apps to match their drivers to customers in response to the entry of ride-hailing platforms. On the other hand, gig economy platforms' reliance on self-employed contractors rather than permanent employees may reduce incentives to maintain and develop workers' skills. In most OECD countries, workers in permanent employment relationships are entitled to employment protection provisions that become more generous with tenure, which reduces workers' incentives to switch jobs and firms' incentives to lay off workers. Since self-employed contractors are not entitled to these provisions, platforms will be less willing to provide training to them as the consequent increase in worker productivity may mainly benefit competing businesses when workers switch jobs (OECD, 2019[19]).

4. Policy discussion

29. The emergence of gig economy platforms can bring economic benefits in terms of productivity and overall employment. The key challenge for policy makers will be to support innovation in business models while ensuring adequate levels of consumer and worker protection. In this light, this section discusses the implications of the emergence of gig economy platforms for product market regulation and competition policy; tax policies; as well as labour market policies.

4.1. The emergence of platforms and product market regulation

30. Gig economy platforms have thus far predominantly entered highly regulated services industries, such as personal transport, personal services and the crafts. This partly reflects a lack of technological and organisational innovation by incumbent firms in a weakly competitive environment with high entry barriers and strict rules on operation. But it partly also reflects differences in the application of product market rules across gig economy platforms and traditional providers. For instance, ride-hailing platforms are typically subject to less restrictive licencing requirements and rules of operation than traditional taxi companies (Wölfl et al., 2009[32]).[12] While innovation undoubtedly

[12] In terms of rules of operation, traditional taxi companies are for instance subject to regulated prices and stricter insurance obligations than ride-hailing platforms.

contributed to platform entry, such differences in regulatory treatment may inadvertently tilt the playing field in their favour.

31. The emergence of gig economy platforms calls into question the rationale for a number of specific services market regulations. In many OECD countries, entry into some services industries is restricted through occupational licences, which typically involves obtaining a formal degree, passing an exam or paying a fee. Occupational licences are typically justified on the grounds of consumer protection as it may be difficult for consumers to evaluate a provider before buying the service (Hunt, 2017[33]). However, such licencing requirements have become increasingly obsolete as gig economy platforms have developed mechanisms to reduce the extent of information asymmetries through reputation rating mechanisms and have strong incentives to establish trust between providers and clients by establishing minimum standards.[13]

32. Differences in product market regulation between gig economy platforms and traditional service providers could be addressed by reviewing existing rules and adjusting them if needed, while applying them to all actors on an equal footing. Simply applying existing rules to platforms would disregard technological and organisational innovations that have reduced the prevalence of asymmetric information issues in the services market, thereby unduly protecting incumbent firms from competitors. Instead, a level-playing field could be promoted by reviewing existing rules and removing those that are no longer justifiable from the perspective of consumer protection. Product market rules should only be kept where genuine health and safety concerns persist. In order to achieve regulatory neutrality between incumbent firms and platforms, such regulations should be applied to all actors on an equal footing. In many cases, registration requirements, basic security and background checks as well insurance requirements for service providers may go a long way towards protecting consumers. Lithuania, for instance, amended its rules on passenger transport in 2016 limiting requirements for drivers to registration with their municipality, subjecting their cars to security inspections and declaring their income to the tax authorities (Delegation of Lithuania to the OECD Competition Committee, 2018[34]).

33. The review and adjustment of existing product market rules could be based on evidence from "regulatory sandboxes" that provide limited regulatory waivers. The limits are typically set in terms of firm size, industry, time or geographical area. Such "regulatory sandboxes" could be beneficial for both businesses and regulators as they provide a space for experimentation with new business models or new technologies while allowing regulators to identify potential regulatory issues at an early stage (OECD, 2019[35]). In this sense, they may provide useful testing grounds for regulations that may be better adapted to the needs of the digital economy. In the context of gig economy platforms, they would for instance allow to assess whether reputation rating mechanisms and platform interventions alone can provide an adequate level of consumer protection or whether licencing requirements continue to play a useful role.

