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The Future of Work in the 'Sharing Economy'

Market Efficiency and Equitable Opportunities or Unfair Precarisation?

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Abstract
This critical and scoping review essay analyses digital labour markets where labour-intensive services are traded by matching requesters (employers and/or consumers) and providers (workers). It focuses on digital labour markets which allow the remote delivery of electronically transmittable services (i.e. Amazon Mechanical Turk, Upwork, Freelancers, etc.) and those where the matching and administration processes are digital but the delivery of the services is physical and requires direct interaction. The former broad type is called Online Labour Markets (OLMs) and is potentially global. The latter broad type is termed Mobile Labour Markets (MLMs) and is by definition localised.

The essay defines and conceptualises these markets proposing a typology which proves to be empirically valid and heuristically useful. It describes their functioning and the socio-demographic profiles of the participants, reviews their economic and social effects, discusses the possible policy implications, and concludes with a research agenda to support European level policy making. It alternates the discussion of 'hard' findings from experimental and quasi-experimental studies with analysis of 'softer' issues such as rhetorical discourses and media 'hyped' accounts. This triangulation is inspired by, and a tribute to, the enduring legacy of the work of Albert O. Hirschman and his view that ideas and rhetoric can become endogenous engines of social change, reforms, and policies. This essay tries to disentangle the rhetoric with available empirical evidence in order to enable a more rational debate at least in the discussion of policies, if not in the public arena. To do so, an in depth analysis of 39 platforms was undertaken together with a formal review of 70 scientific sources. These two main sources have been integrated with: a) an exploration of 100 media accounts (business press, newspapers, magazines, and blogs); b) 50 reports and surveys produced by 'interested parties' (industrial associations, platforms own reports and public relation materials, think tanks with a clear political orientation, NGOs, trade unions, etc.); and c) about 200 indirectly relevant scientific contributions and policy reports (used as sources to contextualise and integrate the above sources, and to derive theoretical and interpretative insights).

While the evidence is limited and inconclusive with respect to various dimensions, the findings of this essay show, among other things, that: a) individuals engage in these activities primarily for money, for a large segment of them this work is their primary source of income, and most are under-employed and self-employed and fewer are unemployed and inactive; b) matching frictions and hiring inefficiencies are widespread and even the OLMs are far from being globalised online meritocracies; c) a behavioural approach to big data exploration should be further applied because there is emerging evidence of heuristic and biases contributing to hiring inefficiencies.
Title: The Future of Work in the 'Sharing Economy'. Market Efficiency and Equitable Opportunities or Unfair Precarisation?

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Acknowledgements

This essay on digital labour markets, and a second one dealing more generally with the 'sharing economy' as a whole[1], presents the results of an exploratory research project conducted by Unit J.03 (Information Society) at JRC-IPTS[2] between June 2015 and February 2016.

Special thanks go to Ioannis Maghiros (Head of Unit J.03), who envisaged the scientific and policy relevance of this topic, and decided to launch this exploratory project. Other colleagues at J.03 also provided input: Gianluca Misuraca made many valuable suggestions and Bertin Martens' questions and comments helped finally to corroborate the key tenets of the analysis of the 'sharing' economy presented in these two essays.

The preliminary versions of both essays were presented in Brussels on 24 February 2016 at an internal workshop, which was organised by Ann Branch and Maria Nyberg of DG Employment. The authors would like to acknowledge their support and policy insights which have improved the content of these essays. The workshop was attended by representatives of various Directorate Generals, whose comments and suggestions have also provided valuable input.

The authors, however, are solely responsible for the limitations of the evidence base upon which these essays rest, for any conceptual and/or logical flaw in the framing of the topic, for biases in the interpretation of the results, and for any possible 'value-relevance' (*Wertfreiheit*)[3] that might be attributed to the discussion of the main findings.

Two disclaimers and corresponding apologies to the community of researchers are in order here. First, for both essays a sizeable lag time elapsed between the completion of the formalised literature review and the finalisation of the work, due to internal peer-reviewing. Though a couple of updates of the literature search (though not as systematic as the first one) were carried out, some important contributions may have been left out, for which we apologise. Second, several contributions have been first found, analysed, and are cited in their pre-publication form. It is possible that some of them have now been published in peer-reviewed journals and that this fact escaped the search updates. If this is the case, apologies are also due to their authors.

Foreword

This essay is one of two that deal with the sharing economy. While this essay deals specifically with digital labour markets, the second provides a more general overview (see footnote 1). Both are based on primary (analysis of platforms) and secondary (scientific literature, think tanks and policy reports, and media accounts) sources. They take an interdisciplinary approach to the analysis, combining economics, sociology, anthropology, legal studies, and rhetorical analysis.

The reader will embark on what may at first sight seem a tortuous journey into different literatures, codes, terminologies, and narratives. Discussion of 'hard' findings from experimental and quasi-experimental studies will alternate with analysis of 'softer' issues such as rhetorical discourses and media 'hyped' accounts. There is a rationale, however, inspired by the enduring legacy of the work of Albert O. Hirschman (1970, 1977, 1991)[4] and his view that ideas and rhetoric can become endogenous engines of social change, reforms, and policies.

In the preface of his book *The Rhetoric of Reaction* (1991), Hirschman observed that opposing groups in liberal democracies sometimes get walled off from each other's opinions and views. He argued that rhetorical discourses can explode into conflict simply as a result of the 'imperative of the argument'. He explained that he found a detached analysis of surface rhetoric, placed historically and analytically in context, more useful than a head-on attack on one of the opposing factions. He also claimed that deconstructing rhetoric by using empirical evidence could help restore dialogue and communication between conflicting factions. He also showed how rhetorical discourses do not emerge from nowhere but are historically inspired and recurring. He compared, for instance, the neoconservative attacks on welfare states, such as Charles Murray's *Losing Ground* (1984), to the reactions hundreds year earlier against the "Poor Laws". He noted how '*Any idea that has been out of view for a long time has a good chance of being mistaken for an original insight*' (1991, pp. 29-30). A case in point is the discourse about gigs workers performing tasks on digital labour markets for 'pin money'. Here, an old idea first articulated in the 1950s and 1960s about the then-emerging temporary work agencies in the US has clearly resurfaced (Berg, 2016). More generally, the 'sharing economy' is today a rhetorical field that needs unpacking.

The 'sharing economy' (also given, among many others, the label 'collaborative economy'), is potentially the ideal place for reconciling the 'passions' and the 'interests'. In the last few years, however, it has become the domain of conflicting discourses, legal disputes, and at times violent strikes (i.e. traditional taxi drivers in Paris or Milan). It may seem churlish to deconstruct these discourses with empirical evidence and to challenge claims made by both naive disinterested and shrewd self-interested parties about '*le magnifiche sorti e progressive*' (the magnificent and progressive fate[5]) of the 'sharing economy'. Alternatively, deflating the gloomy predictions of the harshest detractors of 'sharing platforms' may be considered apologetic. Yet, this is exactly what this essay aims to do. It will try to disentangle the rhetoric with available empirical evidence in order to enable a more rational debate at least in the discussion of policies, if not in the public arena. Analysis of the rhetoric, mapping of stakeholder positioning and interests, and robust empirical evidence are triangulated to inform policy making with a series of options. Currently, commercial 'sharing' platforms operate in an institutional vacuum and stand to some extent 'above the law'. This makes it easy for 'detractors' to argue that they are simply thriving on 'regulatory arbitrage', rather than producing innovation. Decisions made by local governments and courts may create a very

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[4] As evident also in the title of the other essay on the 'sharing economy' in general pitting the passions against the interests.

[5] This is a famous quote from a 1836 poem by Giacomo Leopardi's (*La Ginestra o Fiore del Deserto*), where the Italian poet ironically challenged in the positivist context of the day the blind faith in an unlimited and extraordinary progress for all human race.

fragmented landscape in Europe. Regulatory and policy guidance is therefore urgently needed.

The 'sharing economy' is a paradigmatic case of a policy-relevant issue where facts are uncertain, values disputed, and the stakes increasingly high. As such, it represents a test bed for the exercise of science to broker policy options honestly and transparently. It is a strategic case study in which the JRC could play a valuable role as a 'boundary organisation' between science and policy (Guimarães Pereira & Saltelli, 2014). This essay represents a first step in this direction. There are however some obstacles in data accessibility that must be overcome, as discussed briefly in the final part of this foreword.

On 10 February 2016, Airbnb, Uber and 45 other commercial 'sharing' platforms sent an open letter to the Netherlands Presidency of the Council of the European Union[6]. An extract is reported below:

> *In its Digital Single Market Strategy, the European Commission announced the development of a European agenda for the collaborative economy […] We welcome the Strategy as an important step in realising the benefits which our platforms can deliver for European consumers. We also support the Commission's efforts to seek and remove obstacles in the broader European internal market for goods and services. In view of the upcoming European Competitiveness Council, we urge Member States to support these objectives and continue to seek to ensure that local and national laws do not unnecessarily limit the development of the collaborative economy to the detriment of Europeans. [...] We therefore call on the Council to acknowledge in its Conclusions, the positive contribution of the collaborative economy in terms of sustainable economic growth for Europe*.

The work carried out as part of the exploratory project on the 'sharing economy' shows that evidence is emerging on both the positive and negative effects of platforms. However, it also unequivocally documents that the currently available evidence on costs and benefits is absolutely partial and not yet conclusive. There are a few exceptions where data on labour platforms has been made available to researchers: i.e from Upwork, formerly Elance-oDesk, and Freelancers. However, most of the available quantitative evidence based on platforms' own data has been produced by the platforms themselves (Airbnb, 2015b)[7], or has been commissioned to former members of the Obama administration (Autor *et al.*, 2003; Hall & Krueger, 2015; Sperling, 2015) and of the German Monopolies Commission (Uber, 2015f, 2015g), or co-authored (but not yet published in peer-reviewed journals) by academics and 'embedded researchers' (i.e. researchers who are employed by platforms and have been given access to internal data). The datasets and methods used to produce these reports, thus, are not publicly accessible for third-party scrutiny. It is more than likely that the net welfare effects of the 'sharing economy' are positive for the economy, and the society as a whole, including consumers, employers, and possibly workers. However, it needs to be demonstrated by further empirical research in general and especially in Europe. This research should undergo the scrutiny of peer-review. Though evidence can certainly be gathered through qualitative interviews and case studies, surveys, and web scraping of data, the important data that would show economic effects are those gathered by the platforms, which so far have been made available only to a few selected researchers. It is, thus, important that European researchers also have access to platform-generated data. It would provide evidence on costs and benefits for different categories of stakeholders, from which aggregate net welfare effects could be estimated. The European Commission should take steps to make this possible.

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[6] Available at: https://www.airbnbaction.com/wp-content/uploads/2016/02/NLCouncilLetterCollabEcon-Final-100216-4.pdf (retrieved 11-02-2016).

[7] After this entry in the blog summarising the overall results, one can then access the city specific reports (Airbnb, 2012, 2013a, 2013b, 2013c, 2013d, 2014a, 2014b, 2015a, 2015b; Uber, 2014, 2015a, 2015b, 2015c, 2015d, 2015e, 2015f, 2015g).

Executive Summary

This essay analyses digital labour markets where labour-intensive services are traded by matching requesters (employers and/or consumers) and providers (workers). It defines and conceptualises these markets, describes their functioning, the socio-demographic profiles of the participants, and reviews their economic and social effects. This contribution is one of a kind because it gathers extensive primary and secondary evidence (a total of about 370 unique sources) and it takes an inter-disciplinary approach in which economics, sociology, anthropology, legal studies, and rhetorical analysis converge. It alternates the discussion of 'hard' findings from experimental and quasi-experimental studies with analysis of 'softer' issues such as rhetorical discourses and media 'hyped' accounts. This approach is inspired by, and a tribute to, the enduring legacy of the work of Albert O. Hirschman (1970, 1977, and 1991) and his view that ideas and rhetoric can become endogenous engines of social change, reforms, and policies.

The digital labour markets considered in this essay include both those that allow the remote delivery of electronically transmittable services (i.e. Amazon Mechanical Turk, Upwork, Freelancers, etc.) and those where the matching and administration processes are digital but the delivery of the services is physical and requires direct interaction. The former broad type is called Online Labour Markets (OLMs), which are potentially global, the latter broad type is called Mobile Labour Markets (MLMs), which are by definition localised. Using this distinction together with that concerning the type of task traded a two by two typology is proposed including: (1) OLMs for micro-tasking (i.e. small pieces of routine cognitive work requiring low to middle levels of skills as traded for instance in Amazon Mechanical Turk); (2) OLMs for tasking and at times delivery of entire and self-contained projects (i.e. tasks requiring middle to high skill levels such as in Upwork or Freelancers); (3) MLMs for physical services (i.e. performing low skilled manual work and errands such as in TaskRabbit); (4) MLMs for interactive services (i.e. interactive services requiring high skills such as in TakeLessons). Most transactions in (1) and (2) are Peer-to-Business (P2B) while in (3) and (4) they are Peer-to-Peer (P2P).

These markets can be broadly considered as part of, and related to, wider trends such as globalisation of labour markets through the diffusion of outsourcing and offshoring, computerisation and job polarisation, the de-standardisation of work with the emergence of Non Standard Work (NSW). OLMs are also seen as constituting a further driver of the 'Flat World' and as the advent of an online global meritocracy. Proponents see these markets as a means to empower individuals, allowing them to work flexibly or make extra money. Detractors, however, consider them as unregulated channels which lead to the exploitation of workers.

This essay attempts to disentangle the rhetoric and controversy that has characterised the sharing economy debate. It looks at the available empirical evidence in order to enable a more rational debate - at least in the discussion of policies, if not in the public arena. To do so, an in depth analysis of 39 platforms was undertaken together with a formal review of 70 scientific sources, integrated with: a) an exploration of 100 media accounts (business press, newspapers, magazines, and blogs); b) 50 reports and surveys produced by 'interested parties' (industrial associations, platforms own reports and public relation materials, think tanks with a clear political orientation, NGOs, trade unions, etc.); and c) about 200 indirectly-relevant scientific contributions and policy reports (used as sources to contextualise and integrate the above sources, as well as to derive theoretical and interpretative insights).

The dimensional importance of work in digital labour markets is still debatable and requires more well-designed surveys, but it has been shown to be statistically non marginal. In countries such as the UK and the US, those working regularly for digital labour markets (every week) are conservatively estimated to make up between 1% and 2% of the labour force. Globally, the 39 platforms reviewed have a total of 52.6 million registered contractors (a possible under-estimation since there are more platforms out

there). Most of the platforms reviewed are from the US, whereas there are only a few European platforms with 100,000 registered contractors and international coverage. Overall, platforms have grown exponentially over the last five years, although their size is still small. However, if they continue to grow at this pace, it is an empirically-consequential hypothesis that they could encroach on traditional and long-term forms of employment.

Ex ante, using theoretical hypotheses and indirectly relevant evidence by analogy, a number of potentially positive and negative effects can be identified for digital labour platforms. They can increase the pool of employers and workers by removing barriers and reducing transaction costs, improving matching, increasing human capital specialisation, with potential net welfare effects such as more efficient labour markets and increased employment. This may also increase productivity. However, the distributive effects are less clear, depending on whether there will be a long-tail or superstar effect, which may be different for OLM vs MLM. On the other hand, bias, frictions and mismatches could counter any positive effects. As they create precarious forms of employment, digital labour markets could also be the source of social risks and costs. Temporary work can lead to precarisation, blockages to social mobility, and wage penalties. In spite of emerging indications, the evidence for these effects is still limited and not conclusive. The main findings from the reviewed sources as regards workers, the effects and functionings of digital labour markets, and regulatory issues, are reported below.

Workers

Workers in digital labour markets tend to be younger and better educated than their population of reference. However, between 6% and 12% of individuals 55 and older also participate (depending on the OLMs and MLMs considered and on the country). Overall, women are either more represented than men or equally represented, although gender stereotypes penalise them even in anonymous contexts such as OLMs. The evidence gathered debunks the rhetoric about digital workers being predominantly students, as recent surveys find that this category accounts for no more than 10% of workers. They do not work for 'pin money' or out of boredom, as the available evidence shows that there are fairly large shares of individuals for whom earnings from working for digital labour markets represent their primary source of income and/or who engage in a portfolio of several activities. In the UK, for instance, according to a survey based on a nationally-representative sample, as many as 60% (2.9 million if projected on the population of reference) of those who have worked in digital labour markets at least once (11% or 4.9 million) work for several of them and are registered with between 2 and 5. Even when the pay is very low, available surveys indicate that the primary motivation for engaging in this type of work is to earn money. The question of whether these forms of work are voluntary or involuntary is a thornier one and the evidence available does not enable us to draw any conclusions. Obviously, there is a wide range of situations from freely choosing independent freelancing, to doing 'gigs' for lack of alternative opportunities. On the employment status and history of those working in digital labour markets, much more research is needed, as the evidence reviewed is fragmentary and mostly indirect. According to both scientific work and the data reported by some of the platforms themselves, it seems that the majority of these workers are under-employed or self-employed, and that fewer of them are unemployed and inactive. On the other hand, there is fairly robust and uniform evidence to show that earnings in these markets range from very low to modest, with only a small minority of workers making above middle-level incomes. It is also fairly evident that workers have no form of social protection, are in a position of unfavourable information and power asymmetry, and that their privacy is not protected. Gender and ethnicity-based discrimination (voluntary or involuntarily produced by matching frictions, hiring inefficiencies, and cognitive biases) is not uncommon and workers have no way to protect themselves from it. Finally, several studies have documented the increasing diffusion of strictly automated control through algorithms. This has been further corroborated by the inquiries of US

judges in the legal cases related to Uber and Lyft. This seemingly supports the claim that digital labour markets bring us back to Taylor (automated control), Smith (division of labour into piece work), and to pre-industrial levels of work precarisation (lack of social protection).

Digital labour markets' effects and functioning

The evidence available does not document the positive effects that could be envisaged ex ante but points instead to some limits to their realisation. This does not mean that positive effects should be ruled out or that digital markets are not producing any benefits, otherwise their growth could not be explained. To document these positive effects, more empirical research in general, and especially more studies of the effects on firms, should be conducted. In addition, studies that try to compare the effects of digital labour markets with respect to their non-digital counterparts should be carried out, in order to assess whether they improve production and market efficiency. Surveys commissioned by OLMs such as Upwork and Nubelo document high levels of satisfaction among both employers and contractors (though to a slightly lesser extent). Surveys designed and analysed by disinterested third parties are needed to corroborate these preliminary findings. Therefore, the main findings summarised below only reflect the quantitative and robust evidence that is currently available. OLMs favour international labour flows (especially 'North-South') but are not as flat and as meritocratic as expected. Various barriers that can be aptly summarised by the expression 'the liability of foreignness', limit the globalised trade of digital labour and the expected wage convergence. Non-Westerners receive only a limited wage premium (compared to their domestic markets), However, domestic contractors earn more in absolute terms and for some tasks they are preferred, regardless of qualifications. This means that OLMs are less beneficial than expected for developing countries, and also that they exert less pressure on driving down wages in more developed countries. On employment and related labour income effects, the available evidence is limited and inconclusive. In the reviewed studies, focussing on online labour market, examples of concentration of work assignments (i.e. 'superstar' effects leading to job concentration and more income inequality) were found. No cases were documented, however, of the long tail effect (which has more equalising effects on both employment and income levels). The same applies to MLMs, and in one case, less than 10% of workers account for more than 80% of work completed. There is a fairly large number of experimental and quasi-experimental studies showing that digital labour markets are still riven with matching frictions and hiring inefficiencies. Little correlation is found between skills and earning levels, whereas reputational ratings and references seem to be the main explanation for the number of jobs and the amount of money contractors manage to secure. In this respect, it is important to note the relevance of also applying a behavioural perspective to the documented cases of gender and ethnic-based discrimination. These result from, in most cases, involuntary bad decisions based on stereotypes, like heuristics leading to judgements and decision making affected by confirmation biases.

From legal disputes and regulation

Various class actions in the US (especially those concerning Uber and Lyft) have made the debate on possible regulatory intervention more heated. The legal disputes focussed on the possible misclassification of employees as contractors. A court decision forcing Uber or Lyft drivers to be reclassified as employees could have radically changed the regulatory landscapes and the destiny of these two and other digital labour markets. In January (Lyft) and April (Uber) 2016, the two cases reached a settlement. However, the issue remains open and any governmental agency could pick it up again in the near future. In this domain, it has been proposed that an intermediate status between a contractor and an employee (dependent self-employed) be created and that digital labour markets should be made to pay at least a part of the traditional bundle of social protection provisions. This solution, however, would be difficult to implement as it is not easy to define in a general way the criteria that identify a dependent self-employed person. An alternative proposal, named 'benefits portability', consists of creating

individual security accounts to protect workers as they move from 'gig' to 'gig'. Benefits (wage insurance, health insurance, disability and injury insurance) should be designed universally and not tied to specific employers. The final employers would have obligations similar to those that employ regular workers or they could share contributions with the digital labour markets, which could pay half of them. The enactment of some form of regulation to establish the proposed portability of benefits would represent a positive step forward to ensure more dignified conditions for workers in digital labour markets. Various analysts, however, consider it insufficient for several reasons: earnings are sometimes too low in the absence of any minimum wage rules, the flow of work is unstable, no social protection exists, there are clear information and power asymmetries, there is no protection against privacy violations, and various forms of information or reputation-based ethnic and gender discriminatory mechanisms occur unregulated.

This essay raises four broad questions of interest to policy makers:

A. What are the possible implications of these new digital labour markets for employment and wages? Do they create new jobs or simply crowd-out existing ones? Are they a source of income integration for the underemployed or are they instead pushing wages down?

B. Do they justify regulatory intervention? If yes, in what areas? (i.e., taxation, liability, insurance, social protection).

C. What would the costs of curbing innovation and loosing on improved labour market efficiency as a result of regulatory intervention be?

D. Are there risks, in Europe, that fragmentation will emerge as a result of national or local interventions? And are there cases where the issue of classification (self-employed vs. workers) will be decided by the courts in the absence of regulation?

If growth continues at the fast pace of the last five years, these new markets could encroach on traditional and long-term forms of employment. Policy makers should acknowledge that employment in the 21st century is no longer a binary phenomenon (1= employed, 0= unemployed) and set a target to minimise involuntary employment and under-employment. They should put in place fair conditions for voluntary atypical work so that it does not increase inequality. In the same vein, ways should be found to increase protection without suddenly increasing the costs for digital platforms.

European stakeholders should learn from the US experience and from the past. They should acknowledge that the dual policy approach of liberalising new forms of employment while retaining standard full-time employment as the benchmarking norm was not fully effective. It has, to some extent, exacerbated labour market dualism.

It has also been suggested that support infrastructure be set up which would ensure a minimum wage, some minimal forms of social protection and health insurance, liability insurance, and safeguards to protect privacy and fight discrimination.

The report concludes with a brief discussion of the implications for future research, identifying gaps and opportunities, and highlighting key research questions that need to be answered.

1   Introduction

This essay analyses digital labour markets where labour-intensive services are traded by matching requesters (employers and/or consumers) and providers. It defines and conceptualises such markets, describes their functioning and the socio-demographic profiles of the participants, and review their economic and social effects; it also discusses the current policy implications and how these new and unregulated forms of Non Standard Work (NSW) contribute to shaping the future of work both in terms of potentially beneficial and detrimental effects. It is a one of a kind contribution both for the extensive gathering of primary and secondary evidence (a total of about 420 unique sources have been used) and for its inter-disciplinary scope situated at the confluence of economics, sociology, anthropology, legal studies, and rhetorical analysis.

1.1   Digital labour platforms and the future of work

As recounted by Schwartz (2015) in a piece tellingly titled '*Human pretending to be computers pretending to be human*', in 1770 Wolfgang von Kempelen presented in Vienna to Empress Maria Theresa a sort of robot (see picture) that could beat humans at playing chess; he called it the 'Turk'. The 'Turk' toured Europe and evoked contrasting responses, as some were ready to admit and welcome that machines were surpassing humans but many opposed this view. Although the Turk included a '*labyrinth of levers, cogs and clockwork machinery*' obviously it was not using any algorithm and was operated by a person hidden inside. The first digital platform for the trading of micro-tasks, Amazon Mechanical Turk (henceforth simply MTurk), was presented as a new technology of 'humans-as-a-service' as opposed to 'software-as-a-service' and as a new form of 'artificial intelligence' (Irani, 2015b, p. 225). More recently engineers have brought this idea further by designing Soylent, '*a word processor with a crowd inside*' that uses workers from MTurk to create a 'human powered' editor and writing assistant 'inside' MS Word (Bernstein et al., 2015). So one could wonder to what extent the future will be about robots supplanting humans or conversely about digital transformations turning humans into 'robots'.
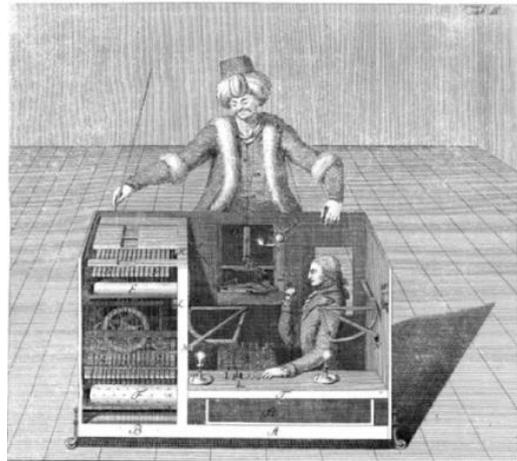
Past and current technological and (to a lesser extent) institutional trends are projected into various descriptions of the future of work in a crucial policy relevant debate. Computerisation and then robotisation as part of the so-called 'second machine age' (Brynjolfsson & McAfee, 2012; Brynjolfsson & McAfee, 2014) is a pivotal hypothesis and narrative in this debate.

Risk of job computerization in Europe (% of total jobs)
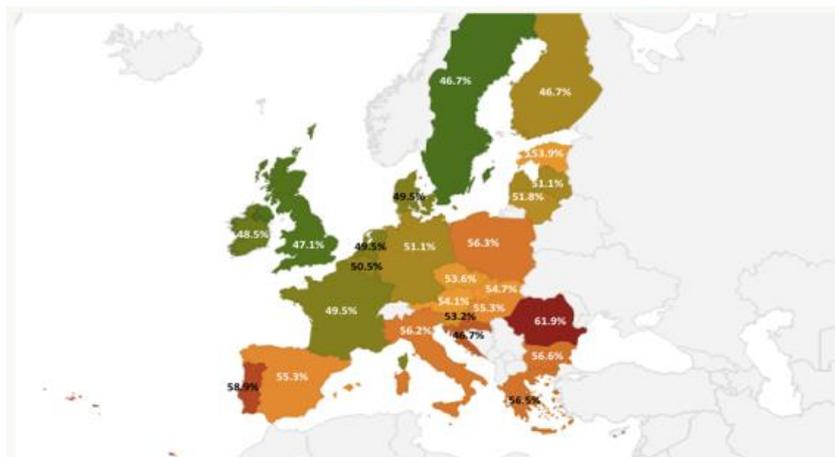
Source: Adaptation from Bowles (2014)

Using the tasks taxonomy developed within the literature on the 'routine-biased technical change' hypothesis (Autor, 2013; Autor & Dorn, 2013; Autor*, et al.*, 2003), has

led to estimates that in the U.S. and in Europe (see graph) the risk of job computerisation stands, respectively, at 47% (Frey & Osborne, 2013) and between 40% and 60% (Bowles, 2014)[i]. Between the mid-1990s and 2010 a clear job polarisation trend (U-shaped work force with the relative decline of middle-skilled jobs and increase of high and low-skilled ones) has emerged in most OECD countries: between 1995 and 2010 routine jobs (i.e. accountants) fell 12 points (53% to 41%), while high skills abstract jobs (i.e. designers) increased ten points from 28% to 38% and non-routine manual jobs (i.e. drivers) increased three points from 18% to 21% (OECD, 2015a, p. 29); this trend is seen as mostly produced by technological change and is expected to increase in the coming years. Another prominent narrative is that of the 'Flat World' whereby increasing outsourcing and off-shoring, also enabled by technology, are creating a globalised labour market (Freeman, 2008; Friedman, 2005). The coming digital wiring of labour was actually announced already in 1998 (Malone & Laubacher, 1998), although limitations to this possibility have been presented much earlier than the formulation of the flat world thesis (Autor, 2001, 2008)[ii]. It has been observed how in the past three decades or so each new wave of digital innovation gave rise to contrasting narratives about the future of work (Baldry, 2011; Holtgrewe, 2014; Howcroft & Taylor, 2014); such unilateral focus on technology obfuscates the importance of institutional changes in labour markets such as for instance the de-standardisation of work and the emergence of Non-Standard Work (NSW: self-employed own account workers not hiring other individuals, temporary or fixed term contracts, and part-time work, see more on this aspect in § 2.2). According to an OECD statistical analysis (2015a, pp. 147-152), the 'routine biased technical change' tells only one part of the story, as job polarisation is clearly associated with de-standardisation of the labour contracts and there is no conclusive evidence demonstrating what caused what between technology and institutional change. What is clear from the data is that routine jobs based on standard contracts (i.e. accountants) have been substituted by routine jobs in NSW forms; if the disappearance of accounting jobs in the middle was entirely driven by technology, then such jobs could not have been substituted by individuals working under NSW conditions having the same skills of those laid off, as data show that it has actually occurred. The emergence of NSW is statistically associated with inequality and poverty (OECD, 2015, pp. 152-170) and is, thus, related to the 'new inequality' debate (Atkinson, 2015; Bernhardt, 2014; Kuttner, 2013, 2016; Standing, 2011; Summers & Balls, 2015), which is a key dimension in the broader discussion of the future of work.

The emergence of digital platforms enabling the delivery of electronically transmittable or physical labour-intensive services is a new trend entering the debate on the future of work. Such platforms, especially in the media but also in academic articles and policy documents, go under various labels including, among others, the 'sharing economy', the 'collaborative economy', 'crowd-employment or crowd-working', the 'gig economy', the 'on-demand economy', etc. Following the more rigorous terminology adopted in the scientific literature, in this essay the first type (i.e. Upwork for tasks and projects or MTurk for micro-tasks) allowing the remote delivery of electronically transmittable services is referred to as Online Labour Markets or OLMs (Horton, 2010). The second type (i.e. TaskRabbit but to some extent also Uber and Lyft), including fully digitalised matching platforms where the services are delivered physically (requiring mobility and direct interaction between provider and requester), has been referred to in the academic literature as 'Mobile Crowdsourcing Markets' (Musthag & Ganesan, 2013), 'Mobile Crowdsourcing Marketplaces' (Thebault-Spieker *et al.*, 2015), and 'On Demand Mobile Workforce'(Teodoro et al., 2014); in this essay they are referred to as 'Mobile Labour Markets' (MLMs). In the large majority of cases both OLMs and MLMs qualify as two-sided markets[iii]. While the full definition and conceptualisation of these platforms is presented later (see § 2.2), as regard terminology it is useful to clarify here that when referring in general to both types the simple expression 'digital labour markets' will be used or at times the acronym 2SOLMLMs which stands for 'Two-Sided Online and Mobile Labour Markets'. The people working through these platforms have been called different things: 'micro-entrepreneurs', 'gigs', 'contractors', 'on-demand workers', 'freelancers,

and even '*Lumpen-cognitariat et salariat algorithmique*'[iv]. For the sake of simplicity, they will be referred to simply as 'workers' and/or 'contractors'.

Regardless of their dimensional relevance, which is very controversial (see § 2.2), these digital labour markets are a paradigmatic and strategic case for the debate on the future of work and are not unrelated to the trends and hypotheses presented above. They are paradigmatic both for the empirical testing of key hypotheses and for the way they entwine rhetorical controversies, tangible conflicts, the presentation of evidence, and eventually regulatory and policy decisions. There are at least three ways in which digital labour markets can be contextualised with respects to the broader hypotheses, trends, and debates on the future of work.

First, while the globalisation of labour (i.e. 'flat world hypothesis') with the diffusion of outsourcing and off-shoring is a wider trend pre-dating the emergence of OLMs[v], the latter have been presented (Horton, 2010, p. 521) and discussed empirically (Beerepoot & Lambregts, 2015) as drivers accelerating the flattening of labour markets through virtual migration, and as potentially increasing wage convergence with its potentially positive (for workers in developing countries) and negative (for domestic workers in OECD countries) consequences; they are also seen as potentially affecting the international division of labour and deepening human capital specialisation at global level. Whether the world is flat in general and whether OLMs are really favouring convergence and abating all geographic barriers is an empirical matter that has yet to be resolved. Friedman's thesis was heavily criticised empirically[vi], whereas the evidence reviewed here suggests that flattening and wage convergence is still limited in OLMs due to a combination of matching frictions and employers' cognitive heuristics and biases (see § 3.2.1).

Second, in both types of digital labour markets work is performed under even less standard forms than 'traditional' NSW, which makes them an object of debate from the perspective of inequality, precarisation, and erosion of labour rights (Berg, 2016; Cherry, 2011, 2016; Kuttner, 2013). In OLMs work is carried out in a regulatory vacuum as the global nature of the platforms neutralises national labour laws and there is no international level agreement (Beerepoot & Lambregts, 2015, p. 246); actually, as candidly stated both by Horton (2010, p. 517) and by Agrawal et al. (2013a, p. 19), platforms perform government-like functions. Despite the fact that MLMs are localised, they have not been regulated yet, although they have been at the centre of lawsuits in the US (see Cherry, 2016).

Third, the emergence of these digital labour markets (particularly OLMs but to some extent also MLMs) is at least indirectly related to computerisation/robotisation trend, the 'routine biased technical change' hypothesis, and to job polarisation [vii]. Although sometimes full self-contained projects are delivered by 'on-demand' workers, in many cases OLMs trade fairly routine tasks and/or micro-tasks into which jobs have been broken down. As shown in the next figure, among the most traded tasks in Upwork (new name given to Elance-oDesk that is the result of the merge between Elance and oDesk) there are also fairly routine ones such as for administrative support as a category, accountants as a position (growth rate, respectively, 37% and 43%)[viii], and the use of basic accounting software as a skill. A reasonable question is, then, why routine tasks and micro-tasks are not computerised and their online trading is fuelling the phenomenal growth of labour platforms (i.e., from 2008 till 2014 contractors' earnings in Upwork went from 0 to 3.2 $ billion with the number of individuals performing tasks growing by 1000%)? There are alternative answers (excessive costs of computerisation especially for SMEs, fluctuating demand for tasks, limits to the possibility of routinizing work, labour cost saving arbitrage made possible by institutional change such as work de-standardisation and regulatory arbitrage). Discussing the available empirical evidence on these digital labour markets can shed light also on indirectly related future of work trends; clearly this preliminary observation may corroborate the OECD analysis (2015a, pp. 147-152), that the 'routine biased technical change' tells only one part of the job polarisation story, the other being work de-standarisation and total lack of regulation that make digital labour markets profitable. Furthermore, the extent to which these

markets trade highly skilled non routine tasks or instead low to medium skilled routine tasks would also contribute to shed further light on job polarisation; the growing trading of low skilled manual jobs through MLMs being the other side of the coin.

Figure 1: Upwork most traded categories, positions, and skills

Source: (Elance-oDesk, 2014; Upwork, 2015a, 2015b)

1.2 Back to the future: from rhetoric to empirical questions

As put by economist Timothy Taylor in his blog (Taylor, 2015), the use of the 'sharing economy' expression to refer to various commercial platforms is a '*triumph of public relations artistry*' (he would rather use 'the matching economy'). This consideration clearly applies to digital labour markets and it would suffice to observe their revenues and market evaluation; unlike community-based 'time banking' digital platforms where 'true' sharing can occur, commercial initiatives such as TaskRabbit fail to cater for less advantaged members of the community (Thebault-Spieker*, et al.*, 2015). The same goes for the 'crowd working' or 'crowd employment' labels resounding the rhetoric of crowdsourcing about the wisdom of crowds and their problem-solving potential, the generosity of cognitive surplus, and the democratising long-tail effects[ix]. There is no unequivocal evidence that these market favour a democratising 'long tail' of employment opportunities (Agrawal et al., 2013a) and there are actually a few contribution documenting 'super star effects' (Horton, 2014; Mill, 2011; Musthag & Ganesan, 2013); it is not the 'generosity of cognitive surplus' but rather monotonous work done for money that characterises the digital crowdsourcing of micro tasks (Martin et al., 2014). The terminology adopted in this essay has dispensed with rhetorically loaded labels, to the point that the expression 'market' is preferred to 'platform' as the latter is surrounded by a politically motivated rhetoric (Gillespie, 2010) matched by that on the objectivity of the algorithms they use (Gillespie, 2014). Nonetheless, following the general inspiration outlined in the 'foreword', a short review of conflictual discourses is presented below for they bring out important empirical research questions whose discussion in this essay can help reconciling opposing positions and better inform the policy-making process.

From the review of media accounts (newspapers, magazines, blogs) performed, a brief characterisation of key rhetorical controversial discourses can be presented here. The enthusiasts see the 'sharing economy' as empowering millions of individuals to unlock the value or their time especially for those segments of human capital that escape

institutionalised employment (i.e. 'flexers' such as stay-at-home parents, retirees, students, etc.), for the under-employed and/or unemployed, and for independent highly skilled professionals. They portray digital labour platforms as helping individuals earn good extra-money and in some cases avoid boredom, achieve work-life balance through flexible and personally chosen work schedules and by working at home, be creative and autonomous and as enabling firms to deal with work picks without incurring unnecessary fixed costs and reach talents not available domestically. The rhetoric of a flat world is integrated with that of the advent of a global online meritocracy as heralded in the Elance-oDesk (then renamed Upwork) 2014 annual impact report (Elance-oDesk, 2014). The pessimists see digital markets as a new and unregulated channel for exploitation by employers and labour costs saving; they argue that the 'gigs' traded on these markets are the components of formerly full-time jobs, parcelled up and put out to tender on a piece-by-piece basis to increase outsourcing across the board (i.e. of both core and non-core tasks) and reduce labour costs (Felstiner, 2011; Smith & Leberstein, 2015). Others see these markets as creating a new class of networked precariat with no benefits and social protection, contributing to the steady erosion of the 'labour contract' and to increasing inequality (Kuttner, 2013; Summers & Balls, 2015, p. 32). As the debate heated up, a series of investigative journalistic reports have shed light on the harsh conditions of work (low earnings, little flexibility, tight work schedules etc.) challenging the view of the enthusiasts (Brown, 2015; CEPR, 2015; Guendelsberger, 2015; Kantor, 2014; O'Brien, 2015; Singer, 2014; Weber & Silverman, 2015; Weiner, 2015; Zimmermann, 2015). As lawsuits cases increased, in the US a debate also started between supporters and opponents of regulatory intervention. The contrasting estimates on the number of people working for these digital labour markets also confirm the heated nature of the debate in the US. These range from 600,000 (Harris & Krueger, 2015) to over 14 million according to a recent (January 2016) survey conducted by *Time Magazine* (Steinmetz, 2016), whose results were questioned by Krueger (Stangler, 2016); the *Time Magazine* estimate, according to (Cherry, 2016, pp. 1-2), has been criticised by economists having an interest in minimising the phenomenon in order to argue against the need for regulation. It is also worth noting that, while the total number of Uber drivers in the US disseminated by Hall and Krueger (2015) was 160,000, California judges dealing with the lawsuit against the ride service platform (O'Connor v. Uber) quantified the total class action into 400,000 drivers (reported in Cherry, 2016, p. 4 n. 23).This brief account raises at least five key empirical questions that will be discussed in this essay in relation to the gathered evidence.

The first question is linked to the flat world hypothesis seen earlier and the additional rhetorical element about the advent of a global meritocracy. The reviewed evidence will be used to assess the extent to which OLMs actually bring about a fully globalised and non-discriminatory market in which skills and experience are the main and only criterion in employers' hiring decisions.

The second one stems from the discourse on 'extra-money' and concerns the motivation of workers taking up little pieces of routine jobs or doing errands for other people. As acutely observed by Berg (2016, p. 18), the claim about individuals working in digital labour markets for 'pin money' or out of boredom is a replication of the rhetoric used in the late 1950s and in the 1960s when the new temporary agency industry in the US was portrayed as employing just middle class wives killing time and earning extra-money. This is an emblematic case of Hirschman's claim that rhetorical discourses of the past tend to resurface and it is a first instance explaining the 'back to the future' expression in the title of this section. Empirically, this entails analysing workers' motivation and tackling the related question on the extent to which fragmented or part-time work is a voluntary or involuntary choice. Furthermore, a closely related issue comes from the discourse on digital labour markets being populated by 'flexers', which requires data on the employment status and histories of those performing tasks and errands through these digital markets. The findings of the surveys and studies reviewed in this essay seem to show that the reality is less rosy than the picture portrayed by the enthusiasts, although not as gloomy as argued by the detractors.

The third question, emerging from the discourse on flexibility and reach to talents for firms and rebuked by claims about exploitation, concerns the motivation of firms for using digital labour market. One possibility, as it occurs to some extent for outsourcing and off-shoring, is that firms use platforms only for the sake of labour arbitrage (saving money on labour) and because of lack of regulation (Beerepoot & Lambregts, 2015). In this respect, a possible hypothesis is that such markets allow SMEs to also take advantage of out-sourcing and off-shoring (typically ripped by big multinational corporations). Labour arbitrage as a main driver can create an asymmetry between capital and labour with questionable ethical implications (Hollinshead *et al.*, 2011). Firms' motivation in using digital labour markets and the extension of such practices remains a key empirical question that this essay also explores. It can be anticipated from the little available evidence that firms (especially SMEs) use such platforms for various reasons, among which savings on labour costs stands at the top.

The fourth question is about the discourse on flexibility, autonomy, and creativity to be contrasted with the actual conditions of work. Indeed, working for these digital labour markets potentially embodies the move toward a knowledge economy based on knowledgeable, skilled, flexible and autonomous workers operating in a flat, networked, and less hierarchical world. On the other hand, automatic management by algorithms for the sake of control or 'algocracy' (Aneesh, 2009), and the breaking down of work into micro pieces for the sake of a more efficient division of labour is possibly another sort of 'back to the future' featuring again Smith (heightened division of labour), Taylor (work decomposition and control), and precarisation of work to pre-industrial era levels (Cherry, 2016, pp. 20-22). To tackle this issue empirically in this essay qualitative in-depth ethnographic studies on work conditions in digital labour markets are analysed.

Finally, there is the debate on regulation and policy where some argue that excessive regulation runs the risk of crushing beneficial innovation (Hagiu, 2015; Hagiu & Biederman, 2015; Sundararajan, 2014), while others claim that these digital markets are thriving on lack of regulation (regulatory arbitrage) and that dispatching workers to provide services to consumers or businesses is no innovation, for this labour brokering function has been around for decades (Smith & Leberstein, 2015). This essay tackles this matter by reviewing regulatory and policy articles and reports.

1.3 Aims, sources, and limitations

This essay, thus, studies 'Two-Sided Online and Mobile Labour Markets' and aims to:

In Section 2

(1) Define and conceptualise these markets (§ 2.1);
(2) Assess their dimensional relevance and possible future developments, contextualised with respect to NSW and other trends (§ 2.2);
(3) Provide a theoretical ex-ante description of their potential positive and negative effects (§ 2.3), serving as a benchmark for the discussion of empirical evidence on such effects (presented in Section 3);

In Section 3, paragraph 3.1:

(4) Draw a picture of on-demand workers' socio-demographic profile (§ 3.1.1);
(5) Explore their motivations to participate, discuss the voluntary or involuntary nature of such participation and their employment status and history (§ 3.1.2);
(6) Describe broadly defined working conditions (remuneration, access to social protection, extent of control exerted by the platforms) in § 3.1.3

In Section 3, paragraph 3.2:

(7) Assess their economic effects, including participation effects, distributional effects (geographic effects whether the flat world hypothesis can be confirmed for OLMs, income effects, and firm's boundary contraction effects), and their overall aggregate welfare effects for both OLMs (§ 3.2.1) and MLMs (3.2.2);

(8)   Analyse the matching frictions and hiring inefficiencies characterising both OLMs and MLMs, in order to assess the extent to which these markets are truly meritocratic in the way hiring decisions occur or rather present forms of distortion and of voluntary or involuntary discrimination (§ 3.2.3)

In Section 3, paragraph 3.3:

(9)   Present an overview of the misclassification lawsuits in the US (§ 3.3.1)

(10)   Discuss the issue of control both with respect to empirical evidence and to current proposals (§ 3.3.2)

(11)   Review a number of regulatory and policy essays presenting various proposals for regulatory interventions.

Finally, in Section 4 the main empirical findings are summarised and discussed in order to extract the main policy implications and to outline a future research agenda.

The analysis that follows is based on a data gathering strategy combining primary and secondary sources of empirical evidence. A more detailed illustration of the methodology and process followed for the gathering of evidence and of its limitations is presented in the Technical Annex (paragraph 5.1).

First, primary data come from an in-depth analysis of a selection of 39 platforms whose websites and blogs were scanned extensively (including annual reports and similar internal documents whenever they were publicly available) and whenever possible integrated with business press and industry analyses concerning them (a summary table of these platforms is presented in § 2.2). Second, an exploratory review of 100 business press items (newspapers and magazine articles; blogs; industry briefs etc.) was performed. Third, using the scoping review method (see paragraph 5.1), 70 scientific sources were selected using a formalised protocol and systematically reviewed (a synthetic and analytical accounts of these sources are presented, respectively, in paragraph 5.4 and 5.5). With few exceptions these sources only include studies designed and analysed by 'disinterested third parties'[ix]. Fourth, a total of 50 surveys and reports released by interested parties (industrial associations, platforms own reports and public relation materials, think tanks with a clear political orientation, NGOs, trade unions, etc.) have not been included in the formal review of scientific contributions but have been used to support the analysis of platforms and of the 70 scientific sources. Fifth, a total of about 200 indirectly relevant scientific contributions and policy reports have also been used as sources to contextualise and integrate the above sources, as well as to derive theoretical and interpretative insights.

There are clear limitations in the evidence base that was cobbled together through the various sources listed. First, in-depth and robust scientific empirical work was found for a limited number of platforms (see paragraph 5.4) with a clear imbalance in favour of OLMs as compared to MLMs. Second, on some key issues such as firms' motivation and worker employment status and history the evidence from scientific papers is limited and has been complemented by surveys and reports from interested parties. Third, the review method selected for the 70 scientific sources (see the Technical Annex, where the method adopted, the process for source search and selection, and the limitations are transparently acknowledged in more detail in paragraphs 5.1, 5.2, and 5.3) has intrinsic limitations in that it contains some element of discretion when including or excluding items. Some purposive and possibly 'subjective' elements of selection are therefore present; these may also have been due to the last sources updates made between end April and mid-May 2016 after the completion of the peer-review process. In this respect, some items included as pre-publication version may have been published in peer-reviewed journal in the meantime and this has possibly been missed. Fourth, it is conceded that the predominance of contributions focussing on the US and the lack of sources focussing on European contexts might partly be the result of performing only an English language search. However, most European scholars, when they have a good piece of research, publish it in English in peer-reviewed journals or in pre-publication platforms such as SSRN and similar. It is therefore reasonable to assume that empirical

work on these platforms in Europe is lagging behind, otherwise at least some working papers would have been found, given the extensive search strategy adopted. At any rate lack of European contributions is a finding that informs the proposed research agenda and does not weaken the overall contribution and value of this essay. Though the tone of the public debate and the legal and regulatory implications will differ between US and Europe, the main empirical aspects and economic effects documented in this essay will apply in the same way across European contexts.

2 Conceptualisation, sizing, and ex ante model of effects

2.1 Definition and typology

Adapting an earlier definition formulated only for OLMs (Horton, 2010), this essay focuses on digital labour markets: *(1) that work as digital marketplaces for non-standard and contingent work; (2) where services of various nature are produced using preponderantly the labour factor (as opposed to selling goods or renting property or a car); (3) where labour (i.e. the produced services) is exchanged for money; (4) where the matching is digitally mediated and administered although performance and delivery of labour can be electronically transmitted or be physical; (5) where the allocation of labour and money is determined by a collection of buyers and sellers operating within a price system*.