[13] Another economic rationale for licencing requirements are congestion externalities, for instance in the personal transport industry, but these can at least partly be addressed by the surge pricing mechanisms offered by gig economy platforms that allow to quickly adjust supply to fluctuations in demand. Similarly, rules on physical presence that allow clients to inspect goods before buying them have little economic rationale in a highly digitalised services economy with well-developed reputation rating mechanisms.

4.2. Network effects and competition policy

34. Gig economy platforms are characterised by a high degree of two-sided network effects, which could lead to the emergence of dominant platforms. Two-sided network effects imply that a larger number of platform participants on one side of the market (e.g. providers) raises the value of participation on the other side (e.g. customers). Even when fixed costs of creating a platform are low so that the coexistence of several platforms may in principle be viable, such network effects tend to favour the emergence of dominant platforms (Van Reenen, 2018[36]).[14] From efficiency and consumer welfare perspectives, this may actually be desirable as increased market thickness (the number of providers and consumers participating in the platform) raises the value of the platform for both providers and consumers, especially when network effects are very large. Conversely, a large number of competitors *in* the market may in some cases be inefficient and harm consumers by fragmenting the market.

35. However, there is a risk that over time dominant players engage in anti-competitive practices to limit competition *for* the market. An example of such "winner-takes-all" dynamics is the emergence of the ride-hailing platform *Grab* as a dominant player in Southeast Asia. As its market share steadily increased over the past years, its main competitor *Uber* stopped operations in 8 Southeast Asian markets in 2018 and became a major shareholder of the resulting monopolist in the ride-sharing market of these countries (New York Times, 2018[37]). More generally, dominant players may attempt to deter entry (e.g. through predatory pricing) or acquire potential competitors to limit competition *for* the market.

36. Promoting sufficient competition *for* the market is thus necessary to minimise the risk of inefficiencies or consumer harm associated with the emergence of dominant platforms. Beyond strictly enforcing traditional competition policy tools such as rules on predatory pricing and control of mergers and acquisitions (OECD, 2018[38]), limiting costs of switching between platforms or participating in several platforms simultaneously ("multi-homing") will be key to promote competition for the market. Compared with other types of digital platforms, such as operating systems for mobile telephones, switching costs for both services providers and consumers on gig economy platforms are in principle significantly lower. As switching from one gig economy platform to another generally does not require an upfront investment for customers and providers, platforms with a superior matching algorithm or that apply a dynamic pricing strategy may thus rapidly attract a critical mass of customers and providers. For instance, the ride-hailing platform *Uber* offers discounts to riders for initial rides and waives the fee for drivers when it enters a city, which allows it to rapidly attract participants on both sides of the market.

37. Low switching costs could be promoted by monitoring contractual terms that discourage switching or multi-homing and by allowing participants to transfer their reputation rankings across platforms. Such clauses do not typically explicitly prohibit workers from participating in another platform, but may offer financial incentives for being online a minimum amount of time and/or accept a minimum amount of requests. For instance, *Uber* introduced a fare policy that guaranteed them minimum hourly

[14] Such "winner-take-all" dynamics sometimes take place at the local level as the geographic segmentation of services markets implies that network effects arise mainly at the local level so that at national or global levels several providers can co-exist. However, insofar as these providers do not compete head-on in local markets, the emergence of dominant players at the local level can have adverse effects on efficiency and consumer welfare.

earnings, but required them to be online at least 50 out of 60 minutes and accept at least 90% of ride requests (Forbes, 2015[39]). Mobility between platforms could also be actively promoted by allowing both workers and customers to transfer reputation ratings across platforms, for instance by giving workers and customers full ownership of their reputation data or creating a public repository of reputation rankings.