This definition clearly delimits the scope and excludes various online players. Online matching for traditional jobs, as performed by LinkedIn, are excluded by condition (1) since both OLMs and MLMs match people to new NSW and highly contingent work. A study by the McKinsey Global Institute estimates that digital labour market platforms could produce globally $2.7 trillion extra GDP growth, benefiting 540 million individuals by increasing labour market participation and job matching efficiency (McKinsey Global Institute, 2015). This estimate, however, is based almost entirely on consideration of the effects of players such as LinkedIn, rather than the effects of 2SOMLMs. Condition (2) excludes services delivered using a decisive physical capital or goods component, such as Airbnb (renting a room or a house), RelayRides (renting a car), or eBay and Etsy (selling second-hands and bespoke goods), but includes Uber and Lyft as they are at the centre of labour related disputes[xi]. The exclusion of renting property or selling goods can be explained considering, for instance, the results of two nationally representative surveys conducted in 2013 and 2015 by researchers of the Boston branch of the Federal Reserve on individuals involved in informal activities in the US, including selling goods, renting properties, and selling their labour online(Bracha & Burke, 2014; Bracha *et al.*, 2015); whereas lessors/sellers and those selling labour earn on average the same amount of monthly earnings (about 200 $) the average hourly earnings of the former is more than double that of the latter. This shows the difference between labour-intensive services and activity leveraging tangible assets[xii]; given the discussion in the introduction the exclusion of online selling of goods and renting of property is more than justified. Also excluded are the positive employment overspills such as those self-reported, for instance, by Airbnb using opaque and unreliable methodologies (Airbnb, 2015b)[xiii], or other indirect employment effects such as those estimated for the tourism industry in one US city (Fang *et al.*, 2015). Various forms of online self-defined crowd-working without traditional monetary remuneration are also excluded by condition (3) [xiv]. Condition (4), on the other hand, extends a definition previously formulated only for Online Labour Markets to also include Mobile Labour Markets[xv]. The last condition (5) typically applies to a two-sided market. Having clarified the conditions of the proposed definition and how they delimit the scope of analysis, a heuristic typology is presented below, acknowledging the limits inherent to any conceptualisation of an emergent and little studied phenomenon, whose empirical manifestation is more nuanced than what can be captured by any typology[xvi], and whose fast and continuous evolution make it a moving target.

The first and most obvious dimension of distinction is whether the labour-intensive services are electronically transmittable (OLMs) or require physical and localised delivery (MLMs). This distinction has a first very clear implication in that the former are potentially global markets and the latter by definition are local markets; this means, for instance, that certain hypotheses (i.e. flat world and salary convergence) concern only OLMs. A second important distinction concerns regulation, in that the global nature of OLMs neutralises national local labour market regulation, whereas localised MLMs could potentially be subject to national and local laws and regulations. This is partly reflected in the fact that most class action misclassification lawsuits in the US concern MLMs

although also a couple of OLMs have been the object of lawsuits concerning minimum wage. It must be noted, however, that despite their localised nature MLMs have not been regulated yet. As a first approximation it is also possible to associate OLMs to cognitive work tasks and MLMs to manual and/or interactive (i.e. teaching) work tasks. The distinction between OLMs and MLMs to some extent therefore overlaps with a broad and high-level distinction in the kind of work entailed (cognitive versus manual versus interactive).

The second dimension of distinction is the extent to which the work performed is low, middle, or high skilled (to be intended as a continuum); this characterisation regards the traded tasks and not necessarily the actual skills possessed by those performing them (i.e. it is not uncommon that highly educated individuals perform errands in TaskRabbit and other similar MLMs). This distinction has regulatory relevance as the kind of skills involved matter when deciding whether an individual is a true self-employed contractor or rather a worker misclassified as self-employed (see Cherry 2016, p. 5 and Harris and Krueger 2015, p. 8); low-skilled work may indicate that the service provider is an employee, rather than self-employed, whereas high-skilled work is more likely to be performed by an independent contractor.

Figure 2 Typology of digital labour markets
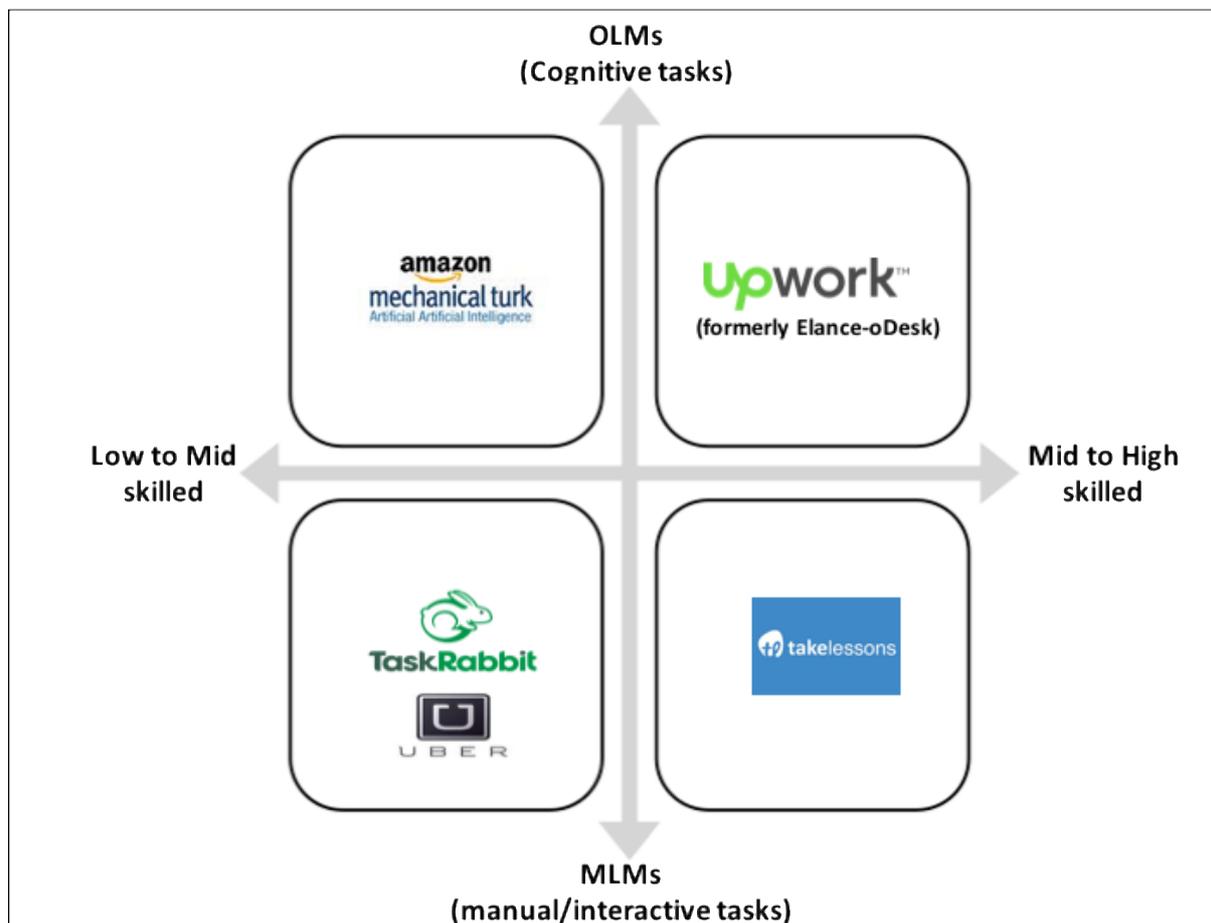
Source: authors' elaboration

Obviously, routine micro-tasks paid a few cents per piece in MTurk require much lower skills than developing software at $ 16 per hour in Upwork; but Upwork also trades low paid routine tasks such as accounting or support to sales requiring middle level skills, while Crowdflower (falling in the same quadrant as MTurk) trades some micro-tasks that are bit more complex and require relatively more skills than the micro pieces of work traded in MTurk. This is rendered in the matrix through the dimension going from low-

to-middle to middle-to-high skills. In each quadrant one example will be taken as ideal-typical and description of its main feature and functioning provided in the corresponding notes placed at the end of this essay.

Quadrant (1) or OLM micro-tasking. Electronically transmittable cognitive micro-tasks paid per piece are traded in markets such as MTurk, Clickworker, Crowdflower, and many other[xvii]. Typical work pieces include object classification, tagging, transcriptions, marketing spam, data entry, content review, editing, website feedback, etc. Micro-tasks are highly standardised, repetitive, and require low to middle skills levels. In these markets, small pieces of work are put out in high volume, with correspondingly low compensation levels. The individuals involved as providers could be workers who are misclassified as contractors. In this respect, it is worth noting that Crowdflower recently had to pay $500,000 in compensation to some contractors for violation of minimum wage legislation in the U.S (see § 3.3.1).

Quadrant (2) or OLM tasking. Electronically transmittable tasks (and in some cases full self-contained projects) paid with fixed contract per deliverable (more often) or per hour (less often) are traded in markets such as Upwork, and Freelancers[xviii]. Typical requested work includes software development, engineering and data science, graphic design, clerical and secretarial work. Some tasks require middle skills level and are fairly routine, while others demand flexibility, creativity, generalised problem-solving, and complex communications (i.e. high skills level). While there is no data to substantiate it, it is reasonable to assume that some contractors are truly highly skilled freelancers, whereas others are not too dissimilar from those working for the markets of quadrants one and could possibly be considered as misclassified workers; yet, so far Upwork and similar have not been the object of any legal dispute.

Quadrant (3) or MLM physical services. Tasks requiring physical delivery of mostly manual services requiring low to medium levels of skills and paid with fixed contract per task (more often) or per hour (less often) are traded in markets such as TaskRabbit, Gigwalk, and various others (several also launched and operating in Europe, see Table 1 in next paragraph)[xix]. Various misclassification lawsuits (contractors vs. workers) have affected these MLMs in the US (see § 3.3.1). A particular case in this quadrant is represented by rides services[xx] such as those provided by Uber or Lyft that have been the centre of misclassification lawsuits.

Quadrant (4) or MLM interactive services. This could be in principle an empty set for local digital markets for high skilled services requiring complex communications so far limited to the localised matching between students and teachers providing lessons in person as in the case of Takelessons.

Two final considerations can conclude this paragraph, one concerning the requesters of tasks and the other the emerging trend of digital markets attempting to trade very high skilled, professionalised, and earlier considered non-tradable work.

In both quadrants (1) and (2) the overwhelming majority of transactions are Peer-To-Businesses (P2B), with own account self-employed requesting tasks also as business entity; the exception are academic researchers hiring contractors from OLMs in quadrant one to participate in surveys and/or experiments. On the other hand, the majority of transactions in quadrant (3) are 'Peer-to-Peer' (P2P) in the sense that requests come from individuals as consumers; in this respect, however, it must be noted that some of the MLMs in this quadrant do work requiring mobility (mystery shopping, inspection services, etc.) for businesses. A further nuance is that whereas MLMs such as TaskRabbit are pure labour markets for the generalised matching of requesters with suppliers for any kind of personal services, others are more vertically specialised in house cleaning or care services.

What could be called the Uberisation of high-skilled or high-paying work has not so far attracted much attention, but is a new trend that is worth studying more in depth in the future. New start-ups are trying to bring into the on-demand economy highly skilled and

professionalised white-collar workers. HourlyNerd's ambitious goal is that of disrupting McKinsey and trade online management consulting. An earlier non-tradable professional activity such as architectural work is being traded in platforms (Maselli & Fabo, 2015). Lawyer-on-demand apps, such as Quicklegal and UpCounsel, already exist. People can use the Medicast app to summon a doctor to their homes or Zirtual, which specialises in providing administrative assistants on demand.

2.2 Current dimensional relevance and future trend in context

As anticipated in the introduction, the work being performed within digital labour markets can be seen as new forms of NSW. The emergence of NWS that can be traced back to the mid-1990s, thus, predates and is a much wider and consolidated trend with respect to new forms of work in OLMs and MLMs; the latter, obviously, cannot be seen as a driver of NSW.

A brief stylised picture on NSW based on various contributions[xxi] and on the data available online from the Eurostat Labour Force Survey, however, provides a contextual introduction and benchmark to assess the various estimates on the current size of work in digital labour markets presented in this paragraph; moreover, some of the possible negative effects of NSW could also concern work in digital labour markets (see § 2.3).

Figure 3: Employment status as a share of total employment EU28 (2014)
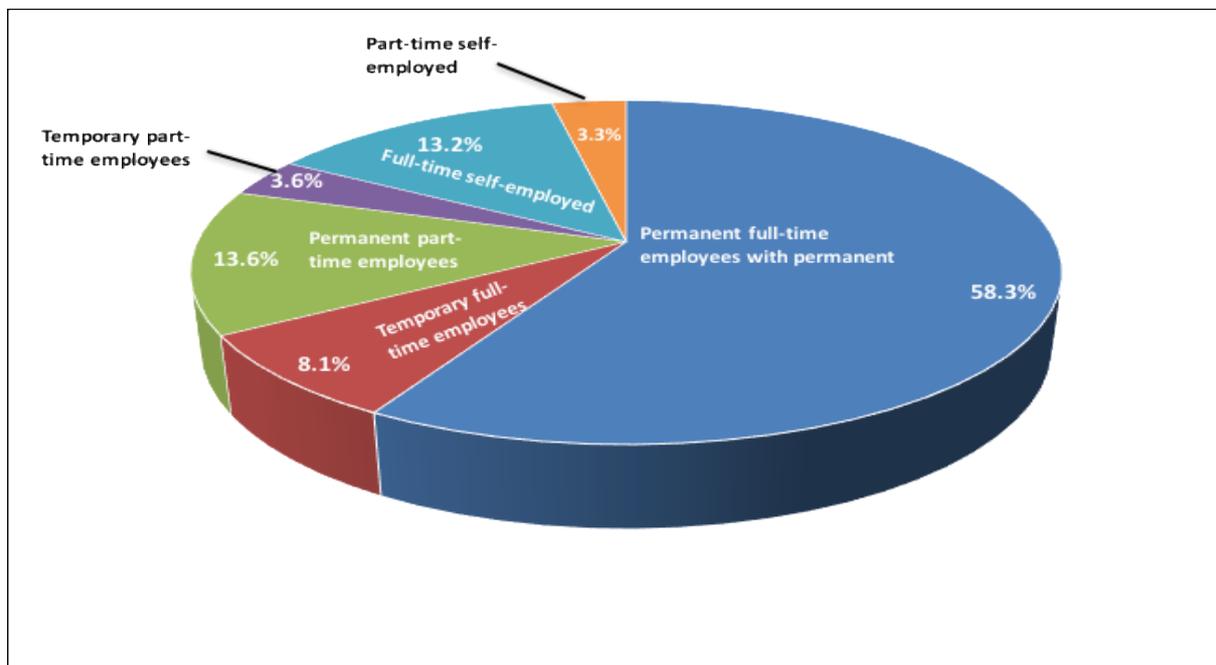
Source: Eurostat Labour Force Survey 2014[xxii]

From the 1990s until the start of the Great Recession in 2007-2008 in OECD26 (excluding the USA for which data is not available, and including EU21) NSW as a whole (part-time work, temporary work, and self-employment) accounted for about 50% of all job creation and 60% extending from the crisis year until 2013. On average 33% of total employment in OECD countries is in the form of NSW with wide ranging differences among countries: as low as 20% in Eastern Europe to up to 46% in the Netherlands (OECD, 2015a, p. 137).

The graph in the previous page presents the share of total employment of different NSW forms among the population aged 15 and older in EU28 as of 2014. Using the underlying absolute volumes and adding as denominator where applicable also total employees the following aggregate picture for EU28 emerges: 37.3 million part-time employees (17.2% of total employment including self-employed, or 20.4% of all employees); 25.5 million temporary workers (11.7% of total employment or 14% of all employees); 35.7 million

self-employed (16.4% of total employment). The graph below shows a further break down of these categories, from which summing up part-timers with temporary contracts (7.8 million) and part-time self-employed (7.1 million) we obtain a total of 14.9 million individuals (i.e. 6.9% of all employment) representing the most insecure/under-employment segment. There are, of course, sharp differences between countries but it is beyond the scope of this essay to discuss these in details; it suffices to observe that temporary employment as a share of all employees (14% at EU28 level) ranges from 22% in Spain to 6% in the UK. A category that poses conceptual and measurement difficulties is that of the self-employed, where one needs to distinguish between true freelancers and Dependent Self Employed Workers (DSEWs) [xxiii]. Using the OECD definition, in Europe the share of DSEWs out of the total number of dependent workers (employees plus DSEWs) varies widely. It ranges from being statistically negligible in Sweden to accounting for 3% of non-agricultural private sector employment in countries such as Italy and Greece (see OECD, 2014, Figure 4.4 at page 153). Another important trend is the increasing taking up of multi-activities to make up a full-time equivalent earning. Thus, employment is becoming fractional as 'people are holding portfolios of activities, offering to their employers slivers of time' (Atkinson, 2015, Chapter 3)[xxiv]. According to the Eurostat Labour Force Survey, in the 17 EU countries for which data is available, 5.5 million people were engaged in multi-activity employment in 2013[xxv].

Data on the US for NSW are not available in the same systematic fashion and, in fact, they have not been presented in the relevant chapter of earlier cited OECD report (2015a). The Bureau of Labour Statistics (BLS) included a module on contingent work (workers reporting that their job is temporary and/or that they do not expect it to last) and other work arrangements forms in 1995, 2001, and 2005 but since then discontinued it. According to the last issue (2005) of the BLS survey (see http://www.bls.gov/news.release/conemp.nr0.htm) using different estimates, contingent labour accounted for between 1.8% (2.5 million) and 4.1% (5.7 million) of total employment; other work arrangements still included in 2005: 10.3 million independent contractors (7.4 percent of total employment, possibly equivalent to the self-employed in the EU statistics), 2.5 million on-call workers (1.8 percent of total employment), 1.2 million temporary help agency workers (0.9 percent of total employment), and 813,000 workers provided by contract firms (0.6 percent of total employment). Adding up these figures (using the upper bound estimate for contingent work) the total number of workers in what can be considered NSW was 20.5 million, or about 14.7% of total employment, which is substantially lower than the average for other OECD countries. The December 2015 report of BLS indicate 15 million as the total number of self-employed, of which 9.6 million were unincorporated and 5.4 million incorporated[xxvi]. These official statistics are in contrast with data based on surveys conducted by the association of US freelancers according to which 53 million Americans (34% of the labour force or 36% of total employment) work in some form of contingent arrangement (Freelancers Union & Elance-oDesk, 2014; Freelancers Union & Upwork, 2015). Furthermore, the two surveys conducted by researchers of the Boston branch of the Federal Reserve found that 44% of Americans of working age in 2013 and 52% in 2015 were engaged in some form of paid informal activity (Bracha & Burke, 2014; Bracha, et al., 2015). A possible more reliable estimate comes from a new paper released in March 2016 that is based on a version of the Contingent Worker Survey (no longer produced by the BLS) that was attached to the RAND American Life Panel (ALP) in late 2015 (Katz & Krueger, 2016). After barely changing between 1995 and 2005, the share of US workers in alternative work arrangements jumped from 10.1 per cent in 2005 to 15.8 per cent in 2015.

Moving to the question of how many individuals employ their time and skills to deliver tasks under the contingent arrangements offered by digital labour market the first point to start from are the only two reliable sources available for Europe in the forms of two surveys conducted in the UK (Huws & Joyce, 2016b) and in Sweden (Huws & Joyce, 2016a) on 'crowd-working'. In the UK 21% have looked for jobs (9 million), 11% have worked at least once (4.9 million), 4% work every month (1.8 million), and 3% every

week (1.3 million) through platforms. In Sweden 24% have looked for jobs (1.4 million), 12% have worked at least once (700,000), 4% work every month (245,000), and 3% every week (170,000) through platforms. The number derived from these surveys (based on nationally representative samples using CATI interviews) depict a statistically not insignificant phenomenon; considering only those working every week they make up 3% of the population of working age in both countries, which represents a dimensionally relevant phenomenon.

For what concerns the US the estimates of the pool of workers in digital labour markets, as seen in the introduction, range from 600,000 or just 0.3% of the labour force (Harris & Krueger, 2015) to 14 million or 9% of the labour force (according to the *Time Magazine* survey reported in Steinmetz, 2016). The earlier cited paper on contingent labour estimates digital gig workers at 0.5% of all workers (Katz & Krueger, 2016). Another estimate from 2013 indicates that there were 2.7 millions of U.S. on-demand independent workers, out of which about 500,000 worked in platforms like Uber, Lyft, and Airbnb (MBO Partners, 2015). According to a McKinsey Global Institute report (2015a, p. 33), about 1% of the U.S. labour force (1.6 million) carries out contingent work through OLMs and MLMs. According to Intuit projections the number of on-demand workers in digital labour market will reach 7.6 million (or 5% of the labour force) by 2020 (Businesswire, 2015). The earlier cited surveys by researchers of the Boston branch of the Federal Reserve (Bracha & Burke, 2014; Bracha*, et al.*, 2015) report that about 25% of Americans of working age carry out paid informal economic activities through digital platforms, which multiplied by the labour force would mean 39.5 million people; yet, the problem with these surveys is that in the two published reports this 25% is not broken down between those who sell goods or rent property and those who provide labour-intensive services. Considering that digital labour platforms have originated in the US and have grown more rapidly there, and looking at the figures for UK and Sweden, it seems obvious that the lower bound figures advanced by Harris & Krueger (2015), MBO Partners (2015), and the McKinsey Global Institute (2015) clearly underestimate the phenomenon. In the same vein the upper bound figures (i.e. the 14 million derived by the *Time Magazine* survey) overestimate it. Starting from the Intuit projection for 2020 (7.6 million or 5% of the labour force) and anchoring to the 3% of labour force indicated by the UK survey, it would reasonable to guess that currently in the US there could be as many as 6 million workers in digital labour platforms (about 4% of the labour force).

From the next table summarising key information for the digital labour markets that have been reviewed[xxvii], a total number of about 52.6 million registered contractors globally can be derived (with huge differences between platforms, ranging from a few thousand contractors to millions of them). It should be noted that only a few of European platforms have more than 100,000 registered contractors and international coverage. Platforms with large numbers of contractors are mostly those originated in the US, although the largest ones (i.e. Upwork) also have registered contractors from European countries. Obviously the figure of 52.6 million is either an under-estimation (cases not included) or an over-estimation (not all registered contractors work at any given time; there could also have been double or multiple counting given portfolio activities).

Table 1: Selective overview of OLMs and MLMs

| Platform	Type/ Field	Registered 'contractors'	Origin/Coverage
Uber	P2PM/ Ride Services	400,000[i]	US/International
Lyft	P2PM / Ride Services	50,000[ii]	US/US
Sidecar	P2PM / Ride Services	6,000[iii]	US/ US major cities
Handy	P2PM/Generic/Home Services	5,000[iv]	US/US
Care.com	P2PM/Generic/Home Services	6,600,000[v]	US/International
TaskRabbit	P2PM/Generic/Generic	30,000[vi]	US/International
Gigwalk	P2P2BM/Generic & Market Research	10,000[vii]	US/US
Postmates	P2P2BM/Generic/Delivery	10,000[viii]	US/US
Instacart	P2PM/Generic/Delivery	7,000[ix]	US/US
Favour	P2PM/Generic/Delivery	3,200[x]	US/US
Fieldagent	P2BM/Market research	800,000[xi]	US/ International
Wegolook	P2BM / Market Inspection	20,000[xii]	US / US, Canada UK, Australia
Amazon MTurk	P2BO/Micro-tasking	500,000[xiii]	US/International
Twago	P2BO/Micro-tasking	225,000[xiv]	Spain / Latin America
Crowdflower	P2BO /Micro-tasking	5,000,000[xv]	US/International
Crowdguru.de	P2BO /Micro-tasking	30,000[xvi]	Germany/Germany
Crowdsource	P2BO /Micro-tasking	8,000,000[xvii]	US/International
Clickworker	P2BO /Micro-tasking	700,000[xviii]	Germany / International
Lingjob	P2BO /Micro-tasking	3,000[xix]	Lithuania/Lithuania
Topdesigner.cz	P2BO /Micro-tasking	3,900[xx]	Czech/Czech
Upwork	P2BO /Macro-tasking / IT & business	10,000,000[xxi]	US/International
Freelancers	P2BO /Macro-tasking / IT & business	18,000,000[xxii]	Australia/International
HourlyNerd	P2BO /Macro-Tasking/ Mgmt. Consulting	17,000[xxiii]	US/International
eYeka	P2B/Design	101,774[xxiv]	ES/International
Frizbiz	P2PM/Generic	65,000[xxv]	FR/FR
Helpy	P2PM/Generic	20,000[xxvi]	FR-ES/FR, ES
CoContest	P2PM/Design	25,000[xxvii]	IT/International
ListMinut	P2PO	34,922[xxviii]	BE/BE
Doido	P2PM&P2PO/Generic	1,857[xxix]	DE/DE
Codeur.com	P2PM/Generic	91,880[xxx]	FR/International
Atizo.com	P2P/P2B/Innovation	30,000[xxxi]	CH/International
Jovoto	P2P/P2B/Innovation	82,776[xxxii]	DE/International
Userfarm	P2P/Video	120,000[xxxiii]	GB/International
Hopwork	P2P/P2B/Generic	20,152[xxxiv]	FR/International
Peopleperhour	P2PO/Generic	250,000[xxxv]	GB/International
Testbirds	P2PO/Software testing	100,000[xxxvi]	DE/International
Microworkers	P2BO /Micro-tasking	763,000[xxxvii]	US/International
99designs	P2PM/Design	364,571[xxxviii]	US/International
Zillion Designs	P2PO/Design	100,000[xxxix]	US/International
Total number of registered contractors		*52,591,032*	

Legenda: O= online; M= Mobile; P2P= peer-to-peer (between individuals);P2B= peer-to-business (individual providing services to businesses); P2P2B = cases where the individuals may provide services both to other individuals and to businesses (i.e. Gigwalk).

Sources: i. California judges dealing with the lawsuit against the ride service platform (O'Connor v. Uber) quantified the total class action into 400,000 drivers (reported in Cherry, 2016, p. 4 n. 23).; ii. (Aloisi, 2015); iii. (McKinsey Global Institute, 2015b); iv. The Economist (http://www.economist.com/news/briefing/21637355-freelance-workers-available-moments-notice-will-reshape-nature-companies-and); v. Care.com investor relations (http://investors.care.com/files/First-Quarter-2015-Results-Supplement_v001_o3d1o3.pdf); vi. Cullen & Farronato (2015); vii. http://www.gigwalk.com/; viii. http://money.cnn.com/2015/05/04/technology/postmates-disrupt/ ; ix. http://www.thelowdownblog.com/2015/06/the-reason-instacart-is-turning.html; x. https://favordelivery.com/press/; xi. https://fieldagent.net/; xii. https://wegolook.com/; xiii. (Aloisi, 2015); xiv. http://www.twago.com/blog/press-release-twago-acquires-spanish-competitor-adtriboo/; xv. http://www.crowdflower.com/ ; xvi. http://www.crowdguru.de/en/company/about-us/ ; xvii.

http://www.crowdsource.com/; .xviii. https://www.clickworker.com/; xix. Eurofound (2015b); xx. Eurofound (2015b); xxi. (McKinsey Global Institute, 2015b);xxii. https://www.freelancer.com ; xxiii. (McKinsey Global Institute, 2015b); xxiv. https://es.eyeka.com/about; xxv. https://www.frizbiz.com/fr/p/presse; xxvi. http://andro4all.com/2015/06/helpy-evolucion-app-colaborativa-servicios-tratojusto-nuevo-diseno-funciones; xxvii. https://www.cocontest.com/; xxviii. https://listminut.be/fr/about; xxix. http://getdoido.com/; xxx. https://www.codeur.com/; xxxi. Sundic and Leitner (2013); xxxii. https://www.jovoto.com/; xxxiii. https://en.wikipedia.org/wiki/Userfarm; xxxiv. https://www.hopwork.fr/; xxxv. http://blog.peopleperhour.com/about/; xxxvi. https://www.testbirds.com/; xxxvii. https://microworkers.com/; xxxviii. http://99designs.com/; xxxix. http://www.zilliondesigns.com/aboutus

It is, thus, difficult to come up with a conclusive estimate of the size of work in digital labour markets. Certainly, they have reached a dimension that is statistically noticeable, although not yet very large. Of course, the fact that these platforms have grown exponentially over the last few years cannot be ignored (see figure below providing as an example a snapshot of Upwork's phenomenal growth).

### Figure 4: Upwork growth by contractors cumulative earnings
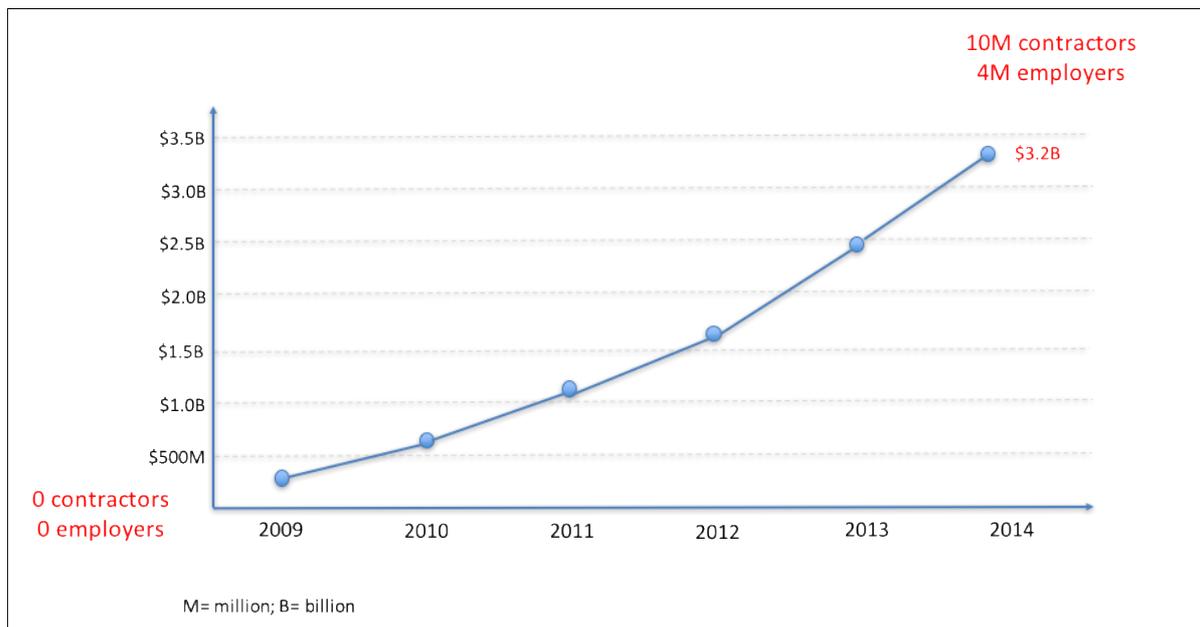
Source: (Elance-oDesk, 2014; Upwork, 2015a, 2015b)

Such a growth rate is not unique to Upwork and can be observed also in other competitor OLMs (i.e. Freelancers); while the total numbers of contractors and volume of trade is not as high in OLMs for micro-task and for MLMs, the growth in the number of such digital markets is also phenomenal: taking MTurk and TaskRabbit as the first ideal-typical example in their respective categories, it is possible to estimate from the online screening conducted that they have been replicated in various countries and with some variations by hundreds of start-ups.

Certainly, if growth continues at this fast pace, these new markets could encroach on traditional and long-term forms of employment (Einav *et al.*, 2015, p. 20). In the figure below, some speculative scenarios about possible future growth trajectories are presented. These scenarios are qualitatively extracted, based on the theory of firms with respect to boundary contractions (due to outsourcing) and hypotheses about the limits on routinisation and digital job matching (Autor, 2001, 2008; Autor*, et al.*, 2003). With regard to the digitalisation of labour market matching, as anticipated in the introduction, information management scholars announced the future pervasiveness of the 'e-Lance economy' as early as 1998 (Malone & Laubacher, 1998). Autor (2001, 2008), however, expressed scepticism about this possibility as he considered that the structure of these digital labour markets would be riven with information asymmetry and would not be capable of conveying the 'high bandwidth' kind of information needed for a job match. From the combination of these theoretical insights, one could expect that outsourcing by

firms may be hampered by the matching inefficiency of digital labour market, or alternatively by intervening regulation. On the other hand, advances in computerisation and eventually in robotisation and their gradual cost reduction (as occurred with traditional ICT) may lead to more tasks being carried out by machines. In this scenario, firms may no longer need to outsource tasks that could be internalised by using robots.

Figure 5: The future size of labour platforms: speculative scenarios
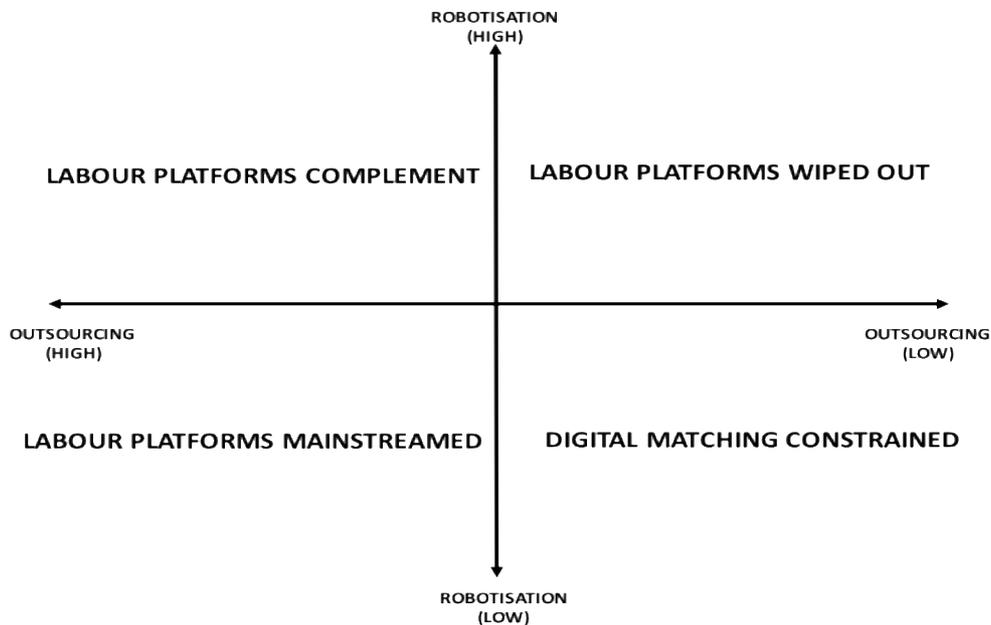
Source: authors' elaboration

On the other hand, robotisation may advance slower than expected (in terms of effectiveness) or may be hindered by intervening regulation. In this case, more space would be left for digital labour platforms. Finally, even under high robotisation, firms may still outsource (for various reasons), so that digital labour platforms may retain a complementary role. Crossing these two dimensions (robotisation, high or low, and outsourcing, high or low), the four scenarios depicted above emerge. With high robotisation and low outsourcing, digital labour platforms would be wiped out. At the opposite end of the scale, with high outsourcing and low robotisation, these platforms could be mainstreamed. Then we have two intermediate scenarios: i) when robotisation and outsourcing are both low, this may be due to the inefficiency of the platforms (i.e. scenario 'Digital Matching Constrained'); and ii) when outsourcing remains high not withstanding full robotisation, platforms could perform a complementary role (i.e. scenario 'Labour Platforms Complement'). Aside from these speculatively futuristic scenarios, there are other possible countervailing factors to the technology push that may limit the growth of these platforms. First, further growth requires that platforms compete with firms providing stable employment. To do this, they must offer higher earnings to compensate for job insecurity, which may prove to be difficult. Second, the most successful platforms, once they scale up, could decide to transform contractors into employees, as is happening in some cases already (see Evidence Box 3, p. 49). In brief, the future growth of these markets remains an open issue, both theoretically and empirically. To sum up, how large digitally-intermediated on-demand work is now, or may become in the future, remains the subject of debate and controversial forecasts (Zumbrun & Sussman, 2015).

2.3 Ex ante analysis of potential effects

In this paragraph, the ex-ante potentially positive and countervailing economic effects of these new digital labour markets are derived from the hypotheses contained in some of the formally reviewed sources that focussed on these digital market from the perspective of economics (see synthetic and analytical summary tables in § 5.4 and 5.5 of the Technical Annex). It must be stated that such ex ante hypotheses mostly concern OLMs and can only be residually and partially applied to MLMs. On the potential social risks and costs from the diffusion of such new form of digitally mediated NSW little theoretically and empirically robust insights were found in the formally reviewed contributions, hence ex-ante hypotheses have been derived indirectly from a literature specifically focussing on the negative effects of atypical and insecure forms of work. Instrumental to the ex-ante analysis of economic effects is an understanding of how the matching process works in practice, which is summarised below for the three main types.

Evidence Box 1: Functioning of different platform types

- OLM for open-ended macro-tasks (stylised using Upwork). Registered contractors provide their CVs and profile pictures, that are then stored digitally and gradually integrated with their work history in the platform: offered bids, hours worked and feedback ratings from previous engagements. More disaggregated information is also available, such as per-contract feedback, hours worked and earnings. Employers create job posts with titles and descriptions, nature of work, the skills required (from a menu of existing categories) and, where foreseen, contractual form (lump sum or hourly wage). Once the post is sent, the platform reviews it and posts it online. Furthermore, the platform makes both job posts and contractors searchable by various categories to help the search on both sides. For employers, verified attributes (number of past jobs, average wage rate paid and so on) are also made available to the contractors. The process of matching can work in two ways. Contractors search for jobs and apply for the one they like, after which they appear to the employers in what is usually called an 'applicant tracking system'. Employers then look at all the information on the applicants. Conversely, employers can search the contractor database and try to recruit the desired profile directly. The search functionality usually allows employers to search by skills and other attributes and it returns lists of contractors with relevant information about their work history. Employers can then send recruiting invitations to the selected contractor(s). It is possible that direct recruitment by employers tends to concentrate on highly positively selected contractors (these have more experience, higher past wages, greater earnings etc., and consequently, accept higher hourly wages than contractors who autonomously apply for a job). Recruited contractors have no obligation to accept a job, as employers have no obligation to hire a contractor that has applied autonomously. Once a match occurs the platform intermediates the relationship in various ways, including through tracking software that contractors install on their computers which functions as a digital punch clock, allowing hours worked and earnings to be measured essentially without error.

- OLM for micro-tasking (Stylised using MTurk). Requesters post small tasks that cannot yet be computerised. Humans find it easy to tell if two different descriptions correspond to the same product, tag an image with descriptions of its content, or transcribe an audio snippet with high quality. However, these tasks, usually called Human Intelligence Task (HITs), are still hard for computers. Employers posts tasks, specify the range of data for processing, define the structure of the form into which the data must be input, create a set of instructions for workers, and assign the task a price. Computers can use a programmable API (Application Programme Interface) to post tasks on the marketplace, which are then fulfilled by human users. This API-based interaction gives the impression that the task can be carried out automatically. Workers find and perform tasks on the platform, which sends the output directly to employers' IT systems without human intermediation. The employer defines the criteria that candidate workers must meet to access the task and if these criteria are met, workers do the job without the need for a digital application process. These criteria include the worker's approval rating (the percentage of tasks the worker has performed that employers have approved and, as a consequence, paid for), the worker's self-reported country, and whether the worker has completed certain skill-specific qualification exams offered on the platform. This filter approach to choosing workers allows employers to request work from thousands of temporary workers in a matter of hours. Once a worker submits completed work, the employer can choose whether to pay for it or not. Workers have no access to data about the employers, neither do they know for what larger purpose the micro-tasks are completed.

- MLM (stylised using TaskRabbit). Buyers post a description of the domestic task they intend to outsource and sellers can search through posted task by location and respond with an offer. Buyers post any possible kind of task (shopping and delivery, moving help, cleaning, home repairs, furniture assembly, etc.), which require local and short notice delivery. The matching process works in one of two ways: the buyer posts a task price and accepts the first offer, or asks for bids and selects from the prices offered by the sellers. Given that buyers and sellers must meet, there is a vetting process that is not needed in online markets. Identity and payment method are checked, with the screening process being more rigorous for sellers. Past history on the platforms and ratings are available for both sellers and buyers.

The figure below summarises graphically the various ex ante hypotheses about the potential positive and negative effects of digital labour markets that are illustrated in this paragraph. The positive effects concern mostly OLMs and can only in some aspects be applied to MLMs; on the other had the potential negative effects apply to both.

Figure 6: The future size of labour platforms: speculative scenarios

Legenda: **+** = increase/positive effect; **-** = decrease/negative effect; **-/+** = ex ante uncertain effect; **Larger Pool** = of both workers and employers as a result of digitalised profiles and job posting; L= Labour; K= Capital; **HC** = Human Capital; **Search** = search costs; **GEO** = geographical barriers; **Coord.** = coordination costs; **Unbundling** = break down of jobs into tasks; **HB INFO** = high-bandwidth information; **Heterogeneity**: increase pools of workers increase their diversity; **SEGM/POLAR** = segmentation/ polarisation of labour markets; **EMPL** = employment level in general; **TRAPS** = Non Standard Work trapping workers rather being a stepping stone toward standard employment

Source: authors' elaboration based on the reviewed theoretical and empirical sources

The digitalisation of workers profiles (CV, skills, experiences, reputation) and job posting is the starting output produced by these markets, and from there a range of first, second, and third order effects may follow. Though this was not possible to fully render in the graphic depiction above, there is a loop back from the first order effects to the increased pool primary output, which can feed an exponential increase in such pool.

These markets increase the pool of employers and workers because distance barriers are wiped out (subject to the capacity of both sides to use English as a global language), while search, coordination, and transaction costs are reduced (search algorithm and intermediated administration and tracking system offered by platforms). All of this could produce more and better matches between employers and workers (more because of the efficiency of matching and better because availability of searchable information could reduce mismatches). Furthermore, as coordination costs decrease, the unbundling of jobs into tasks, and tasks into micro-tasks, multiply the number of possible 'gigs' beyond the number of employers. These features have in turn a number of intermediate outcomes and eventually some positive end outcomes. A first intermediate (i.e. second order) outcome is the fact that, due to more and better matches, lack of distance barriers and unbundling of tasks, it becomes possible to increase human capital specialisation at global level and greater vertical functional specialisation (division of labour, or Smith effects), with positive effects on labour productivity. A further intermediate outcome, through reduced coordination and monetary costs, is the increased possibility of outsourcing (especially for SMEs). As a result, better and more matches could produce generalised net welfare effects in the form of more efficient labour markets, including increased employment and, again, improved productivity

(third order effects). Some argue that these effects could benefit not only the unemployed searching for a job, but also the inactive or underutilised population (part-time workers who would prefer to work full-time, newly retired people, stay-at-home parents, discouraged workers). This may apply to micro-tasking platforms and to MLMs, and also digital markets such as Upwork, though in the latter case skills and experiences may represent an entry barrier. Additional positive effects on productivity might originate from more stringent monitoring of workers –especially for unskilled- and from better incentives –for both unskilled and skilled workers. Note that if production efficiency is translated into better and/or cheaper products, this may lead to a reduction in prices which would generate a rise in sales, with an indirectly potentially positive effect on employment.

The direction of the distributive effects (who gets most jobs and earn more, prevailing of long tail or super start effects, possible forms of gender or ethnic based discrimination, etc.) is ex ante ambiguous. First, in all the reviewed digital labour markets the registered contractors greatly outnumber registered employers in every job category. Therefore, employers have a higher chance of finding the needed contractors. As for the contractors, a greater pool might imply less chances of being selected and lower wages. At the same time, since a larger pool is also associated to a great heterogeneity in terms of skills, experience, motivation etc., it is not unlikely that the growth of platform mediated employment leads to increases in inequality. The effects are ambiguous even a priori and depend on the characteristics of the pool of contractors on any given digital labour market. Second, the prevalence of either superstar effects or of long-tail effects adds to the ambiguity of income distributive effects. Lower search costs and global reach can enable employers to contract either the best workers (in absolute terms) or those who provide the best value for money in a global rather than a local context. This skews jobs, and consequently wage levels, towards a minority of the contractors registered on a given platform. In the case of OLMs jobs will move globally and potentially depress the income of workers located in the richest areas, driving up the wages of the highest-quality workers available in the OLM. But a different mechanism is also possible: individuals with uncommon and less mainstream skills, who are underemployed in local offline markets, may benefit from more opportunities when they post their CVs on a global platform. This increase in the demand for their skills (compared to their local market of reference) could drive up their wages. In a given OLM market, superstar and long tail effects may coexist if the pool of employers posting jobs cover both vertical differentiation (quality leading to superstar effects) and horizontal differentiation (variety leading to long tail effects). Long tail and super star effects are also possible in MLMs where, however, there is not a competitive pressure from globalised labour. However, MLMs can rather disintermediate or disrupt local services industries (i.e. Uber with taxi drivers) and their net effect on total employment level in their locality can either be positive or negative.

The picture, however, would not be complete without considering opposite factors that produce countervailing effects. As supported by the empirical evidence reported in the next section and predicted by Autor (2001), 'wired labour markets' present frictions and hiring inefficiency. As will be shown later, these are compounded by typical cognitive heuristics and biases, which affect employers' judgement and the decision making process (i.e. it will be shown there is no level playing field because of gender and ethnic stereotypes). First, expanding the pool has the side effect of increasing the heterogeneity of employers, workers, tasks and skills. Second, lack of face-to-face interaction prevents access to softer and/or 'high-bandwidth' information on both contractors and employers. These two factors can:

a) produce mismatches and reduce the quality of the selected workers; and

b) produce search frictions given heterogeneity, especially when quality is difficult to determine.

As a result, employers may cope with these difficulties by relying excessively on references and reputation and going after highly-demanded superstars (loosing time if

matches fall through, or money, by paying high wages), or on stereotypes selecting only from specific language/cultural origins or on gender based stereotypes. These countervailing effects reduce potential employment, productivity, and efficiency gains, while at the same time, they may exacerbate superstar effects and drive income inequality upward.

With specific respect to MLMs, a priori economic theorising is less developed, although a few speculations can be made. They concern typical urban markets for personal services where the demand is driven by the presence of middle-aged affluent households. In TaskRabbit, for instance, the typical buyer is a woman between the age of 35 and 44 with a household income between $150,000 and $175,000. The typical seller is 25-34 years old and has a household income between $50,000 and $75,000. The average income of the seller is not very low and suggests that these markets increase the participation of underutilised individuals. Given the low skilled content of the work, one would expect long-tail rather than superstar effects to prevail. There are, however, limits in terms of physical proximity and thickness of co-presence in a given neighbourhood. Earning $20 easily and in a relaxing way by taking someone's dog around is convenient, if the dog's owner is within walking distance or easily reached by transportation, but it becomes inconvenient if one needs to drive or ride a bus for more than an hour. Not surprisingly, the limited evidence available points to the clear presence of superstar effects in MLMs, although 'superstar' in these circumstances does not refer to a worker's skills or ratings but more probably to proximity between requesters and suppliers.

Finally, economic theorising does not help extract ex ante social risks/costs and empirical evidence from related literatures is used and especially from the analysis of NSW presented in two OECD reports (2014, chapter 4; 2015a, chapter 4).

First, temporary work can reduce social mobility, as precarious jobs become 'traps' as opposed to 'bridges' into secure work (Cahuc & Kramarz, 2005; Gash, 2008; International Labour Office, 1997). Statistical analysis by the OECD finds that, whereas working with temporary contract may increase the likelihood of getting a regular job as compared to staying unemployed, part-time employment and self-employment do not favour the transition to standard work (OECD 2015a, pp. 162-167). A large study of Europeans aged 20-35 shows, for instance, that temporary work is a choice among the younger group (20-25) but tends to become a trap for the 31-35 who cannot find better employment (Nunez & Livanos, 2014).

Second, trends towards work becoming more flexible have also been associated with growing inequality (Atkinson, 2015; Bernhardt, 2014; Kuttner, 2013, 2016; Standing, 2011; Summers & Balls, 2015). NSW is associated with a wage penalty compared to standard work (controlling for other conditions), and for the 50% of non standard workers who are the main bread winners there is also an increased risk of falling below the poverty line (OECD, 2015a, chapter 4). A study using EU-SILC data for 24 European countries shows that the temporarily employed have a higher poverty risk than permanent workers, mainly due to lower wages (Van Lancker, 2012).

Third, there is strong evidence that insecure employment and precariousness is associated with psychological morbidity (Virtanen *et al.*, 2005) and that this is not moderated by 'flexicurity' regimes (Burchell, 2009).

Finally, fiscal costs may increase if, in the end, governments have to provide social protection for precarious workers and tax credits and subsidies to make up for insecurity of income (Adams & Deakin, 2014).

As the digital labour platforms analysed in the essay create contingent and precarious employment forms, they may also be the source of some or all of the potential social risks/costs above, with the possible exception of true skilled freelancers who get a lot of work at good hourly wages from OLM for macro-tasking.

Last but not least, all of the positive and negative effects defined above ex ante must be looked at from the viewpoint of the current and possible future dimensions of the

phenomenon. As illustrated earlier, although their growth has been phenomenal in the past 5 years, these digital labour currently engage a statistically non marginal pool of individuals but of a dimension that is still limited to produce aggregate economic and social effects in the short term as such; they can be added to the overall pool of NSW and increase the effect of this larger phenomenon. On the other hand, these effects should be considered and discussed in terms of possible regulatory interventions should these digital labour markets continue to grow in the future. In the next section, the empirical evidence gathered is reported, following a structure that mirrors as far as possible the various effects described above. It can be anticipated, however, that for many of these effects the evidence is either lacking, or limited and inconclusive, or ambiguous.