38. Strong competition for the market may in some instances require giving potential entrants access to data beyond incumbent platforms' reputation rankings. For instance, the efficiency of the algorithm matching workers to clients may depend on the scale and the scope of the data collected by the incumbent platform, which may constitute a barrier to entry for potential entrants that do not have access to these data. However, the legitimate concern to promote contestability of the market needs to be balanced against maintaining incentives for innovation, as better data on workers and customers of incumbent platforms typically reflect the return to past technological and organisational innovations. In instances of clear anti-competitive practices by an incumbent platform, competition concerns may outweigh innovation incentive considerations, which may call for obliging the incumbent platform to fully or partly share its data on workers and clients with potential entrants.

39. Promoting competition for the market would not only counter-balance the tendency towards dominant platforms on product markets, but would also reduce the risk of labour market monopsony. The emergence of dominant platforms on product markets could reduce workers' outside options in the labour market, thereby allowing these platforms to push down pay with little negative effects on employment. Recent evidence for the United States, for instance, suggests that increasing employer concentration reduces wages and may partly explain low wage growth and declines in labour shares (Azar, Marinescu and Steinbaum, 2017[40]; Benmelech, Bergman and Kim, 2018[41]; De Loecker and Eeckhout, 2018[42]; Krueger, 2018[43]). Evidence from *Amazon Mechanical Turk* suggests that labour supply responds only very weakly to changes in pay, implying that requesters on the platform have significant wage-setting power (Dube et al., 2018[44]).

4.3. Labour market policies and institutions

40. In addition to differences in the application of product market rules across gig economy platforms there are also significant differences in the application of labour market rules. The reliance of gig economy platforms' on self-employed contractors rather than employees has allowed them to develop innovative business models in which capacity is adjusted rapidly to fluctuations in demand, for instance through surge pricing. But reliance on self-employed contractors also raises the questions of regulatory neutrality and adequate protection of platform workers. The challenge for labour market policies is to preserve sufficient flexibility in work arrangements to allow innovative business models to succeed while providing adequate working conditions and incentives for skill upgrading for platform workers.

41. One issue for regulatory neutrality and the protection of platform workers is whether they should be classified as self-employed contractors or platform employees. On the one hand, platform workers have significant autonomy over working time, are free to reject clients matched to them by the platform and can work for several platforms simultaneously. Moreover, many industries in which gig economy platforms are active are characterised by high shares of own-account workers, suggesting that movements into platform work are mainly from self-employment (or unemployment) rather than dependent employment. On the other hand, the platform limits worker autonomy by

typically fixing the price of the service and may in practice require workers to be connected a minimum number of hours or to accept a minimum share of service requests. Non-compliant workers may be removed from the platform (or suffer other penalties) without due process.

42. Irrespective of the legal controversies surrounding classification issues (Adams, Freedman and Prassl, 2018[5]), there may be more innovation-friendly ways of promoting job quality for platform workers than simply classifying all of them as employees. Flexible work arrangements, for instance in terms of working time, can bring gains to both businesses and workers, but the gains from such flexibility need to be shared equitably. A number of tools developed by gig economy platforms may actually promote such equitable sharing. By attracting new workers "surge pricing", for instance, may allow platforms to charge higher prices and serve clients that would otherwise have gone unserved. In practice, such sharing of the gains from flexibility requires strong competition between platforms to prevent the emergence of labour market monopsony, but may additionally require to adapt labour market regulations and the legal and institutional setup for collective bargaining.

43. Labour market regulations that could be adapted to prevent the erosion of platform workers' bargaining position include rules for the termination of contracts, worker mobility and minimum pay. There may be a need for minimum standards to remove workers from platforms to avoid that platforms impose abusive contractual terms on workers who fear being penalised for non-compliance by being taken off the platform. More generally, there may be a need for clear rules on what constitutes abusive contractual terms, including those reducing worker mobility, for instance by preventing workers from multi-homing. Designing rules on minimum pay for platforms workers is complex since platform workers are paid per provided service (output) rather than per hour worked (input). One option is to define minimum pay on a piece-rate basis (OECD, 2018[45]), but this risks involving significant administrative costs since it would require assessing output per hour for different types of platform workers and then setting the minimum rate per output so that low-productivity workers can achieve earnings similar to the minimum wage.

44. Ensuring that platform workers can bargain over working conditions collectively would further strengthen their bargaining position. In a number of OECD countries self-employed workers cannot bargain collectively because of antitrust rules, since associations of self-employed workers would be considered as a cartel. Such rules may need to be reviewed since platform workers share a number of characteristics with dependent employees, including limited autonomy over setting pay. New technologies can in fact facilitate innovative platform-based collective action by allowing workers to collaborate and to share information. For instance, *Dynamo* is a forum for workers on *Amazon Mechanical Turk* that promotes collaboration, including on launching campaigns and developing guidelines for setting pay and designing tasks.

45. Apart from improving working conditions for platform workers by reviewing labour market regulations and rules on collective bargaining, there is a need to ensure that platform workers have access to basic social protection, including work-related accidents, parental benefits, health and pensions. Platform workers have considerable autonomy over when and how much to work, implying that coverage by unemployment insurance would raise significant moral hazard issues. However, this is not the case for work-related accidents, health and pensions. While in most OECD countries the self-employed benefit from statutory access to health and pension insurance, there are significant gaps in

coverage for work-related accidents. Moreover, in practice platform workers may not meet eligibility requirements due to earnings, hours or minimum contribution periods. For instance, around 40% of self-employed workers do not have access to sickness benefits on average across European Union countries (Matsaganis et al., 2016[46]). In this light, policy makers may need to review statutory access for the self-employed to these schemes and consider making parametric changes that would raise effective coverage.

46. To offset adverse effects on training incentives from high work flexibility and multi-homing, platform workers need to be given access to existing training schemes. Platform workers' status as self-employed contractors may prevent them from accessing existing training schemes. Making access to training schemes independent of employment status would go a long way towards promoting training and skill acquisition of platform workers. According to a recent decree in France, for instance, platforms that set workers' pay and other working conditions will under certain conditions have to reimburse workers' costs of validating acquired experience (Donini et al., 2017[47]). Given that digital skills of platform workers are better than those of the general population, leveraging the opportunities of digital technologies could be a particularly cost-effective way of providing training for these workers, for instance through Massive Online Open Courses (MOOC).

4.4. Tax policies

47. The reliance of gig economy platforms on self-employed contractors rather than dependent employees may distort competition if tax obligations differ across forms of work. The self-employed typically pay lower social security contributions and – so long as their revenues remain below legally mandated thresholds – are generally not subject to value-added taxes (VAT). Such differences in tax treatment can induce inefficiencies as firms' and workers' incentives to choose self-employment rather than dependent employment may be influenced by tax differentials rather than firms' technology or workers' preferences.

48. Lower social security contributions of the self-employed compared with employees partly reflect lower social entitlements, but may in some countries unduly give platforms a cost advantage over traditional businesses. As indicated above, in most OECD countries, there is currently no obligation for the self-employed to be covered against unemployment and they benefit from only limited health insurance and pension coverage (Matsaganis et al., 2016[46]). If the resulting lower contributions are reflected in a lack of entitlements to sickness and unemployment insurance, this does not distort firms' and workers' choice between self-employment and dependent employment.[15] However, in a number of countries – including the United Kingdom – limited differences in social entitlements do not justify the large differences in social contributions (Adam, Miller and Pope, 2017[48]).

49. Gig economy platforms that rely on self-employed contractors to provide services are not subject to VAT on these services. In principle, this does not create a distortion because in such a case it is the contractor who is liable to pay VAT. However, where the contractor is exempted from VAT, for instance by being below the exemption threshold, there is a cost advantage to organising the provision of the service through a platform compared with firms that rely on employees to provide the same services. The OECD,

[15] If lower social security taxes are not fully offset by higher pre-tax pay, platforms may nonetheless choose self-employment over dependent employment.

through Working Party No.9 (WP9) of the Committee on Fiscal Affairs is intending to commence work before the end of 2018 to explore the VAT implications arising from sharing economy business models. This work will include an assessment of VAT implications in respect of the status of service providers including those in the gig economy. The analysis at WP9 will take due account of the neutrality, efficiency and fairness of the VAT treatment applying to services in this sector.