3 Main empirical findings

This section reports the evidence extracted from the 70 formally reviewed scientific articles and papers and is organised in three paragraph: one on the on-demand workers' profiles and conditions (§ 3.1), one on the digital labour markets and their effects (§ 3.2), and one on regulatory and policy relevant topics (§ 3.3). Presenting the results of a potentially self-standing scoping and critical review, this section does not report in details the findings of each of the reviewed items (see summary tables in § 5.4 and 5.5 of the Annex for a transparent illustration of the sources reviewed), but rather extracts from them evidence that can at least preliminarily and partially address the key questions raised in the introduction and organise it into thematically coherent topics. Differently from traditional scientific scoping review, whenever needed the evidence from the scientific sources is integrated with information and data retrieved from sources produced by interested parties such as for instance surveys commissioned by the platforms or reports by associations, think-tank, and foundations with evident 'political positions'; some information from investigative journalistic reports is also used.

3.1 On-demand workers

3.1.1 Socio-demographic and employment profiles

Beyond slight differences depending on the specific OLMs or MLMs considered, workers tend to be younger and more highly-educated than their corresponding populations of reference and, in the US, ethnically similar to the rest of the population. This type of generalisation cannot be made on gender balance as it differs substantially depending on the OLM or MLM considered and by country. Evidence on the labour histories and work patterns of on-demand workers is limited and fragmented, yet there are signs that some of them had been employed especially part-time, or have another employment while they work for these new markets; but there are also individuals who were unemployed or under-employed.

OLM micro-tasking. The first survey (2009) providing information on individuals working for MTurk (henceforth also Turkers') found that 50% were from the US, 40% from India, and 10% from several other countries (Ipeirotis, 2010b). The same survey indicates that US respondents were fairly representative of the US Internet population. They were however younger (54% in the 21-35 age group versus 22% in the general Internet population) and mainly female (70% versus 50%). The survey does not contain information on the employment profile of respondents, but related information on the overall social status. US Turkers showed lower income (65% with household incomes less than $60K, versus 45% in the general population) and lived in smaller families (55% with no children, versus 40% who children). The gender split for Indian respondents was reversed (the majority were male). For both the US and India, Turkers' self-reported educational level was higher than for the corresponding general Internet population. In terms of income, Turkers based in India had significantly lower incomes (55% declared an income of less than $10,000/year) compared to those based in the US. There is now a freely available web resource providing updated demographics on Turkers: http://demographics.mturk-tracker.com/#/countries/all). A quick review produces the following update:

- Nationality: 73.3% US, 12.2% Indians, 14.4% other nationalities
- Gender:
  - US: 60% female, 40% male;
  - Indian: 20% female; 80% male;
- Income
  - US: 10% earn less than $15K; 70% below $60K (compared to 65% in 2010);
  - Indian: 80% earn less than $15K;

A very recent study, based on a survey of workers in MTurk (only Indian and Americans) and in Crowdflower (including 50 or more nationalities), broadly confirms the socio-demographic profile above and adds interesting elements on employment status (Berg, 2016). This survey finds gender balance among Turkers based in the U.S. but with more males compared to previous surveys (52% male, 48% female), whereas in India Turkers are 69% male; on the other hand, Crowdflower' workers are on average 73% male. With respect to age and education the earlier profile of Turkers is confirmed; in Crowdflower only 14.1% have a high school diploma or less (1.1% have less than a high school diploma) and most workers have at least attended some years of college (28.4%), or have a college (36.7%) or a post-graduate degree (16.9%). Overall, combing the two samples (both MTurk and Crowdflower) students are only 14.5% of respondents, which contradicts the myth about these markets employing mostly students and other 'flexers'. The most interesting and novel findings from Berg's study are that: a) 33% of the sample at the time of the survey (conducted in November-December 2015) was unemployed; b) 37% reported that working for such digital markets is their primary source of income

OLM Tasking. Apart from a generic statement about workers registered with (at the time) oDesk (now Upwork) being highly-educated and skilled (Agrawal*, et al.*, 2013a), there are no other scientific sources on them, and the only available information comes from reports based on surveys conducted by Elance-oDesk (Elance-oDesk, 2014) and by Nubelo (Nubelo, 2014), a digital labour market for the Spanish speaking world where clients and contractors come mostly from Spain (accounting for 40.6% of contractors and 64.5% of employers), and to a much lesser degree from Argentina, Colombia, and Mexico. The data for Elance-oDesk comes from two surveys of its registered contractors conducted in 2014 in 9 countries (for Europe including only UK and Ireland)[xxviii]. In terms of age 90% of contractors are below the age of 45 (26% 18-25; 48% 26-35; 16% 36-45) with only 10% above the age of 46 (6% 46-55 and 4% 55 and above). Only 23% have less than college education, 49% have a college degree, and 28% a graduate degree; 55% has been working as independent contractors for more than 5 years and 20% for less than 3, while for 63% working with this digital market represent the primary source of income (all income for 18%, most of it for 25%, more than half for 20%) and only 37% indicated that it accounts for less than half of their income. The contractors of Nubelo show similar age profiles as those seen above (57% reported as 'Generation Y', 27% reported as 'Generation X', and 15% reported as 'baby boomers') are mostly male (65% vs. 35%) and in 60% of cases are college graduates. On average (considering responses from all countries) 61% of respondents work full time for Nubelo which is for them the only source of income, 25% have another full-time job, and 14% another part-time job; the average tenure with Nubelo is two years. On the other hand, although the younger contractors are the most numerous, the analysis of the data shows a correlation between age and full-time work in Nubelo: contractors above 45 years of age work full-time in 72% of cases, whereas this occurs in only 45% of cases for those below the age of 25. When considering only Spain, the percentage of those working full time and obtaining their entire income increases to 74% (vs. 61% in the all sample), and the average tenure is also higher.

Uber (ride services). The only quantitative contribution on the socio-demographic and motivation of Uber drivers is the paper published by Hall & Krueger (2015) that analyses primary administrative data obtained by Uber and the results of a survey, also commissioned by Uber. In terms of socio-demographics, Uber drivers on average are more like the general U.S. population than the population of traditional taxi drivers:

- Age (% in the 18-39 age group): Uber drivers 49.2%, traditional taxi drivers 28.4%, general population 44.3%;
- Educational level (% with college degree): Uber 36.9%, traditional taxi drivers 14.9%, general population 25.1%;
- Percentage white non-Hispanic: Uber 40.3%, traditional taxi drivers 26.2%, general population 55.8%.

According to data provided by Uber and analysed by Hall & Krueger a sizeable share of drivers works part-time alongside another job; this finding is somehow in contrast with what emerged from the misclassification lawsuits and from the fact that without keeping a high level of acceptance rate drivers are 'terminated' (and reaching such target seems fairly difficult working part-time).

MLMs physical services. In TaskRabbit, the customers on the site are predominantly female (55%) and relatively affluent (Cullen & Farronato, 2015, p. 7). The modal customer is a woman aged 35 – 44, with a household income between $150,000 and $175,000. The providers are younger and not surprisingly have lower incomes. The modal provider is 25-34 years old and has a household income between $50,000 and $75,000. A comparison of MTurk demographics with those reported in a study of Mobile Crowd[xxix] (Mushtag & Ganesan, 2013) shows that in the latter, men outnumber women (71% men and 29% women, whereas in MTurk women account for 60%) and, in general, the educational level is higher (75% with college degree vs. 55% in MTurk). The 'taskers' or 'agents' (to use the same expressions as in the paper) in this platform are young (70% are under 35 years of age). No other information was found on the profile of workers in this type of digital labour market.

UK and Sweden national surveys. As anticipated in § 2.2, a few key findings from two surveys of crowd-working conducted using nationally representative samples in the UK (Huws & Joyce, 2016b) and in Sweden (Huws & Joyce, 2016a) have been released as short briefs, respectively, in February and March 2016. While only key highlights are reported, they nonetheless provide very insightful information and are the only two sources found for Europe. It is worth recalling that according to these two surveys 4% of respondents work in some kind of digital labour platform every month and 3% every week in both the UK (projectable, respectively to 1.8 million and 1.3 million individuals) and Sweden (projectable, respectively to 245,000 and 170,000 individuals); those who worked at least once were 11% (4.9 million) in the UK and 12% (700,000) in Sweden.

UK. Considering the sub-sample of those who worked at least once and answered income related questions, in 48% of cases digital labour accounts for less than half the income and for over a third it represents the primary source of income. Women are more likely than men work in such markets (54% vs. 46%); 51% of workers are below the age of 35 but a sizeable 16% is older than 55, and contrary to a prevailing myth only 10% are students. Considering the larger sub-sample of those who looked for such kind of job (21% of the total sample): online work that can be done from home is sought by 88% of respondents, physical work through TaskRabbit and similar by 12%, while 7% are looking for job as drivers (more than one answer was possible). Among those who are working for digital labour markets more than two thirds do office work, short tasks, and 'click work' in OLMs. Also interesting is that as many as 61% of those who work show a portfolio of activities strategy and are registered with two to five platforms (and 7% with more than five); for this reasons there are also sizeable share who works in MLMs or drive for Uber and Lyft. Online work includes also more high skilled and professional work (45% of those who work). In 81% of cases those who work are the main breadwinner and generally make a modest yearly income: from the answers it is estimated that 42% of those working earn less than £ 20,000 before taxes and only 7% make more than £ 20,000 before taxes (the remaining 51% spread between these two figures).

Sweden. The picture emerging from the survey in Sweden is by and large similar to that of the UK with a few differences, the most notable of which is the reversed gender balance (54% men and 46% women working in these markets). In terms of age those working are divided as follows: 29% are 16-24, 29% are 25- 34, 18% belong to the 35-44 age group, 15% to the 45-54 age group, and 10% are over 55 years; only 12% are students. Among those who are working for digital labour markets 70% do office work, short tasks, and 'click work' in OLMs, although given that people are registered in several platforms and do various activities, there are also relevant shares of individuals working in MLMs, driving for ride services markets, and doing more professionalised

work. For about 33% of the sub-sample of those working and revealing income information tasks performed in digital labour market is their primary source of income. As in the UK yearly earnings before taxes are fairly modest: 53% earn less than 300,000 KR, 87% earn under 500,000 KR, and only 4% make more than 700,000 KR.

3.1.2 Motivations to participate

All scientific sources providing robust empirical data on motivations converge in that money is by far the primary extrinsic reason why individuals work in these digital labour markets, regardless of which specific case one considers. Other extrinsic motives such as flexibility, autonomy, and working from home are detected but are given less importance than money. Intrinsic motives are much less important and the discourse about working to kill time, for fun, or for networking purposes is mere rhetoric. Even in MTurk, where earnings are very low, various studies show that money is the primary motive (Kaufmann *et al.*, 2011; Pilz & Gewald, 2013; Ross *et al.*, 2010); this is further confirmed by longitudinal ethnomethodological studies of online communities such as 'Turker Nation' and 'Turkopticon' (Irani & Silberman, 2013; Martin*, et al.*, 2014; Silberman & Irani, 2016), although other aspects besides money also emerge but as side benefits. The most recent survey of MTurk and Crowdflower confirm the importance of money as a primary motive, but find somewhat more support for other reasons such as working from home.

According to Hall & Krueger (2015), drivers appear to be attracted to the platform largely because of the flexibility it offers and the level of compensation. Ethnographic interviews with drivers of various ride services (including Uber) and with passengers using ride sharing platforms in the San Francisco area identified three types (Anderson, 2014): full-time drivers (who provide the service as their primary means of income), part-time drivers (who supplement income from other jobs: these drivers include students), and incidental drivers (who provide the service only occasionally, for instance while commuting to and from work: this type fits to some extent with 'sharing' or 'collaborative' images).

Teodoro et al. (2014) conducted a qualitative study into the motivations of workers in TaskRabbit and Gigwalk. They found that monetary compensation and control of working conditions (time of day, rate of pay, the tasks they do) were primary reasons for joining these systems. They report that on-demand mobile workforce participants preferred to know background information about task requesters and the original purpose of the tasks. They also appreciated the non-financial incentives of new and different experiences that occurred as by-products of task completion.

Whether the choice of working fragmented gigs is voluntary or involuntary was not tackled directly in any of the reviewed studies, although some evidence can be derived indirectly from various sources. The survey on MTurk and Crowdflower shows that 90% of the sample consider insufficient work as a main concern and would like to work more (Berg, 2016). Lack of steady flow of work is also among the main drawbacks cited by 26% of contractors working for Nubelo (Nubelo, 2014) and by 49% of American on-demand workers surveyed in another industry study (RFS, 2015). Other surveys by associations of freelancers in the US indicate that working independently (including in digital labour markets) is a choice in 60% and a necessity in 40% of cases. (Freelancers Union & Elance-oDesk, 2014; Freelancers Union & Upwork, 2015; MBO Partners, 2015).

An indirect benchmark can be provided by data from the Eurostat Labour Force Survey on the share of involuntary part-time and temporary employment reported in the next two graphs. Part-time and temporary employment figures reflect the number of respondents to the survey who reported working part-time because they were unable to find a full-time employment and who reported working in temporary arrangements because they were unable to find a permanent job. Leaving aside the at times wide country differences, it emerges that on average in Europe 29.2% of part-time employment and 62.3% of temporary employment were involuntary.

It is, thus, not unreasonable to speculate that, alongside those working on unsteady flows of gigs, there are also a fairly large amount of people who would rather work more in these digital markets or altogether find regular full-time jobs.

Figure 7: Share of involuntary part-time employment EU28 (2015)
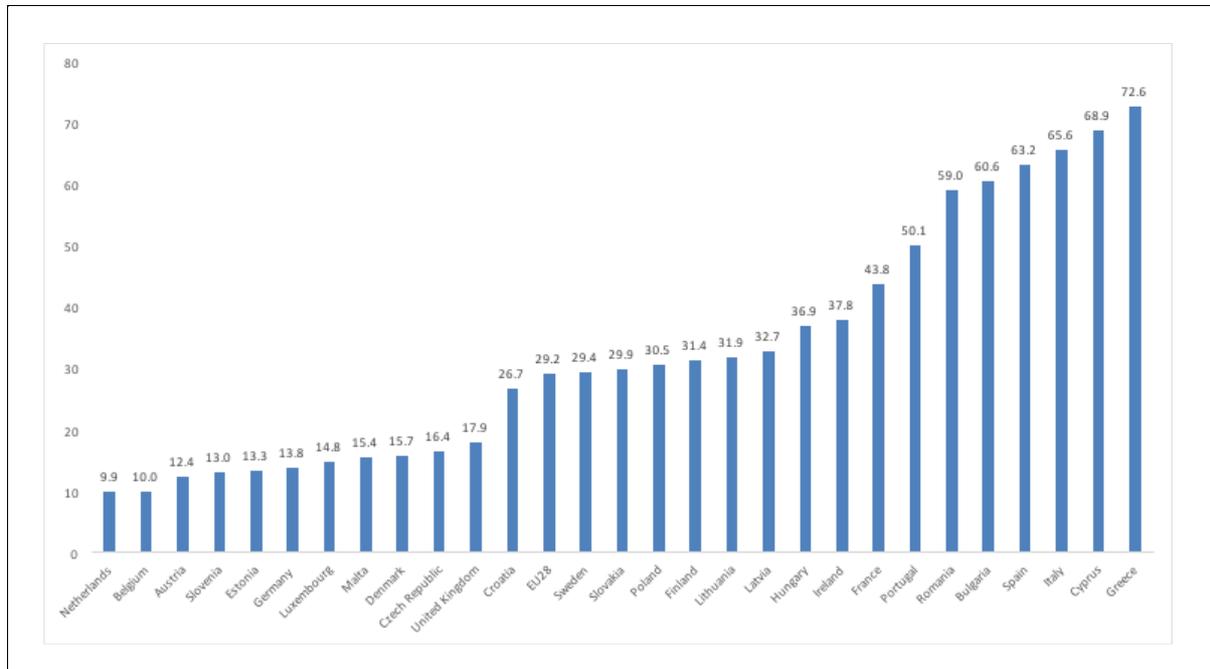
Source: Eurostat Labour Force Survey [lfsa_etgar]

Figure 8: Share of involuntary temporary employment EU28 (2015)
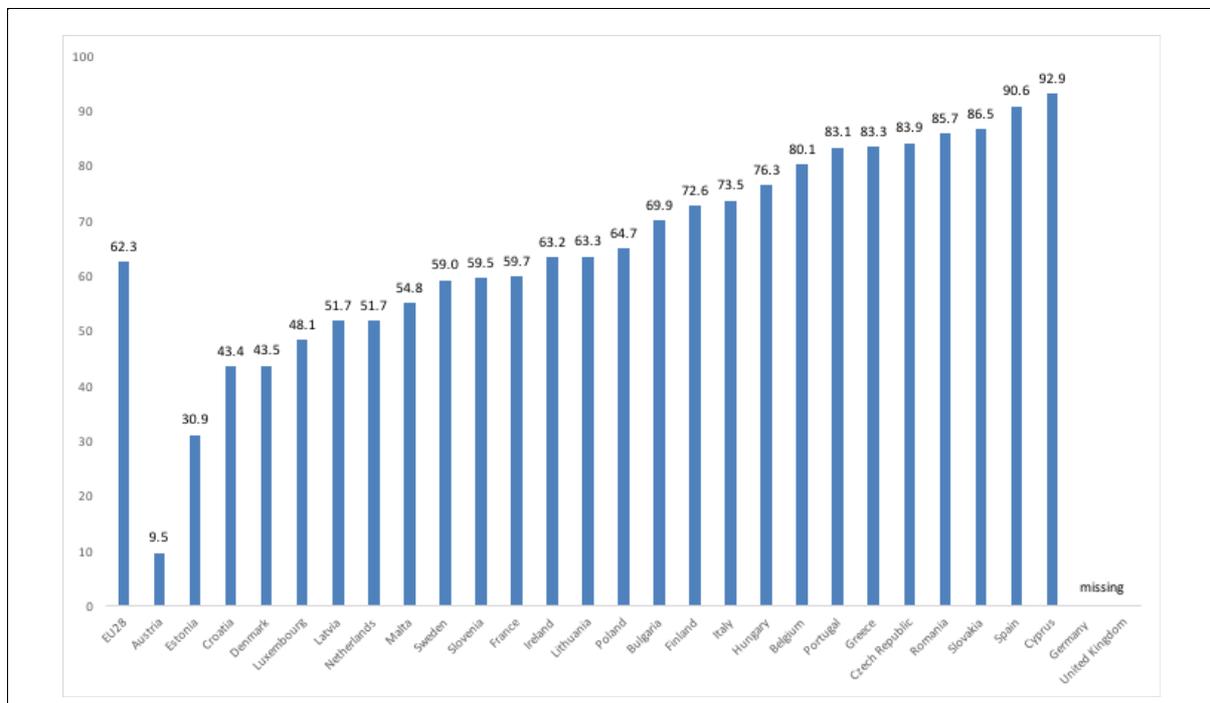
Source: Eurostat Labour Force Survey [lfsa_etgar]

A number of experiments focussing on MTurk provide some indirectly relevant insights into motivation, perception, and actual behaviour. For instance, in natural experiment settings it is found that motivation depends not only on money, but also on whether task monotony is offset by disclosing why these tasks are requested. This is interpreted as

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the importance of telling workers the meaning of the work (Chandler & Kapelner, 2013). Another experiment found that turkers typically did more work when paid more but did not deliver better results (Mason & Watts, 2010). Two experiments show that when turkers had to think about the responses of their peers, combined with financial incentives, they provided higher quality results (Shaw et al., 2011). On the other hand, an earlier experiment had found that workers can attempt to game the system for monetary reward. Younger men (under 25) were more likely to engage in gaming, while men over 30 and women of any age were more likely to take tasks seriously (Downs *et al.*, 2010). Another experiment with MTurk shows that workers work less when the pay is lower, but they do not work less when the task is more time-consuming (Horton & Chilton, 2010). Finally, a simple experiment with turkers explored their perception of employers, in order to challenge the many critical articles about exploitation of turkers (Horton, 2011). The findings reported are that, on average, turkers perceive employers in MTurk to be slightly fairer and more honest than offline employers. However, the many limitations of this experiment hardly warrant sweeping conclusions[xxx].

3.1.3 Working conditions

There are various general essays and commentaries on the alleged exploitative patterns and unfair work conditions in 'crowdsourcing' and the 'sharing economy'. However, few empirical studies were identified that dealt with these issues. These studies are complemented with various additional sources, including investigative journalistic reports. Besides economic conditions and social protection, some aspects of the organisational conditions of work (including the issue of automated control) are considered for just a few specific cases.

Earnings and social protection. The evidence on the earnings of contractors in these digitally-mediated labour markets is limited to a few studies of a limited number of cases (MTurk, Crowdflower, Uber, Upwork and Nubelo, and TaskRabbit). This evidence can be supplemented, however, with the investigative journalistic accounts reported in Evidence Box 2. According to the first analysis of earning in MTurks in 2010 10% of the posted micro tasks in MTurk were priced at 2 cents or less, 50% above 10 cents, and only 15% of the HITs above $1 (Ipeirotis, 2010a). Using a stochastic simulation turkers' potential average hourly wage was estimated at $5 per hour (which is lower than the US minimum wage of $7.25 per hour). More recently it has been confirmed that reported average hourly wage for both MTurk and Crowdflower is between $1 and $5.5 per hour, although 10% of Turkers both in the U.S. and India report hourly earnings above $10 (Berg, 2016). According to Hall & Krueger (2015), Uber drivers earn $6 per hour more than drivers of traditional cabs ($19 per hour versus $13 per hour), This figure, however, has been seriously challenged by investigative journalism which, taking into account idle times and running costs, estimates a net earning per hour barely above the minimum wage. In Upwork, the average hourly wages are $16 in software, $8 for writing and translation, $4 for administrative support, and $5 for both customer support and sales and marketing. With TaskRabbit, the average job is $55 and now it cannot entail an hourly wage of less than $12.50 per hour. Journalistic reports show that contractors can make up to $25 per hour (or between $2,000 and $3,000 per month) by working from different platforms (doing errands for TaskRabbit and driving for Uber), as long as they work up to 12-15 hours per day. Considering that there are superstar effects (i.e., 20% of contractors do 80% of the jobs) on many of these digital markets, it is reasonable to assume that, for the majority, average earnings are limited. As shown, the earlier cited surveys conducted in UK and Sweden confirm based on nationally representative samples that earnings are very modest.

According to the data reported in Berg (2016), the respondents from MTurk and Crowdflower for whom this kind of work is the primary source of income lack any form of social security coverage, only 8.1% of those based in the US report making regular payments into private pensions and only 9.4% contribute to social security. In the *1099 Economy Workforce Report* (RFS, 2015) the respondents (all self-employed[xxxi]) indicate as the most desired benefits in order of importance: health insurance; retirement

benefits; paid sick, holiday, and vacation days. The same report shows that: 8% of drivers and 16% of delivery workers are uninsured; 30% have no health insurance; 43% complain about insufficient pay and 49% about not finding enough work. An indirect way to imagine what is the social protection conditions of workers in digital labour markets is to look at the situation in traditional NSW where lack of any social protection and benefits such as unemployment benefits, eligibility for work injury benefits, as well as for sickness and maternity benefits is the norm (OECD, 2015, 179-190).

Multi-activities and work-life balance. It is debatable whether these digital markets do in fact provide the flexibility, autonomy, and work-life balance that advocates and companies claim are the benefits of the gig economy. The impression given by the investigative journalistic reports in the box below is that on-demand work also involves dependent micro-earners and not only flexible and autonomous freelancers.

Evidence Box 2: Working conditions (investigative journalistic accounts)

- Micro-tasking platforms have been described as digital machines that turn workers into ghosts, (Marvit, 2014), or as horrific digital sweat shops (Uddin, 2012; Zittrain, 2009). Furthermore, research has shown that 90% of tasks posted on Amazon's Mechanical Turk are priced at less than 10 cents and, on average, people only make $4.8 per hour (Ipeirotis, 2010a, 2010b);

- Various investigative journalistic reports have shown that providing generic personal and home services through sharing economy platforms (i.e. TaskRabbit) provides no flexibility or work-life balance. Workers would have to work more than 12 hours a day in order to cobble together a decent income running errands and driving people around (Kantor, 2014; Shontell, 2011; Singer, 2014; Weber & Silverman, 2015; Zimmermann, 2015);

- With respect to the above, a survey of on-demand workers (including those working in the sharing economy platforms) has found that there is no flexibility and autonomy because working hours are demand-dependent. Many workers are dissatisfied with both the pay and the work schedules (reported in Smith & Leberstein, p. 6);

- Investigative work on Uber and Lyft drivers uncovered that: a) many are full-time taxi drivers with their own cars and there is little autonomy and flexibility (Rapkin, 2014); b) contrary to claims by Hall & Krueger that Uber drivers make about $16 per hour (2015), field work (including working as an undercover driver) places the net earnings at $7.20 per hour (Brown, 2015; CEPR, 2015; Griswold, 2014; Guendelsberger, 2015; Weiner, 2015); c) documents from court cases on Uber and Lyft unequivocally prove that the advertised autonomy and flexibility is a myth, since the two platforms can terminate drivers if their dispatch acceptance rate is too low. These platforms also look for accounts to deactivate when there are too many drivers or business is slow.

Working for MTurk. A group of broadly-defined ethnographic studies provides evidence on what it means to work for MTurk (Bergvall-Kåreborn & Howcroft, 2014; Irani, 2015a; Irani, 2015b; Irani & Silberman, 2013; Martin, et al., 2014; Silberman et al., 2010a; Silberman et al., 2010b). Taken collectively, regardless of the method and evidence gathered[xxxii], they identify the following problems faced by MTurk workers concerning asymmetries in terms of both information and levers for action:

- **Information asymmetry in general**. MTurk terms of agreement stipulate that the judicial rights over the task accomplished by the workers pass to the requesters, who can accept the output, or not. The platform tracks and maintains workers' acceptance rates so that that requesters can recruit workers who have higher rates of task acceptance from prior requests, However, there is no equal mechanism for workers to filter employers. Workers only see the name the requester chooses to use and only receive limited information about the tasks, whereas firms can access the employment history of workers.
- **Employers' moral hazard**: When workers submit work to employers through Mechanical Turk, they have no guarantee of receiving payment for their work. Employers can retain the work and not pay, without having to provide any justification.
- **Moral valence**: Mechanical Turk workers have to learn to identify illegitimate tasks to stay safe online. The lack of transparency raises ethical questions as

workers are unable to make judgments about the moral valence of their work (Zittrain, 2008);

- **Costs of requester and administrator errors are often borne by workers**: When a requester posts a task with inadequate instructions, they often do not get the responses they want from workers and reject the work. The responsibility for the lack of quality does not belong to the workers but to either the requester or the platform administrator.

Workers discuss these issues in online forums such as 'Turker Nation' (Martin et al., 2014) and also on the activist platform 'Turkopticon', where they help each other by making public and evaluating their experiences with the employers (Irani & Silberman, 2013). Aside from the empirical documentation of these problems, the following authors draw more sweeping conclusions about MTurk (Bergvall-Kåreborn & Howcroft, 2014; Irani, 2015a; Irani, 2015b). Bergvall-Kåreborn & Howcroft (2014) conclude that MTurk is not merely a passive broker but also an active organiser in a long supply chain. MTurk plays a fundamental role in establishing the conditions for crowd labour, because it makes it possible to exercise control by bypassing traditional routes and regulatory procedures when procuring labour supply. In the authors' view, this is further corroborated by the fact that a range of intermediaries who filter work requests from their clients to the MTurk platform have emerged and are very actively organising work on the platforms. Irani (2015a; 2015b) argues that MTurk and other similar platforms are a source of social differentiation, within the universe of knowledge workers, between 'innovative workers' and 'menial workers'. She claims that the former maintain their identities as creative, highly-valued entrepreneurs, by outsourcing tedium, tinkering with labour, and casting their work as high-tech entrepreneurs. In addition, she also considers that MTurk is a controlling and organising platform, which makes cheap labour invisible. In other words, Irani (2015a) sees MTurk as a platform that helps '*ameliorate the contradictions of intensified labour hierarchies by obscuring workers behind code and spreadsheets*'.

Automated workers' control. Ethnographic (Lee *et al.*, 2015; Rosenblat & Stark, 2015) and quantitative (Chen *et al.*, 2015) analyses have focussed on control and surveillance by algorithm in Uber. Rosenblat & Stark (2015) argue that Uber's digitally and algorithmically-mediated system of flexible employment builds new forms of surveillance and control, which result in asymmetries around information and power for the drivers. Their analysis casts doubt over the claims made in the Hall & Kruger paper that the main reason drivers join Uber is the flexibility of schedules (2015). Their findings are corroborated by Lee et al. (2015) who interviewed drivers from both Uber and Lyft and triangulated these interviews with passenger interviews. They describe how drivers respond to algorithm-assigned work and how they share with each other (in online forums) informational support and social tactics on how to resist or game the rigid restrictions imposed by the algorithmic control. In addition, a quantitative study of how the Uber surge price algorithm works shows that this algorithm is opaque and clearly manipulated, does not reliably reflect the real situation of peak demand, and is resisted with various tactics by both drivers and passengers (Chen*, et al.*, 2015). Based on their analysis, these authors conclude: '*Our observations about Uber's surge price algorithm raise important questions about the fairness and transparency of this system. The forces at play on markets like eBay and Airbnb are well understood: the supply of goods is transparent, and prices are set by competing individuals. In contrast, Uber does not provide data about supply and demand, and the pricing algorithm is opaque*' (Chen, *et al.*, 2015, p. 13). These contributions, taken collectively, document the functioning of an ensemble of surveillance instruments which substitute direct managerial control and create power asymmetries between the platform and the drivers. The pillars of this system are: assignment algorithms, surge price algorithms, and semi-automated evaluation (i.e. drivers' acceptance rate plus the ratings received by the passengers). These match three aspects typical of human resources management: work allocation (i.e. passenger assignment, plus predictive scheduling), information (dynamic surge pricing), and evaluation (semi-automated evaluation).

Passenger assignment, for instance seems to severely limit both the flexibility and autonomy of drivers for two reasons (Lee *et al.*, 2015; Rosenblat & Stark, 2015). First, drivers are basically forced into blind acceptance of passengers since when they accept a call they are not shown the destination or how much they can earn on the fare. Second, in principle drivers can refuse a call but they risk being suspended or removed from the system (both in Uber and Lyft). Uber in San Francisco requires drivers to have cancellation rates below 5% and an acceptance rate of at least 90%. Uber uses predictive scheduling trying to influence drivers (i.e. there is high demand now in the area where you are located) to convince drivers to keep working when they attempt to log off (Rosenblat & Stark, 2015, pp. 8-10). Chen et al. (2015), analysing four weeks of Uber's surge pricing data in downtown San Francisco and mid-town Manhattan[xxxiii], conclude that it seems prone to manipulations, has a few bugs, and raises issues of fairness and transparency. These quantitative findings are corroborated by triangulating them with qualitative interviews (Lee *et al.*, 2015) and analysis of online forums posts (Rosenblat & Stark, 2015). It seems that some drivers are not influenced by surge pricing, others avoid surge areas or try to game the system by colluding with passengers. Still others consider it to be an unfair system, because at times it leads them into areas where they expect higher earnings which later do not materialise. According to some interviews, surge-pricing changes too rapidly and unexpectedly for drivers to use the information strategically to boost their incomes (Lee, p. 1607).

Though in-depth analysis of management by algorithm as the primary focus was found only in studies of Uber, issues of control, surveillance, and standardisation also affect other platforms such as Upwork (Agrawal, et al., 2013a) or MTurk (Ipeirotis & Horton, 2011). In platforms such as Upwork digital on-demand workers can be controlled even by measuring their productivity in terms of keystrokes (Horton & Tambe, 2015, p. 131). Some platforms include virtual office applications which ensure tight control of contractors (i.e. with regular screen shots and activity logs). In some cases, contractors are incentivised to log onto these applications by a guarantee of a certain hourly wage (Agrawal et al., 2013a, p. 11). Standardization and control are presented as key ways of helping MTurk and other similar platforms scale up by increasing efficiency and reducing frictions (Ipeirotis & Horton, 2011).

The practices described above fit in what has been defined as 'algocracy', to be a new form of algorithms based governance alternative to both markets and hierarchies (Aneesh, 2009). Algorithms can be seen as a new source of rhetoric that promises 'objectivity' (Gillespie, 2014). Both in the practice of administering the matching and quality control processes and in its public relations campaign, Uber smartly appeals to the algorithm in both rationalistic and 'affective' ways, thus blurring analysis and prediction.

3.2 Economic effects and markets functioning

In this paragraph the main economic effects and the functioning of these digital markets as matching mechanisms are discussed as documented in scientific contributions mostly in economics that use both observational (quasi-experimental) and experimental design and where the gathered data are treated econometrically or statistically. In this sense these groups of studies provide the most quantitatively robust evidence on effects and functioning. The drawback is that they focus on a few markets (Upwork, Freelancers, Nubelo, MTurk, TaskRabbit), and in three cases on markets that are left anonymous, although two can be attributed to the Upwork type, and one to the TaskRabbit one; there is a clear unbalance with more studies concerning OLMs and fewer MLMs, and within the former a larger number of articles focus on Upwork (actually on their predecessors oDesk, Elance, and no study has yet been conducted on the new merged market). The section below analyses separately the evidence on OLMs and MLMs effects (respectively in § 3.2.1 and in § 3.2.2), and then discusses in general the observational and experimental evidence on matching frictions and hiring biases; obviously effects and frictions/biases are related and are treated separately only for the sake of organising the exposition in coherent themes.

3.2.1 Online labour markets effects

Increased participation? None of the identified observational econometric and statistical analyses deal with the question of whether OLMs enable the earlier unemployed and inactive to find a job. Hence this question can only be partially and descriptively answered in light of the evidence on workers' profiles presented earlier. Berg (2016), using only two small samples, reports that 33% of those working for micro-tasking OLMs such as MTurk and Crowdflower were unemployed, whereas the remaining two thirds use these markets to complement part-time or full-time employment. Earlier cited sources (i.e. the surveys on UK and Sweden, the Upwork and Nubelo surveys) provide interesting information on the amount of time dedicated to digital work and whether it represents or not a primary source of income, but they do not include any information on current and previous employment or unemployment status; in this context a reasonable speculation is that the majority of these workers (possibly excluding the markets for small micro-tasks) come more from the ranks of the under-employed and the self-employed than from those of the unemployed and inactive; this can be corroborated when tenure in the platforms is relatively long as shown for Upwork. In this respect, two qualitative studies (not included in the formal review, given their very exploratory nature and the use of very small samples) are worth mentioning (Dillahunt & Malone, 2015; Jen *et al.*, 2014). They suggest that individuals from the most socially-excluded social groups are not aware of these digital labour possibilities, and do not have the skills to participate in them. A separate issue concerns the increased participation of female based on the general hypothesis that schedule flexibility and the possibility working remotely offered by digital work can help women previously out of the labour markets to 'opt back in' while managing other responsibility such as childcare (Dettling, 2016; Rossotto *et al.*, 2012) or to overcome some of the cultural barriers that may exist in traditional workplaces (Raja *et al.*, 2013). Using US data and applying an instrumental variable strategy leveraging cross-state variations, Dettling (2016) finds that the work forms made possible by access to broad-band Internet increases the labour participation of highly educated married women with children who were earlier out of the labour force. The descriptive data found from the sources reviewed in the previous paragraph do not allow to draw any correlational analysis, but unequivocally show that in most digital labour markets women are either more or equally present compared to men; yet, it can anticipated that they can still suffer from stereotype based hiring biases (see § 3.2.3).

Is the OLMs world really flat? Horton's initial optimistic 'flat world' hypothesis was that online labour markets would enable global matching, unlimited 'virtual labour migration', and international human capital specialisation (2010). Although at descriptive level international flows of digital work seem fairly widespread and even dominant for Upwork, more sophisticated analyses of data suggest that in OLMs the world is not as flat as Horton predicted when it comes to geographical, cultural, and language differences (Agrawal *et al.*, 2013b; Beerepoot & Lambregts, 2015; Galperin *et al.*, 2015; Ghani *et al.*, 2014; Hong & Pavlou, 2014; Lehdonvirta *et al.*, 2014; Mill, 2011); as put it by Lehdonvirta et al. (2014), even in OLMs there is still a high 'liability of foreignness'.

The first descriptive analysis of oDesk international flows of labour shows that: North-South exchange dominated this platform from 2009 until 2013 for there were 10 times more employers from high income countries than there were from low income ones, whereas there were 4.5 times as many contractors from low income countries than there were from high income ones. (Agrawal et al., 2013a, see the graphs and data reported at pp. 32-42). In some lower income countries (i.e. China, Russia, Ukraine) where contractors were concentrated in the best-paying tasks (i.e. software development, information systems, and web development), the average wages obtained in oDesk were above those prevailing in the respective domestic markets. With the exception of Poland, contractors from EU countries were much less active than non EU ones. The more recent data from Upwork global labour report (Upwork, 2015a, 2015b) included in the next table only partially confirm this earlier picture (it includes both oDesk and Elance data, whereas the earlier data concerned only oDesk).

Table 2: Upwork top employers and providers countries

Top 10 hiring countries (based on employers spending)	Top 10 providers countries (based on freelancers' earning)
Growth rate > 25%	**Growth rate > 25%**
U.S.	U.S.
UK	Philippines
France	Russia
Germany	Bangladesh
Israel	UK
Netherlands	Romania
Singapore	**Growth rate 10%-25%**
Switzerland	India
Growth rate 10%-25%	Ukraine
Australia	Pakistan
Canada	Canada

Source: (Upwork, 2015a, 2015b)

The table confirms that top employers are from more developed countries and top providers from developing ones, although we also find the US in the latter group (at the top) and the UK and Canada. This suggest that there is also some level of domestic hiring. In this respect a study of Nubelo finds that in this market there is a clear preference for domestic hiring especially for Spanish employers (Galperin et al., 2015).

Using data from Freelancers, Mill (2011) showed that when they have no experience in this OLM, contractors from developing countries are less likely to be hired. Another study on Freelancers contractors from poor, non-English speaking countries with traditional (religious versus secular) cultural values and a large time zone difference from employers' geographical locations such North America and Europe find that they have more difficulty being employed (Hong & Pavlou, 2014). Agrawal et al. (2013b) present results for oDesk that are counterintuitive with respect to those reported above (Agrawal et al., 2013a). Focussing on contractors from low-income countries they find that, all else being equal, those with no experience have a much lower probability of being employed. On the other hand, when contractors from these countries have prior experience, then they are disproportionately at an advantage. A different but related finding is that members of the Indian diaspora who hire on oDesk are more likely to hire workers in India than other employers (Ghani, et al., 2014). Lehdonvirta et al. (2014) test and empirically confirms using oDesk data the hypotheses that international digital labour flows are hindered by (i) practical barriers (language differences and time zones) and (ii) the liability of foreignness (more complex work, and work involving formal institutions and/or communication work) and that (iii) foreign contractors are paid less for the same type of work relative to domestic contractors with this gap being greater in complex work, work that directly involves formal institutions, and communication work (interaction between this hypothesis and the previous one). Beerepoot & Lambregts, (2015), with with data from oDesk, empirically test the hypothesis of wage convergences due to globalised flows. They find that Western contractors earn more than non-Western ones, although when earnings are normalised using data reflecting the countries of origins economic contest a wage premium for non-Western contractor emerges and documents a limited level of convergence; non-Western contractors earn relatively more than in their domestic markets, but this does not seem to drive down the earnings of Western ones. Furthermore, they find that there is no correlation between earnings and skills/experience and that reputational mechanisms have a greater effect;

this suggests that the Upwork claim of being a global digital meritocracy is overstated at best. It is interesting to also note that Beerepoot & Lambregts (2015, p. 247) claim that is not uncommon to find in posts statements such as the following:

> *This job is not for people from Bangladesh and Pakistan and your bid would be rejected automatically if you are from any one of the mentioned countries;*
>
> *Business to Business appointment setters needed: with previous calling experience Filipinos are preferred;*
>
> *The client has requested they want a female caller with a British or Australian or New Zealand accent working on the campaign. MEANING UNLESS YOU ARE FEMALE AND UNLESS YOU ARE A KIWI, AN AUSSIE OR BRITISH, DO NOT APPLY!!!!.*

The authors comment that such forms of discrimination thrive as a result of the regulatory vacuum in which such transaction take places.

While the evidence reviewed is limited to a few platforms and more research is needed, from the reviewed sources it can reasonably be concluded that the world of OLMs is not flat and is still far from being a globalised digital meritocracy. The limits evidenced here are example of the matching frictions and hiring biases that are further discussed.

Super star or long tail effects? The distributional employment and related income effects depend on whether 'superstar effects' (leading to income inequality) [xxxiv] or 'long tail effects' (having an equalising impact) prevail. Citing evidence from other online platforms (but not labour market ones), Agrawal et al (2013a, pp. 14-17) conclude that both results are possible and that the evidence on these effects is ambiguous and inconclusive. Yet, in the reviewed studies focussing on online labour markets examples of concentration of work assignments (if not full blown 'superstar' effects) are found and no case of long tail effect is documented (Horton, 2014; Ipeirotis, 2010a, 2010b; Musthag & Ganesan, 2013). In oDesk, for instance, buyers inefficiently pursue oversubscribed (i.e. superstars) sellers (Horton, 2014; Horton, 2015b). MTurk is a heavy-tailed market in terms of both 'requesters' and of 'turkers' (Ipeirotis, 2010a, 2010b). The top 0.1% of requesters account for 30% of the dollar activity and 1% of them post more than 50% of the dollar‐weighted tasks, and 10% of 'turkers' perform 75% of completed tasks. Such effects, moreover, can be related to the barriers to internationalisation seen above and to matching/frictions and hiring bias. Beerepoot & Lambregts (2015, p. 250), for instance, find that Filipino contractors are preferred by many employers for administrative support services, which makes it very difficult for other groups to compete for this task category.

Why do firms hire from OLMs? This is a crucial research question because it refers to the theory of the firm and the possibility that OLMs may increase the contraction in firms' boundaries in the same way that outsourcing has done since the 1990s. This may impact future development trends in these digital markets, as discussed previously (§ 2.2). According to the theory of the firm and to transaction costs theory, if online labour markets reduce transaction costs, firms should contract more workers in this fashion and this would produce a distributional transfer of work activity from vertically-integrated firms to OLMs. Unfortunately, no scientific study on this aspect is available and only a few descriptive data from surveys commissioned by OLMs can be reported.

A first survey of 7,000 employers was conducted by oDesk in 2012 (few findings reported reported Agrawal et al., 2013a, p. 12); this survey found that 76% of them indicated that they hired 'remote workers' because they are less expensive. However, 46% selected the answer 'can get work done faster', 31% selected 'difficult to find talent locally'. A more recent (2014) survey on Elance-oDesk broadly confirm the above findings (Elance-oDesk, 2014), although those indicating work being less expensive as a motivation were about 60% (so a bit less than in the previous survey). What is more interesting is that in both surveys between 15% (2012) and 20% (2014) of employers indicated that in the absence of the digital hiring possibility they would have made a traditional local hiring; this means that the boundaries of only one in five firms are affected. The survey of Nubelo employers (2014) report that cheaper labour is indicated as a key reason by 52% of employers, and 30% state that they would make a traditional

local hiring in the absence of Nubelo (i.e. firms' boundaries seem more affected). Finally, it is worth noting in both these OLMs the overwhelming majority of employers are SMEs, which seems to suggest that OLMs makes outsourcing more available to this type of firms.

Gurvich et al (2015) provide further insights into future of digital outsourcing, albeit not empirically but rather from formalised modelling simulation of on-demand work. They model a situation where firms use on-demand work with self-scheduling, meaning that workers are fully autonomous and decide independently how much labour to supply. Their model concludes that under this configuration, compared to a scenario where it is possible to dictate to workers when they must work, the firm has lower profits and customers have a higher chance of not being served. Furthermore, the modelling foresees that, when demand is volatile, self-scheduling results in lower service levels in high demand periods. This analysis clearly points to the limits of outsourcing and relates to the discussion above about the boundary of the firm. It can also be seen, on the other hand, as indirectly supporting the claim that digital labour markets must exert strong control over on-demand workers and possibly influence their patterns of work, if they are to be profitable and used by firms.

Net Aggregate effects. The evidence available does not warrant any conclusion with respect to the net welfare effects that online or mobile labour markets and services have. The only source dealing with these aspects for OLMs is the well-reasoned and balanced theoretical discussion presented in Agrawal et al. (2013a, pp. 23-25). There are two kinds of possible aggregate welfare effects:

i. increased efficiency in overall labour market matching (i.e. increased pool of workers and employers, lower transaction and search costs);

ii. increased production efficiency due to lower coordination costs.

For the first effect, the evidence reviewed suggests that online and mobile labour markets still have considerable frictions and inefficiencies, and some intangible obstacles hamper the full impact of breaking geographical barriers. Agrawal and colleagues recognise that these markets must further improve their design and two-sided strategies to improve matching because:

a) OLMs reduce search costs but increase heterogeneity in the pool of workers and employers and, consequently, in the skills and tasks to be matched; and

b) this may compound the potentially negative effects of the lack in OLMs of soft and/or high-bandwidth information about both job seekers and prospective employers (Autor, 2001).

c) Lower coordination costs and lower outsourcing costs through these new labour markets may increase production efficiency, yet this is still speculation since no empirical evidence was found on this aspect.

3.2.2 Mobile labour markets effects

As anticipated in the introduction, evidence on MLMs is more limited than evidence on online labour markets.

Increased participation. The evidence is mixed as to whether female participation is increased in mobile labour markets for the provision of generic services. In TaskRabbit, women are overrepresented (Cullen & Farronato, 2015), but in other platforms (i.e. Gigwalk), men are overrepresented (Mushtag & Ganesan, 2013; Teodoro et al., 2014).

Distributional effects. Compared to OLMs, the MLMs by definition cannot have global geographical effects, for they are localised. Providing personal and home services obviously does not have any effect on firms' boundaries. Markets such as FieldAgent or Wegolook, which provide services to business, might in principle have these effects, but no empirical evidence was found on these types of services. Musthag & Ganesan (2013) show that one platform for mobile services is heavy tailed: i.e. less than 10% of workers account for more than 80% of the activity generated by the platform. On the other hand, a survey of TaskRabbit workers documents a different kind of distributional effect

(Thebault-Spieker, et al., 2015): low socio-economic status (SES) areas are relatively less serviced by TaskRabbit. They conclude that more research is needed to document whether or not their results can be generalised and can support the conclusion that lower SES groups and/or neighbourhoods have less chance of benefiting from the sharing economy.

3.2.3 Matching frictions, hiring inefficiencies, and behavioural biases

Although not included among the formally reviewed sources and used as complementary background, the article by Autor on 'wired labour' (2001) is cited by many of the authors discussed below; it builds on earlier labour economics studies of markets with matching functions and with search (Petrongolo & Pissarides, 2006; Petrongolo & Pissarides, 2001). The evidence on matching frictions and hiring biases (or inefficiencies) is very extensive and solid, including also several experimental studies. It shows that these markets are still not as efficient as expected and that Autor (2001, 2008) had a strong point when he voiced scepticism about 'wired labour'.

Probably the most striking evidence of the existence of frictions and entry-level hiring inefficiencies comes from a field experiment run by Pallais (2014) using oDesk, which is worth giving relatively more space compared to other contribution. Adopting the '*Experimenter as employer*' framework, the author posted a 10-hour data entry task and randomly hired 952 contractors, providing them with a rating when they completed the task (treated group). The 2,815 contractors that applied but were not hired were used as the control group. Subsequently, the employment performance in oDesk of both groups was monitored. It was found that, considering only those contractors with no prior experience in oDesk, the income for the treated group was three times greater than for the control group during the two months following the experiment. The employment performance for the treated group can be attributed just to the information the author posted on those who were 'fictitiously' hired (since only contractors with no other prior experience were considered in the experiment). The evidence is striking considering how small the treatment was (a short simple job and a single score out of 5) compared to the size of the effect produced. This clearly suggests important frictions and hiring inefficiencies and biases, especially for entry-level contractors. The author concludes that the welfare implications are that it had been inefficient not to employ some of the experimental workers; she further argues that OLMs may exacerbate wage inequalities by further skewing work in favour of the most skilled and precluding entry by inexperienced workers. Another three experiments conducted on oDesk by the same author confirm that, all else being equal, referred workers are more likely to be hired than non-referred workers (Pallais & Sands, Forthcoming). It seems that referrals information is used by employers more than all other observable characteristics on which information is fully available in OLMs.