50. The emergence of gig economy platforms further raises the issue of how to tax the electronic platforms themselves. This is an issue that has been identified by the work of the Inclusive Framework on Base Erosion and Profit Shifting (BEPS), including the Interim Report on the Tax Challenges Arising from Digitalisation (OECD, 2018[49]) and it is the subject of ongoing work at the global level through the OECD's Task Force on the Digital Economy.

5. Conclusion

51. This paper has made a first attempt to analyse the economic and policy implications of the emergence of gig economy platforms. The results suggest that the rapid growth of these platforms partly reflects technological and organisational innovations, with potentially positive effects on aggregate productivity and employment. The Productivity Workstream envisages to conduct further empirical work based on cross-country firm-level data on the productivity effects of the emergence of a broader range of digital platforms in the context of the project on services productivity.Although platform work could in principle substitute for dependent employment, thus far it mainly appears to be an alternative to traditional self-employment, with little effects on dependent employment and wages. Looking forward, the main challenge for public policies will be to promote strong competition *for* the market while improving working conditions for platform workers. Instead of strictly enforcing existing rules, this will in many cases require adapting policy settings in product and labour markets to the needs of the digital economy.

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Annex A. Supporting technical material

Table A.1. Selected gig economy platforms

Main field	Platform	Industry coverage (in ISIC 4)	Operating areas	Workforce	Founded in	Headquarters
Personal transportation	Didi	Taxi operation; Other postal and courier activities	Australia, Brazil, China, Japan, Mexico	-	2012	China
	Lyft	Taxi operation	United States	50,000[1]	2012	United States
	Ola Cabs	Taxi operation	Australia, India, United Kingdom		2010	India
	Uber	Taxi operation; Other postal and courier activities	Worldwide	160,000[1]	2009	United States
Home deliveries	Deliveroo	Other postal and courier activities	Australia, Belgium, France, Germany, Hong Kong, Ireland, Italy, Netherlands, Singapore, Spain, United Arab Emirates, United Kingdom	-	2013	United Kingdom
	Delivery Hero	Other postal and courier activities	Worldwide	-	2011	Germany
	Glovo	Other postal and courier activities	Argentina, Brazil, Chile, Costa Rica, Ecuador, France, Guatemala, Italy, Panama, Peru, Portugal, Romania, Spain, Turkey	-	2015	Spain
	Postmates	Other postal and courier activities	Mexico, United States	10,000[1]	2011	United States

Main field	Platform	Industry coverage (in ISIC 4)	Operating areas	Workforce	Founded in	Headquarters
Personal services	Bambino	Child day-care activities	United States	-	2015	United States
	Bubble	Child day-care activities	United Kingdom	-	2016	United Kingdom
	Care.com	Child day-care activities; Residential care activities for the elderly and disabled; Residential nursing care facilities; General cleaning activities[2]; Other personal services; Other education	Andorra, Australia, Austria, Belgium, Canada, Denmark, Finland, Germany, Ireland, Liechtenstein Monaco, Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, United Kindom, United States	6,600,000[1]	2007	United States
	Handy	General cleaning activities[2]; Repair and maintenance services; Electrical, plumbing and other construction installation activities	Canada, United Kingdom, United States	5,000[1]	2012	United States
	Helpling	General cleaning activities	Australia, Austria, Brazil, Canada, France, Italy, Netherlands, Singapour, Spain, Sweden, United Arab Emirates	-	2014	Germany
	Le Cicogne	Child day-care activities	Italy	-	2013	Italy
	Listminut	General cleaning activities[2]; Repair and maintenance services; Electrical, plumbing and other construction installation activities; Child day-care activities; Other personal services; Cultural education; Other education	Belgium	-	2013	Belgium
	TaskRabbit	Repair and maintenance services; Electrical, plumbing and other construction installation activities	United Kingdom, United States	30,000[1]	2008	United States
	Urbansitter	Child day-care activities	United States	-	2010	United States

Main field	Platform	Industry coverage (in ISIC 4)	Operating areas	Workforce	Founded in	Headquarters
Crowdwork	Amazon Mechanical Turk	Data processing activities; Photographic activities (e.g. images and videos processing); Translation activities; Other specialised office support activities (e.g. audio transcription)	Worldwide[3]	500,000	2005	United States
	BeMyEye	Advertising and market research[4]	Europe	1,000,000	2011	United Kingdom
	Catalant	Information and communication; Legal and accounting activities; Management consultancy activities; Advertising and market research;	Worldwide	10,000	2013	United States
	Crowdsource	Publishing activities; Data processing activities; Advertising and market research; Other specialised office support activities (e.g. audio and video transcription)	Worldwide	8,000,000[1]	2011	United States
	Clickworker	Publishing activities; Data processing activities; Advertising and market research	Worldwide	1,000,000	2010	Germany
	Figure Eight	Data processing activities[5]	Worldwide	5,000,000[1]	2007	United States
	Fiverr	Publishing activities; Motion picture, video activities; Sound recording and music publishing activities; Computer programming, consultancy and related activities; Advertising and market research; Specialised design activities; Translation activities; Other education (e.g. online private lessons)	Worldwide	-	2010	Israel
	Spare5	Data processing activities	Worldwide	-	2014	United States
	Twago	Publishing activities; Motion picture, video activities; Sound recording and music publishing activities; Computer programming, consultancy and related activities	Worldwide	500,000	2009	Germany
	UpWork	Publishing activities; Computer programming, consultancy and related activities; Legal and accounting activities; Management consultancy activities; Advertising and market research; Specialised design activities; Translation activities; Office administrative and support activities	Worldwide	12,000,000[6]	2015	United States

[1] See Smith and Leberstein (2015[50]) for original references.
[2] Includes office cleaning
[3] Allowed requesters come from 49 countries.
[4] Requesters are in the retail trade industry
[5] Human-in-the-loop approach to create AI by combining people who annotate or label data and machines
[6] https://digit.hbs.org/submission/upwork-changing-the-way-we-work/

Table A.2. Selected studies on the size of gig economy platforms

Reference	Gig economy platforms	Data collection	Country	Year	Sample size	Representative	Frequency	Size estimates
Balaram, Warden and Wallace-Stephens (2017)	Incl. asset-based platforms	Face-to-face survey	United Kingdom	Not available	8000 individuals	Yes	Full-time and occasional	2.17% of population aged 15 or older
BLS (2018)	Yes	Labour Force Survey	United States	2017 (May)	60,000 households	Yes[1]	Full-time and occasional	1% of total employment
Boeri et al. (2018)	Yes	Online survey	Italy Unitted Kingdom	2018	15,000 20,000	Yes[1]	Full-time and occasional	2.6% of working age population 3% of working age population
Bonin (2017)	Yes	Telephone survey	Germany	2017	8,452	?	Full-time and occasional	3.1% of population aged 18 or older
Farrell and Greig (2018)	Yes	Bank data (JP Morgan)	United States	2018 (March)	39 million	No	Full-time and occasional	1.1% of bank account holders
Gazier and Babet (2018)	Yes[2]	Labour Force Survey	France	2017	3,700	Yes[1]	Main job[3]	0.7% of total employment
Jackson, Looney and Ramnath (2017)	Yes	Tax data	United States	2014	148,381,730	Yes[1]	Main job[3]	0.7% of total employment
Katz and Krueger (2016)	Yes	Online survey	United States	2015	3,844	Yes[1]	Full-time and occasional	0.5% ot total employment
Pesole et al. (2018)	Yes	Online survey	14 European countries	2017	32,409 (about 2,300 per country)	Yes[1]	Main job[4]	2% of population aged 16 to 74
Statistics Canada (2017)	Peer-to-peer ride services	Labour Force Survey	Canada	2015-2016	100,000	Yes[1]	Full-time and occasional	0.3% of population aged 18 and older in the past 12 months
Statistics Finland (2018)	Incl. asset-based platforms	Labour Force Survey	Finland	2017	43,000	Yes[1]	Full-time and occasional	7% of population aged 15 to 74 in the past 12 months