In another observational study of oDesk, it emerges that inexperienced contractors affiliated with an intermediary agency (active in using oDesk to mediate between employers and contractors) have substantially higher job-finding probabilities (almost double) and wages (15% more) at the beginning of their careers, than inexperienced contractors not affiliated to an agency of this kind (Stanton & Thomas, 2014). This study, besides confirming entry level frictions, also underscores the importance of this kind of outsourcing agency (as many as 1,100 such firms are active in oDesk) that intermediate between the workers in the OLMs and potential employers. In practice, they act as re-sellers. In other words, for that part of the transaction intermediated by these agencies, oDesk (and other OLMs where this practice exists) ceases to be a two-sided market. This seems to confirm the prediction that these new forms of wired labour would require new intermediaries to reduce frictions and increase workers' productivity (Autor, 2001). This paper shows that in the case of oDesk these agencies reduce information frictions in the market by screening workers and communicating the results to employers. A typical agency represents a small number of workers, often from the same region or city, who in many case know each other offline. It is worth noting that the presence of these intermediating agencies is observed not only on a similar platform (Freelancers) but also

on MTurk. Here, they figure among the top requesters as they aggregate tasks on behalf of their clients to provide a quality assurance service, on top of MTurk' services (Ipeirotis, 2010a).

An experiment run by oDesk shows that algorithmically recommending workers to employers for the purposes of recruitment can substantially increase hiring (Horton, 2015a). Employers with technical job vacancies that received recruiting recommendations had a 20% higher fill rate than the control. Another experiment run in Elance-oDesk shows that, when employers were asked for their price/quality preferences before posting their job openings and these preferences were then exposed to would-be workers, a substantial sorting by workers and better matches were achieved, compared to the control group (Horton & Johari, 2015). These experimental findings are confirmed by observational studies. Traditional ratings are not efficient to reduce frictions and may actually increase them (Horton & Golden, 2015). Another observational study of Elance-oDesk shows the existence of supply constraint frictional effects: spurned invitations affect subsequent match formation (Horton, 2015b). The author shows that sellers are more likely to reject interested buyers when those sellers have more proposals to choose from and, using an instrumental variable identification strategy, argues that this relationship is likely to be causal. When a buyer is rejected by a seller, the latter's chances of filling his/her request is reduced. This is possibly so because the seller may be pursuing a 'superstar' contractor.

Market frictions also affect mobile labour markets for the delivery of physical tasks like TaskRabbit (Cullen & Farronato, 2015). In TaskRabbit, demand is highly variable and there is a wide heterogeneity in the tasks posted by the 'requesters' and in the skills offered by the sellers. The authors find that in the period considered (before the change in the TaskRabbit business model, see below):

a) the natural level of efficiency of this market is very modest (although with some differences across different cities);
b) there are clear frictions partly compensated for by elasticity in the supply of labour;
c) matching success varies across cities as a function of geographic density (buyers and sellers living close) and of task standardisation (buyers requesting homogeneous tasks). Interestingly, they find that when demand exceeds supply there is no effect on price but rather the supply expands. In other words, contractors work more but the average price remains between $52 and $59 per job.

In view of these findings, the platform has been re-designed to increase the efficiency of matching, moving from the original auction model to a new more controlled and standardised business model. In the original model, a buyer could post a task-specific price and then accept the first offer, or ask for bids and review the prices offered by sellers. This move away from the auction business model to more centralisation is part of a growing trend (Einav et al., 2013). After the change in its business model, TaskRabbit basically accepts standardised tasks that are offered at fixed prices[xxxv]. So, whereas originally TaskRabbit was presented as the eBay for physical odd jobs, today its ambition is to become the 'Uber for everything' (Newton, 2014). Finally, Cullen & Farronato (2015) use their model to estimate the aggregate value of the market for domestic tasks in the US (considering only 18 cities) at $920 million[xxxvi] in total.

The contributions above study and interpret frictions and hiring inefficiency from a strictly economics and technical perspective. Studying gender hiring in one OLM (name not revealed) other authors find (Silberzahn et al., 2014) and discuss (Uhlmann & Silberzahn, 2014) discrimination that is rooted in cognitive heuristics and biases (i.e. conformity under uncertainty) affecting employers judgement and decision-making. The main empirical findings are that, controlling for other relevant parameters: a) female workers are less likely to be hired for stereotypically male jobs (i.e. programming), and more likely to get stereotypically female jobs (i.e. customer service); b) in the less likely cases in which women are hired for stereotypically male jobs they are more often paid by the hour rather than by a fixed price of the all output (whereas the reverse is true when women are hired for stereotypically female jobs) as a result of a risk averse choice

based on gender stereotypes (i.e. employers are uncertain about women doing a good programming job and to reduce risk by the hour rather than by the final output). In the comments to such findings – presented in a separate piece published in a special issue of *Behavioral and Brain Sciences* on big data and the study of collective behaviour – the authors first observe that OLMs in principle approach very closely a perfect market given the amount of information available on workers that is searchable and organised algorithmically, which should enable the typical employer to act as perfect Homo Oeconomicus (Uhlmann & Silberzahn, 2014, p. 103) and hire rationally on the basis of skills, merit, and value for money; the fact that this does not occur for women with higher skills and better price/quality ratio compared to men is interpreted as a sign of typical heuristic and biases in the face of information overload. When one receives 100 CVs one hour after posting a job he/she faces the situation of assessing many options along many criteria, which is typical of other situations where it is common to rely on social convention heuristics such as stereotypes and make potentially biased decision. Cultural stereotypes and confirmation can thus be seen as playing a role in the observed 'discrimination' concerning hiring decision and contract types for women (Uhlmann & Silberzahn, 2014, p. 104). The empirical findings fully confirm that stereotypes are inaccurate and cause distorted decisions, since the data show unequivocally that women applying for stereotypically male jobs possess on average, more domain relevant skills than their male counterparts (Silberzahn*, et al.*, 2014). These mechanisms reproduce themselves inasmuch employers who choose based on gender stereotypes and are satisfied with the output will never test counter stereotypical hiring, thus, reinforcing and confirming their own biases.

This line of behavioural interpretation could be applied to the findings about the limitation to the 'flat world hypothesis' and further makes the claim of a new 'global digital meritocracy' which looks like public relations rhetoric.

3.3 Legal disputes and regulatory issues

In this final paragraphs the formally reviewed contributions focussing on legal disputes and regulatory and policy issues are discussed (Berg, 2016; Cheng, 2014; Cherry, 2011, 2016; Felstiner, 2011; Sprague, 2015), complemented by various other sources including reports by think tanks and foundations and contributions by scholars taking sides on the ongoing debates (Hagiu, 2015; Hagiu & Biederman, 2015; Harris & Krueger, 2015; Hill, 2015; Koopman *et al.*, 2015; Smith & Leberstein, 2015; Strom & Schmitt, 2016; Sundararajan, 2014), as well as various journalistic accounts. Before dealing with disputes (§ 3.3.2) and regulatory matters (§ 3.3.3), a sort of digression on two-sided markets and the issue of control is presented in § 3.3.1 for it is important with respect to misclassification lawsuits (contractors vs. employees) and potential regulation addressing them.

3.3.1 Two-sided markets vs. vertical integrated firms

In parts § 3.1.3 evidence was presented documenting that some digital labour markets exert a stringent form of control over their contractors. In their approach to two-sided markets (2SMs) and multi-sided platforms Hagiu & Wright (2013; 2015a; 2015b, 2015c) contrast them to Vertical Integrated (VI) firms or resellers alongside the dimension of the amount of control exerted. In principle VI and resellers exert more control on various terms of trade and on workers than 2SMs (in the case of the online markets studied here the notation is 2SOLMs).

As documented earlier, intermediary agencies operate within some of the 2SOLMs to organise on-demand workers and perform coordination and quality control functions on behalf of the final employers. This is depicted in the figure overleaf. The scheme (1) in the figure shows how a pure 2SOLM works. In (2), the classical and traditional case of a vertically-integrated outsourcing firm such as Wipro is illustrated. In (3), we have the hybrid case of an intermediary agency using a 2SOLM to further intermediate between workers and employers.

Figure 9: The case of intermediary agencies operating inside 2SOLMs
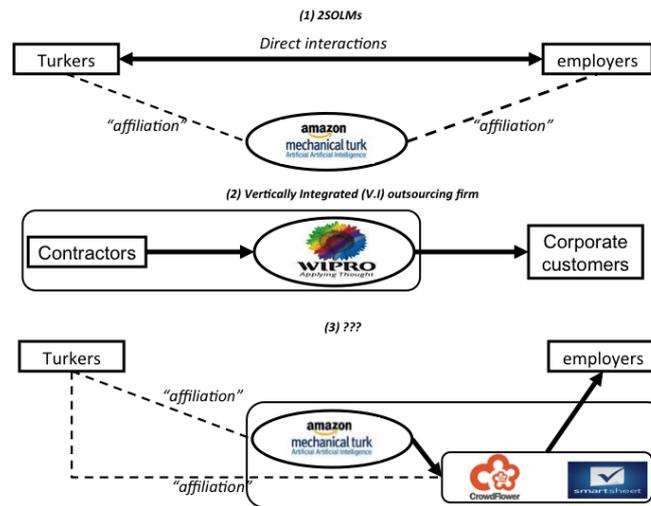
Source: own elaboration following Hagiu & Wright (2015c, fig. 1, p. 4)

In scheme (3) is it a case of 'input reseller' or of 'input supplier'? This nominalist issue is of little interest here - what matters is the following:

a) this occurs because 2SOLMs are not yet fully efficient, so intermediary agencies arbitrage their frictions to increase control and coordination for their customers (employers); and

b) these intermediary agencies exert full control over the contractors and de facto should be considered the same as traditional off line temp agencies. The corollary is that these agencies are in practice employers. Obviously, they bear the risks of lawsuits, and 2SOLMs are happy to let them work, for they receive the transaction fees without incurring any lawsuits.

Figure 10: 2SMs Vertically-Integrated (V.I.) firms and/or resellers
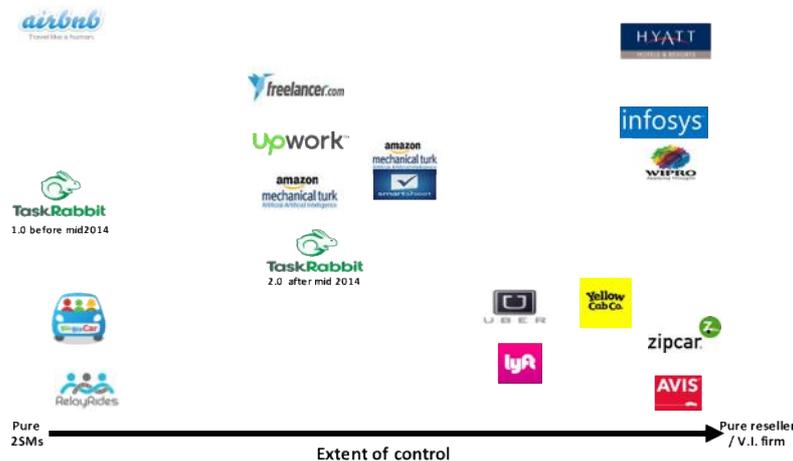
Source: own elaboration on Hagiu's presentation delivered at IPTS workshop[xxxvii]

The figure above takes an additional step and uses the dimension of control to position various players in the continuum between pure two-sided markets (2SMs) and pure V.I. firms or pure resellers. In the figure above, 2SMs that are not 2SOMLs are also included as a comparison, which explains why the counterpart pure model includes V.I. firms and resellers in both labour and non-labour domains. In view of the discussion on algorithm management and various other tightly controlled aspects, Uber and Lyft are placed closer to the V.I. firms/reseller pure model (very close to traditional taxi companies) and far from platforms exerting little control on the terms of conditions for hosts and guests such as Airbnb. On the other hand, in § 3.1.3 it has been shown that Upwork and MTurk

also exert control over contractors (Upwork more than Freelancers, as the latter does not have virtual offices which monitor even keystrokes) thus they are placed closer to Uber than to Airbnb. Intermediary agencies operating within MTurk or Upwork are placed towards the increased control end of the continuum, not far from Uber. When TaskRabbit introduced a more standardised and controlled business model in 2014, it also moved to the right.

This conceptual mapping, together with evidence presented earlier, point to the fact that control, which is important in all two-sided strategies, is even more critical when dealing with labour. There are various reasons for this: typical matching frictions, the heterogeneity of tasks/contractors/ employers, prominence of on-demand and time-sensitivity (i.e. Uber), and problems of co-ordination of multiple contractors. Obviously control is maximised in vertically-integrated firms to ensure consistency, speed, timely delivery, coordination and scale. However, control has a cost: it can make independent contractors into employees, which increases costs by between 25% and 35% (possibly more in a European context)[xxxviii]. Lower costs for the 2SOMLMs also mean less control, although some of these platforms seem to be striving to minimise costs and maximise control, almost to the level typical of a vertically-integrated firm. This, however, has caused them risky court cases that are discussed below.

3.3.2 Contractors vs. employees and other legal disputes in the US

In the U.S., a number of litigations have been brought to the courts concerning the possible misclassification of workers as contractors but also other violation of the 'Fair Labor Standard Act' (FLSA). The table below provides only a selective list of such cases (only for the most well-known platforms also listed earlier in § 2.2).

Table 3: Selected litigation cases in the US

Platform	Object of litigation	Status
Crowdflower	Fair Labor Standards Act (FLSA) violations with respect to minimum wage	Settlement reached (payment of $ 583,000), parties agreed an amendment denied by the Court
Handy	Misclassification class-action lawsuit with	Unsuccessful mediation attempted, will go toward arbitration.
Homejoy	Misclassification class-action lawsuit	Class claims dismissed (Homejoy ceased operations)
Lyft	Employee benefits, cost reimbursements	Settlement for $12 million on January 27 2016; as part of settlement termination of drivers will be subject to due process rights
Postmates	Class-action for violation of FLSA	Ongoing
Uber 1 (v. O'Connor)	Employee benefits, Cost reimbursements; Overtime under FSLA	Settlement for $12 million on April 21 2016; as part of settlement termination of drivers will be subject to due process rights
Uber 2 (v. Ehret)	Employee benefits, cost reimbursements;	Ongoing
Uber 3 (v. Mohamed)	Employee benefits, cost reimbursements;	Ongoing

Sources: compiled from (Cherry, 2016; DeAmicis, 2015; Kessler, 2015; Madden, 2015; Smith & Leberstein, 2015)

While the cases concerning Uber and Lyft have attracted most of the media attention, the table shows that several other OLMs were concerned, including Crowdflower for violation of LFSA related to minimum wage.

In Lyft and Uber key cases (Cotter v. Lyft, Inc., 60 F. Supp. 3d 1067, N.D. Cal. 2015; and O'Connor v. Uber Technologies, Inc., No. C–13–3826 EMC, 2015 WL 1069092, N.D. Cal. Mar. 11, 2015), judges pointed out that drivers possess no special skills, their input is essential to the businesses, they monitored and terminated if they do not comply with rules set by the two companies. In the Uber case where the company claimed to be just a software company that was deemed by the court, however, this line of defence was 'fatally flawed in numerous respects' as it focused exclusively on the mechanics of the platform rather than on the substance of what Uber actually does (O'Connor, 2015 WL 1069092, at *6). The plaintiff, in fact, cited the Drivers' Handbook where it is clearly written that drivers should accept all ride requests and that if a driver rejects too many trips, he/she will be investigated and possibly terminated. Uber argued it never performs inspections.

The ruling on these two cases was expected to potentially change the business of riding services and potentially of all other OLMs and MLMs. As shown in the table, however, a settlement has been recently reached in both cases and there is no court ruling as yet that provide employee status to drivers and could, thus, change the regulatory framework for the entire world of OLMs and MLMs. On the other hand, despite these settlements there is '*no guarantee that the Internal Revenue Service, the NLRB, or another governmental regulator will not determine that these workers are employees*' (Cherry, 2016, p. 7); in other words, the issue of classification remains open in the US. It must be noted that, while not addressing employees status, both settlements provide that the drivers can no longer be 'terminated' (i.e. their account deactivated) without going through a grievance process heard by an arbitrator.

There are complex multi-factor tests defined by the law and applied to decide whether a person is a contractor or an employee (Cherry, 2011; Harris & Krueger, 2015; Muhl, 2002; Sprague, 2015); the Uber and Lyft cases, though not producing regulatory effects, have ascertained the control exerted by the Uber and Lyft drivers, highlighted the associated liability, and deemed their claim that they are just software companies simply untenable.

It has been observed by various authors that these litigation cases might have influenced the emergence of a new trend with OLMs and MLMs reconsidering their position with regard to labour issues (Bensinger, 2015b; Cherry, 2016; Lang, 2015; Smith & Leberstein, 2015; Stokes *et al.*, 2014). Several have started to redraft their terms of agreement and reclassify the individuals performing work. In addition, they are introducing some kind of minimum wage provisions. A number of markets have already decided to adopt fairer practices and self-regulation codes. A few example are provided below.

Evidence Box 3: Changing practices by sharing platforms in the US

- TaskRabbit, for instance, since 2015 has set a wage floor: it is not possible to earn less than $12.80 an hour, which is higher than any minimum wage in US states (Quittner, 2015).

- Munchery (food preparation and delivery) hires their workers as employees (O'Donovan, 2015), as do the house cleaning services platforms Qii (Koso, 2015) and MyClean (Roose, 2014), the valet parking service Luxe (Lien, 2015), the mailing company Shyp (Alba, 2015), and food delivery start-up Sprig (Bensinger, 2015a).

- Instacart has announced that it has reclassified some of its independent contractors as employees (Bilis, 2015).

- Some of these platforms are doing very well economically, despite the alleged additional health insurance and social contribution costs of switching from contractors to employees (Roose, 2014).

3.3.3 From litigation to regulation?

Workers vs. self-employed? As the litigation cases were ongoing a few scholars have taken sides, some arguing from a pure free-market thinking that contractors should not be left as such to avoid curbing innovation and labour market efficiency (Koopman, *et al.*, 2015; Sundararajan, 2014), others proposing more balanced solutions (Hagiu, 2015; Hagiu & Biederman, 2015), as depicted in the figure below (presented before the reached settlements).

Figure 11: Court or regulation-driven solutions to the contractor disputes
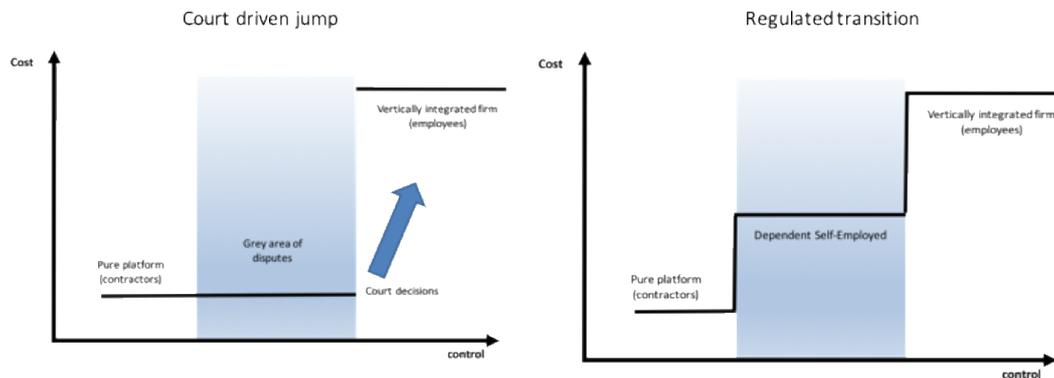
Source: re-elaboration on (Hagiu, 2015; Hagiu & Biederman, 2015)

As seen earlier, in a stylised ideal-typical situation, vertically-integrated firms have much greater control and also higher costs, whereas a pure 2SM platform basically has no fixed labour costs but less control. Platforms, however, increasingly exert control over on-demand workers and/or are perceived as doing so by the courts. If the courts in the U.S. had taken the decision that Uber and Lyft drivers had to be reclassified as employees, this would have moved them abruptly (left hand side of the picture) to equal status with vertically-integrated firms. In the U.S., it is estimated that this could increase costs by 25% to 35% and could actually lead to many bankruptcies (so far only Homejoy has suffered this fate). Without providing the nitty-gritty details of how this could be done, Hagiu (2015) reasonably proposed creating (with regulatory intervention) the intermediate position of 'dependent contractors' for whom platforms would cover some costs but not others. As seen, the settlements do not rule out the fact that the issue may resurface because of decisions by governmental agencies, so this proposal remains valid for the US and should be discussed in the EU context where so far no legal or regulatory developments have taken place. This proposal, however, faces the challenge recognised by Hagiu of how to draw the boundaries between a truly independent contractor, a dependent contractor, and an employee. Identifying Dependent Self-Employed Workers (DSEWs) is not an easy matter considering that regulation and law are general and cannot empirically ascertain all possible situations (as courts do for specific cases). There are various types of DSEWs, including highly skilled ones choosing such work arrangements, so caution should be exerted in creating statutes by law (Eichhorst et al., 2013). A recent report by the European Parliament, for instance, recommends not to alter labour market regulations to specifically include sharing economy providers and concludes that it would be best to include sharing economy service providers in the scope of the general rules applicable to self-employment (European Parliament, 2016). While this recommendation appears reasonable at face value, it is circular to say the least for also in most EU countries legislation exists that if applied would force under certain circumstance the reclassification of self-employed into employees.

Benefits portability. It has been shown earlier (§ 3.1.3) that all the sources reviewed indicate that contractors in digital labour markets are basically excluded from any form of social protection. A new topic in the regulatory debate emerged in 2015 around the proposal that goes under the name of 'portability' (Berg, 2016; Harris & Krueger, 2015;

Hill, 2015; Strom & Schmitt, 2016). As effectively summarised by Berg (2016, p. 2), in basic terms the proposal consists in creating '*individual security accounts to protect the worker as they move from gig to gig*'. Benefits (wage insurance, health insurance, disability and injuries insurance) should be designed universally and not being tied to specific employers (Strom & Schmitt, 2016, p. 14). The final employers would have obligations similar to those with regular workers or they may share contributions with the digital labour markets that could pay half of them (Harris & Krueger 2015).

Beyond benefits portability issues. The enactment of some form of regulation to establish the proposed portability of benefits would already represent a positive step forward to ensure more dignified conditions for workers in digital labour markets; yet, they are blatantly not sufficient. In § 3.1 it has been shown that earnings are at times too low in the absence of any minimum wage rules, the flow of work is unstable and no employment benefits exists, there are clear information and power asymmetries, no protection against privacy violations, and various forms of information or reputation based ethnic and gender discriminatory mechanisms occur unregulated. A few authors have proposed wider and more comprehensive and regulatory approaches (Berg 2016; Sprague, 2015; Strom & Schmitt, 2016). These include minimum wage, the need to recognise overtime and business expenses, support to workers' self-organisation and unionisation, changes in the organisation of work, and various other provisions.

A final note on the European context. Both at EU and at MS level no noteworthy developments have been found concerning legal disputes and/or regulatory proposal specifically concerning workers in digital labour markets. On the other hand, new work arrangements have been introduced and regulated widely both in MS and at EU level with the three key Directives on part-time (1997), fixed-term (1998), and temp agency contracts (2008)[xxxix]. As noted (Peers, 2013), the spirit of these directives was to protect atypical workers directly from abusive conditions of employment, and to protect workers with standard employment contracts indirectly from being undercut by atypical workers. They represent a dual approach aimed to liberalise NSW rules and remove barriers, while at the same time providing some protection to workers employed in these forms of employment (they contain provisions banning, in principle, discrimination against atypical workers as compared to standard workers). An appraisal of these measures yields mixed results (Deakin, 2014). Many exceptions have been introduced and the way some Member States have implemented the Directives can risk nullifying the protective provisions; transition is facilitated from standard work to NSW but not vice versa; they seem to be perpetuating labour market dualism. A comparative study of labour market development in the US and the EU (DiPrete*, et al.*, 2006), for instance, already by the middle of the previous decade highlighted that the precarisation of work in Europe was a more widespread trend than in the US with growing numbers of insecure jobs where low-skilled workers were concentrated. Therefore, the proposal advanced by Hagiu is probably reasonable for the U.S. where the labour market situation is relatively more binary (0= contractors; 1= regular employee) compared to Europe. In this respect any new regulatory proposal concerning workers in digital labour markets should take into account this aspect and consider the differences existing compared to the US situation.

4 Discussion and conclusions

In this final section, first the main contributions and findings of this essay are summarised and discussed with regard to the research questions and broader issues raised in the introduction. Some broad policy implications follow. Then, the conclusions are in the form of a research agenda in general and with specific respect to support for European policy making.

4.1 Discussion of main contributions

Obviously a disclaimer cannot be avoided on the preliminary and non-conclusive nature of the reviewed evidence; various evidence gaps exist particularly for European contexts and inform the research agenda that concludes this essay. On the other hand, the first important result is having shown that robust experimental and quasi-experimental empirical work is emerging, which means data is available but so far it has been used only to study the US cases and context. In synthetically discussing the main contributions of this essay the structure of the previous sections is followed starting from the sizing and typology (section 2), and continuing with workers (§ 3.1), the markets effects and functioning (§ 3.2), to conclude with legal and regulatory matters (§ 3.3).