[1] Weights are used to align the sample to national level.
[2] Includes self-employed who are in touch with their clients through a platform or through a firm that redirects clients.
[3] Based on self-report.
[4] Main platform workers are defined as workers who earn at least 50% of their income via platforms and/or work more than 20 hours a week.

Table A.3. Platform presence by occupation (ISCO08)

Occupations with known platform presence	Occupations with no known platform presence
Sales and marketing managers	Finance managers
Graphic and multimedia designers	Policy and planning managers
Nursing professionals	Business services and administration managers not elsewhere classified
Physiotherapists	Manufacturing managers
Teaching professionals not elsewhere classified	Construction managers
Accountants	Supply, distribution and related managers
Advertising and marketing professionals	Restaurant managers
Systems analysts	Services managers not elsewhere classified
Software developers	Civil engineers
Applications programmers	Mechanical engineers
Software and applications developers and analysts not elsewhere classified	Engineering professionals not elsewhere classified
Journalists	Building architects
Nursing associate professionals	Generalist medical practitioners
Accounting associate professionals	Specialist medical practitioners
Buyers	Primary school teachers
Information and communications technology user support technicians	Early childhood educators
Accounting and bookkeeping clerks	Financial and investment advisers
Statistical, finance and insurance clerks	Management and organization analysts
Hairdressers	Policy administration professionals
Beauticians and related workers	Personnel and careers professionals
Cleaning and housekeeping supervisors in offices, hotels and other establishments	Technical and medical sales professionals (excluding ICT)
Shopkeepers	Lawyers
Child care workers	Social work and counselling professionals
Health care assistants	Civil engineering technicians
Home-based personal care workers	Electrical engineering technicians
Plumbers and pipe fitters	Mechanical engineering technicians
Painters and related workers	Draughtspersons
Building and related electricians	Physical and engineering science technicians not elsewhere classified
Electrical mechanics and fitters	Manufacturing supervisors
Car, taxi and van drivers	Construction supervisors
Domestic cleaners and helpers	Dental assistants and therapists
	Medical assistants
	Insurance representatives
	Commercial sales representatives
	Real estate agents and property managers
	Office supervisors
	Administrative and executive secretaries
	Government social benefits officials
	Social work associate professionals
	Chefs
	Bank tellers and related clerks
	Receptionists (general)
	Stock clerks
	Production clerks
	Transport clerks
	Mail carriers and sorting clerks
	Clerical support workers not elsewhere classified
	Waiters
	Bartenders
	Building caretakers
	Shop supervisors
	Shop sales assistants
	Teachers' aides
	Police officers
	Security guards
	House builders
	Bricklayers and related workers
	Carpenters and joiners
	Building frame and related trades workers not elsewhere classified
	Welders and flamecutters
	Structural-metal preparers and erectors
	Toolmakers and related workers
	Metal working machine tool setters and operators
	Motor vehicle mechanics and repairers
	Agricultural and industrial machinery mechanics and repairers
	Butchers, fishmongers and related food preparers
	Bakers, pastry-cooks and confectionery makers
	Cabinet-makers and related workers
	Product graders and testers (excluding foods and beverages)
	Stationary plant and machine operators not elsewhere classified
	Mechanical machinery assemblers
	Electrical and electronic equipment assemblers
	Bus and tram drivers
	Heavy truck and lorry drivers
	Earthmoving and related plant operators
	Lifting truck operators
	Building construction labourers
	Hand packers
	Manufacturing labourers not elsewhere classified
	Freight handlers
	Shelf fillers
	Kitchen helpers