Size and future growth

The dimensional relevance of work in digital labour markets is still the object of controversy and requires more well-designed surveys, but it has been shown to be statistically non marginal. In countries such as the UK and the US those working regularly for digital labour markets (every week) can be estimated at least between 1% and 2% of the labour force (staying on the conservative side). Their potential growth in the future depends on many factors for which evidence is limited and only speculation about firms' decision can be made. The limited evidence shows that firms use these markets especially (but not exclusively) for saving on labour costs and that only for between one in five and one in three this amounts to a contraction of their boundaries (i.e. in the absence of digital labour markets they would have made a regular hire). Most hiring firms are SMEs, which may suggest that such markets are making outsourcing of certain labour services appealing to them (possibly also as a consequence of Employment Protection Legislation to which SMEs are especially sensitive). On the other hand, the emergence of new digitalised work arrangements is not unrelated to the broader trend of work de-standardisation with the widespread diffusion of NSW and to job polarisation with the hollowing out of standard middle level jobs. Routine task requiring middle skills are among the most traded digitally and are performed by individuals with the same profile as those being laid off or not hired from firms under regular work forms, which means they are outsourced not just because of technology (as assumed in the 'routine biased technical change' hypothesis) but also because it is institutionally possible and economically more convenient. So, while currently limited, if digital NSW continue to grow it is an empirically consequential hypothesis that they could potentially encroach traditional and long-term forms of employment (Einav, et al., 2015, p. 20).

Types of digital labour markets

The evidence gathered also supports the typology of digital labour markets presented in section two as a heuristically valid conceptual tool to both inform future research and warn policy-makers from taking a 'one-size-fit all' approach to regulation. More research has been conducted so far on OLMs as compared to MLMs, which represents a gap to be filled. From a policy perspective the broad distinction between OLMs (global) and MLMs (local) is fundamental considering that for the latter a national and local approach is possible, whereas for the former the global nature of such markets neutralise any national legislation and would require international agreements: for instance, employers from Western countries can post jobs stating '*This job is not for people from Bangladesh and Pakistan and your bid would be rejected automatically if you are from any one of the mentioned countries*' as contractors in those and other countries have no venue where

to complain about such blatant form of discrimination. The further distinction concerning the level of skills and type of tasks, cutting across that between global and local markets, is also important with regard to the issue of distinguishing true independent freelancers from Dependent Self-Employed Workers (DSEWs).

Workers

Workers in digital labour markets tend to be younger and more highly educated than their population of reference, although there are also between 6% and 12% of individuals 55 and older (depending on the OLMs and MLMs considered and on the country); overall, with the exception of a couple of MLMs and excluding non-Western countries, women are either more represented than men or equally represented. It is reasonable to see these markets as a channel especially for 'stay at home' female parents to 'opt back in' the labour force, although gender stereotypes penalise them even in anonymous contexts such as OLMs (see more *infra*). The gathered evidence debunks the rhetoric about students being predominant among digital workers, as recent surveys find this category to account for around no more than 10% of workers. The high proportion of highly educated individuals performing small pieces of work at 10 cents per piece in OLMs such as MTurk or running errands at around minimum hourly wage may be seen as a signal of the over-supply of college graduates with respect to the needs of standard labour markets; alternatively, it could also be interpreted as the result of an institutionally designed 'job polarisation' trend.

Another rhetorical discourse debunked is that about working for 'pin money', out of boredom and/or of the 'generosity of cognitive surplus'; possibly the most unequivocal finding toward which all sources converge is that money is the primary motivation to perform this kind of work even when earnings are very low as in MTurk. While evidence is less conclusive, it seems that there are fairly large shares of individuals for whom earnings from working for digital labour markets represent the primary source of income and who engage in a portfolio of several activities; in the UK, for instance, as many as 60% (2.9 million if projected on the population of reference) of those who have worked in digital labour markets at least once (11% or 4.9 million) work for several of them and are registered with between 2 and 5.

The question whether these forms of work are voluntary or involuntary is a thornier one and the evidence available does not enable any conclusive statement. At the opposite extreme some claim that from the fast pace of growth in the number of contractors and their profile it can be derived that working in OLMs is a free choice Agrawal et al (2013a), whereas others using qualitative in-depth ethnography conclude that is not a totally uncoerced choice (Irani, 2015b, p. 227). In a few surveys respondent complain about low pay and not sufficient and steady flow of work. Obviously, there is a wide array of situations that range from freely choosing independent freelancing and to doing gigs for lack of alternative opportunities. As a contextual term of comparison, data from the Eurostat Labour Force Survey have been presented in which the percentage of involuntary part-time and fixed-term employment is, respectively, around 30% and 60% on average in EU28.

On the employment status and history of those working in digital labour markets much more research is urgently needed and the evidence reviewed is fragmentary and mostly indirect. Berg (2016), for instance, using only two small samples reports that 33% of those working for micro-tasking OLMs such as MTurk and Crowdflower were unemployed, whereas the remaining two thirds use these markets to complement part-time or full-time employment. The nationally representative surveys for UK and Sweden and two surveys commissioned by two OLMs (Upwork and Nubelo) provide some information on the amount of time dedicated to digital work, whether it represents a primary sources of income, and on duration of tenure, but include no information on current and previous employment or unemployment status. On the grounds of the available information it can only be speculated that the majority of these workers come more from the ranks of the under-employed and the self-employed than from those of the unemployed and

inactive, although this may be more the case for OLMs trading tasks as opposed to those trading micro-tasks and to MLMs.

The evidence is also fairly uniform in attesting that earnings in such markets range from very low to modest with only a small minority of workers making above middle level incomes and that workers have no form of social protection, are in a position of unfavourable information and power asymmetry, and that their privacy is not protected. Gender and ethnicity-based discrimination (voluntary or involuntarily produced by matching frictions, hiring inefficiencies, and cognitive biases) is not uncommon and workers have no way to protect themselves from it. In the US, leaving aside Uber and Lyft, several markets (mostly MLMs but also one case of OLMs - Crowdflower) have faced or are facing class action for violations of the Fair Labour Standards Act (FLSA) regarding minimum wage and other provisions. Using by analogy consolidated evidence on the negative effects and social costs of traditional NSW, it is possible to identify the following risks for workers in OLMs and MLMs: a) becoming traps rather than stepping stones toward regular employment; b) structural wage penalty with increasing income inequality and risk of poverty; c) increased psychological morbidity.

Finally, several studies have documented the increasing diffusion of strictly automated control through algorithms, which has been further corroborated by the inquiries of US judges in the legal cases around Uber and Lyft. This seemingly support Cherry's claim (2016) that digital labour markets brings us back to Taylor (automated control), Smith (division of labour in pieces), and to pre-industrial levels of work precarisation (lack of social protection).

Digital labour markets effects and functioning

From an ex ante theoretical perspective digital labour markets can be expected to produce a number of positive effects such as increased employment and productivity, as well as aggregate increases in market and production efficiency, as a result of lowering search, transaction, and coordination costs, by producing more and better matches. The evidence available does not document such positive effects and rather focuses on some limits to their realisation. This does not mean that they should be ruled out and that digital markets are not producing any benefits, otherwise their growth could not be explained. To document such positive effects more empirical research is needed in general, and especially more studies of effects on firms should be conducted, as well as studies that try to compare the effects of digital labour markets with respect to their non-digital counterparts so as to assess efficiency effects on production and on markets. Surveys commissioned by OLMs such as Upwork and Nubelo document high levels of satisfaction among both employers and contractors (though slightly to a lesser extent). Surveys designed and analysed by disinterested third parties are needed to corroborate such preliminary findings. Therefore, the main findings summarised below only reflect the quantitative and robust evidence that is currently available.

OLMs favour international labour flows (especially 'North-South') but are not as flat and as meritocratic as expected. Various barriers that can be aptly summarised by the expression 'the liability of foreignness' (Lehdonvirta*, et al.*, 2014) limit the globalised trade of digital labour and the expected wage convergence; non-Westerners receive only a limited wage premium (compared to their domestic markets) but domestic contractors earn more in absolute terms and for some tasks are preferred regardless of qualifications. This means that OLMs are less beneficial than expected for developing countries, but also that they exert less pressure in driving down wages in more developed countries.

On the distributional employment and related income effects the available evidence is limited and inconclusive. In the reviewed studies focussing on online labour markets examples of concentration of work assignments (i.e. 'superstar' effects leading to job concentration and more income inequality) are found and no case of long tail effect (having more equalising effects on both employment and income level) is documented. The same applies to MLMs where in one case less than 10% of workers account for more than 80% of work completed.

There is a fairly large number of experimental and quasi-experimental studies showing that digital labour markets are still ridden with matching frictions and hiring inefficiencies, which confirm the earlier prediction by Autor (2001). Little correlation is found between skills and earning levels, whereas reputational ratings and references seem to be the main explanation for the amount of jobs and money contractors manage to secure. It seems that referrals information is used by employers more than all other observable characteristics on which information is fully available in OLMs. There is a risk that such frictions and hiring inefficiencies may exacerbate wage inequalities by further skewing work in favour of the most skilled and precluding entry by inexperienced workers. In this respect, it is important to note the relevance of also applying a behavioural perspective to the documented cases of gender and ethnic-based discrimination resulting from, in most cases, involuntary bad decision based on stereotypes as heuristics leading to judgements and decision making affected by confirmation biases.

From legal disputes and regulation

Various class actions in the US (especially those concerning Uber and Lyft) have heated the debate on possible regulatory intervention. The legal disputes focussed on the possible misclassification of employees as contractors. A court decision forcing Uber or Lyft drivers to be reclassified as employees could have radically changed the regulatory landscapes and the destiny of these two and other digital labour markets. In January (Lyft) and April (Uber) 2016 the two cases reached a settlement; yet, the issue remains open as any governmental agency could still pick it up again in the near future. In this domain a proposal is to create by regulation an intermediate status (dependent self-employed) between contractors and employees and impose that digital labour markets pay at least a part of the traditional bundle of social protection provisions. This solution, however, is difficult to implement as it is not easy to define in a general way the criteria that identify a dependent self-employed.

An alternative proposal going under the name of 'benefits portability' consists in creating individual security accounts to protect the workers as they move from gig to gig'. Benefits (wage insurance, health insurance, disability and injuries insurance) should be designed universally and not being tied to specific employers. The final employers would have obligations similar to those with regular workers or they may share contributions with the digital labour markets that could pay half of them.

The enactment of some form of regulation to establish the proposed portability of benefits would already represent a positive step forward to ensure more dignified conditions for workers in digital labour markets; various analysts, however, consider it insufficient in view of the facts that earnings are at times too low in the absence of any minimum wage rules, the flow of work is unstable and no employment benefits exists, there are clear information and power asymmetries, no protection against privacy violations, and various forms of information or reputation-based ethnic and gender discriminatory mechanisms occur unregulated.

4.2 Policy implications

There are four broad questions to which policy makers would certainly like to have firm answers backed by robust evidence:

A. What are the possible implications of these new digital labour markets for employment and wages? Do they create new jobs or simply crowd-out existing ones? Are they a source of income integration for the underemployed or are they rather contributing to downward pressure on wages?

B. Do they justify a regulatory intervention? If yes, in what areas (i.e., taxation, liability, insurance, social protection)?

C. What would be the costs of curbing innovation and loosing on improved labour market efficiency as a result of regulatory intervention?

D. Are there risks, in Europe, that fragmentation will emerge as a result of national or local interventions, or in cases where the issue of classification (self-employed vs. workers) will be decided by the courts in the absence of regulation?

Obviously the evidence collated in this essay can provide only tentative and partial answers and it is only by filling in the gaps already outlined and further discussed in the concluding paragraph that firmer answers will be possible.

First of all, more surveys and data are needed to better assess the dimensional relevance of this phenomenon and its possible development paths because this will determine the extent to which the questions above are really policy relevant. Certainly, if growth continues at the fast pace of the last five years, these new markets could encroach on traditional and long-term forms of employment. Currently, however, the size of these new markets is limited. Economic theory suggests that there will be both further growth (reduction of search, coordination, and transaction costs) and countervailing effects (frictions cost of quality control, etc.).

With regard to question (A) the evidence is inconclusive and lends itself to different interpretations in terms of potential impacts on labour market dualism, employment polarisation, and income inequality. In other words, there is still ambiguity on the direction of the effects and, especially, about how these effects will be distributed both within and between countries. It has been suggested that digital labour markets can be together with more general form of NSW the other side of the job polarisation story told by the 'routine biased technical change' literature. This said, the evidence reviewed is absolutely insufficient to conclude that this is the case and discern whether these markets increase the dualism of the labour markets or generate a polarisation between these new forms of flexible work and regular employment (full-time, but also standard part-time and fixed-term employment). Lack of evidence also prevents us from assessing the extent to which firms outsource non-core or core tasks to these markets, which is key to understand the main direction of future development. On the other hand, question (B) is relatively easier to answer. The evidence shows that the amount of money workers can make on these platforms varies widely from very little to just above the minimum wage and that work-life balance, and working conditions are far from ideal (no social protection, asymmetries, surveillance, lack of privacy protection, etc.). While caution must be exerted especially on the classification issue (need to avoid treating truly independent freelancers as dependent self-employed), there is enough evidence and several reasonable proposals for regulatory intervention. In this respect, it is fairly clear that platform liability should be better defined, both in general and with specific regard to third party damages and to accidents workers may have as they perform tasks (this mostly concerns mobile labour markets). The answer to question (C) on what society stands to lose if regulation curbs labour market innovation finds the same limitation as question (A) due to lack of conclusive evidence on key effects. Answering this question would require a cost-benefit analysis weighing in the positive and negative effects, but empirically the evidence is not conclusive for either. Positive effects identified as ex-ante (production efficiency, aggregate welfare effects from more efficient labour markets, productivity and indirect employment gains, increased participation of the inactive and the unemployed) are not empirically confirmed yet but should not be discarded. Finally, on question (D), it should be recalled that this essay did not perform a review of regulatory developments in EU28 and that this undertaking could be an important complement to the evidence presented here. On the other hand, it is fairly clear that, if in Europe things develop as they have done in the U.S. and arising issues are defined by court decisions, this will cause fragmentation. It is, thus, urgent that some EU-level guidance be provided so that Member States can introduce some form of regulation to reduce any potential fragmentation.

More generally, policy makers should acknowledge that employment in the 21st century is no longer a binary phenomenon (1= employed, 0= unemployed) and set a target to minimise involuntary employment and under-employment (Atkinson, 2015, chapter 5), while letting open the opportunity for flexible and small pieces of jobs to be performed

by those freely choosing to do so. They should put in place fair conditions for voluntary atypical work so that it does not increase inequality. In the same vein, it has been argued that a regulatory approach should not be 1=employees and 0=contractors, but ways should be found to increase protection without suddenly increasing the costs for digital platforms.

The second wave of digital transformation could be beneficial as long as researchers, policy makers, trade unions, and industry find innovative institutional ways of helping to exploit the opportunities, without neglecting the social challenges (Brynjolfsson & McAfee, 2014; Brynjolfsson *et al.*, 2015). The recent '*Open Letter on the Digital Economy*' (Brynjolfsson, et al., 2015) calls companies to '*develop new organizational models and approaches that not only enhance productivity and generate wealth but also create broad-based opportunity*'. The European Economic and Social Committee (EESC) in a draft opinion stresses that new policy measures and new agreements on the organisation of work are needed to avoid a situation where digitalisation further increases inequality, reduces job quality, and worsens working conditions. As shown, industry leaders and foundations have followed up with the proposal to make social benefit portable across gigs; although not yet sufficient (see *infra*), this would already represent a step ahead.

Digital labour platforms are also relevant from a fairness perspective. Fairness prescribes that all individuals should:

–   be provided with equal chances to make the best of the powers they possess (Tawney, 1931);

–   have the right to dignity (being the first of the six values comprising the European Charter of Rights);

–   and perceive in practice a link between efforts and rewards (Roemer, 1998).

While platforms might help in providing more and better job opportunities for some workers (hence improving fairness), they also fuel the growth of non-standard forms of employment that, in many cases and if unregulated, imply worse working arrangements and conditions compared to those experienced by workers with standard employment contracts (with a negative effect on fairness). The coexistence of positive and negative effects is confirmed when one looks at the relationship between the development of labour platforms and inequality of wages: while for some aspects –mostly related to the efficiency-enhancing aspects of labour platforms- they might lead to a reduction of wage inequality, for others (such as the superstar effect) they are likely to increase it, so that the response can only be provided on an empirical level (while in the case of fairness, the policy response can be offered just with an ex-ante analysis of the differential treatments under standard and non-standard working arrangements). Notice also that fairness and equality are tightly linked as ex-ante input and ex-post outcomes and should be both tackled through policy and regulation, since the inequality outcomes of today will become the unfair starting conditions of tomorrow (Atkinson, 2015, Chapter 1).

People deserve to keep a reasonable portion of what they earn through increased hours or taking increased responsibility for a second job. Principles of social justice require that individuals have access to primary goods such as rights, powers, and income (Rawls, 1971), not forgetting that people also have very different capacities of converting primary goods into a good living (Sen, 2009). Ex-ante opportunities are better linked to ex-post outcomes by expanding the relevant dimensions in terms of capacity and functionings (Sen, 1999). Labour markets are social institutions since there is something special about labour as a commodity, including the fact that participants on both sides hold well-developed notions and norms about what is fair and what is not (Solow, 1990). Social norms and the notion of fairness actually remove indeterminacy since individual incentives are not sufficient to reach a unique equilibrium in the market (MacLeod & Malcomson, 1998). Social norms and values can be consistent with agent rationality and shape economic behaviour because, for instance, of their implications for the reputation and public legitimacy of workers and employers (Solow, 1990).

In view of the above considerations and the empirical evidence reviewed, it is not unreasonable to expect policy makers, regulators, and social partners in Europe to meet and define a consensual roadmap toward the establishment of a Fair and Dignified Support Infrastructure (FDSI) for on-demand workers that does not jeopardize innovation. As a relative late comer to the ongoing disputes and conflicts erupting in the U.S., Europe could learn from this experience and avoid issues ending up in court and becoming radicalised. European stakeholders should also learn from the past and acknowledge that the dual policy approach of liberalising new forms of employment while retaining standard full-time employment as the benchmarking norm was not fully effective and has to some extent exacerbated labour market dualism. An FDSI should ease convergence and transition between digitally-mediated on-demand work and other forms of employment, limiting as far as possible the exemptions and exceptions that have undermined the effectiveness of previous Directives and social partner agreements.

This support infrastructure should include the following pillars:

a) a **minimum wage** should be defined together with limits to the maximum number of hours worked per day (acceptance rates should not be used by platforms to deactivate or terminate workers' contracts);

b) some minimal forms of **social protection and health insurance** should be introduced;

c) **liability insurance** for damage to third parties should be considered, and some forms of health-safety measures;

d) the kind and frequency of technological forms of control and the use of workers' data should be regulated to ensure the **protection of privacy**;

e) it should be ensured that, in maximising volumes for the platforms, algorithmically-automated matching and reputational ratings do not produce **discrimination** with respect to gender, ethnicity, race, and age.

More generally, this FDSI should facilitate individuals' access to the standard forms of employment at certain points during their lives and then to more flexible forms of work at other points. Individuals should not be penalised for these transitions by the loss of seniority rights and occupational benefits. So far in Europe existing settings facilitate the transition from standard to non-standard forms of employment, but not vice versa. Though it is difficult to identify and measure involuntary atypical digitally-mediated work, policies should minimise this type of work, while at the same time allowing voluntary adhesion to flourish under conditions of fairness and dignity.

4.3 Toward a research agenda

This essay concludes with a brief discussion of the implications for future research, both in general and with specific regard to a European policy-relevant research agenda. There are gaps and opportunities, and this concluding section starts with the latter.

The first result is that robust empirical studies are emerging meaning that data is potentially available. The evidence reviewed reveals that there are 'big data' research opportunities, either in accessing data provided by the platforms or web scraping some parts of it. Economists have started to use big data (Einav & Levin, 2014; Taylor et al., 2014) and more recently a research agenda for '*big data labour economics*' has been proposed (Horton & Tambe, 2015). Big data can be used to study, for instance, the geographic composition of the pool of contractors and further analyse the effects of language, culture, genders and other possible barriers on matching.

There is, however, a possible drawback to the ' big data opportunity' represented by the rise of what have been called 'embedded researchers' (Ruths & Pfeffer, 2014). These are researchers with special relationships with platforms and access to their data, which creates a divide in the research community and little possibility of validating/replicating

their results. This problem, which seriously affects research on the 'sharing economy', should be urgently remedied.

There are evidence gaps in most of the topics discussed and there is still much to be done to sharpen our understanding of these new labour markets and their implications. There is a huge lack of evidence on European contexts compared to the US, which is taken into account in the following considerations.

First, the kind of experimental and observational analysis based on platforms data that have been reviewed should be replicated across different types of digital labour markets and across different locations, especially for what concerns localised MLMs. Studies on OLMs should be conducted with a more granular and extensive focus on the country of origins of both employers and contractors, and with differentiation by categories of tasks traded, and by firms sectors and size.

Big data alone, however, would not fill all evidence gaps, and needs to be integrated with more traditional survey data, as well as with in depth qualitative studies. One evident gap, for instance, concerns the measurement and quantification of the phenomenon. In this respect more surveys based on nationally representative samples are needed, and should be complemented with a collation of descriptive data on more platforms than those for which data have been found and reported in this essay.

A second gap regards 'workers' socio-demographic profiles, employment status and histories, earnings, motivations, how they consider the choice between gig and other forms of work and how they assess the experience of working for digital labour markets. This kind of information can be gathered triangulating traditional surveys, surveys on specific digital labour markets, and qualitative case studies on the latter.

Third, the evidence on distributional effects on employment and income is emerging but still limited and inconclusive; it is of clear importance and policy relevance to ascertain whether 'super star' or 'long tail' effects are prevalent; studies on such effects should be replicated and expanded with a triangulation between administrative data from digital labour markets and surveys/in-depth interviews with their contractors. Information is needed on the country of residence and socio-demographic profile of contractors where super star effects emerge, as well as on which type of firms (size and sectors) are more active in sourcing tasks to platforms; whether the outsourced tasks are part of the core business, or rather non-core tasks.

The issue of control, algorithm management, and working conditions need to be further documented through qualitative in-depth studies complemented with other studies that look more specifically at regulations and labour law for these new forms of employment. More granular overviews are needed on: a) how different digital labour markets deal with liability and insurance issues; b) differences in European countries in the criteria applied to distinguish self-employed and workers; and c) whether new legal approaches are emerging on the latter issue with specific regard to sharing economy platforms.

The matching process with its frictions is well documented, but studies should be replicated for more platforms and different locations. Finally, aggregate welfare effects are certainly important but are probably the object of a more long-term agenda.

As a first step toward a European research agenda in support of policy-making, the following key research questions need to be answered:

A. What is the direct employment effect of labour market platforms: i.e. how many workers are actually involved in the functioning of labour market platforms?

B. Who are the service providers (i.e. the supply side)? What are their demographics, education, location, and motivation and how do they judge the experience? This will also help us to answer questions about the substitution of regular labour contracts with labour supplied through platforms, from the perspective of those supplying the labour. It will also provide a better

understanding of their opinions on the conditions of employment in the sharing economy (hours of work, wages, quality of work etc.)

C. From the user's perspective (i.e. the demand side): what kinds of tasks are outsourced? Are outsourced tasks mostly related to non-core activities and/or standardized activities (where the "buy" option dominates over the "make" one)? Are those tasks mostly cognitive, manual or interactive? Are they routine or non-routine tasks? What are the main drivers for firms to use labour market platforms?

A specifically delimited and short-medium term research project could include the following steps:

(1) Select one of the types identified in the matrix presented in paragraph 2.1 (possibly based on clearly identified policy priorities);

(2) Conduct a more focussed review of the literature on this type, striving as far as possible to capture non-English language papers and grey literature focussing on European settings;

(3) Perform a wide ranging web-based review of the digital labour markets belonging to chosen type and active in Europe;

(4) Based on the previous steps, make a preliminary identification of those that seem to have achieved some scale and, through short telephone interviews, obtain more data to validate the selection. In spite of the fact that these markets could be international or global, data on the labour platforms should be collected locally, i.e. based on their prevalence in given country (we would hence have about 20 country-specific markets, covering five major European countries such as UK, Germany, France, Italy, and Spain) ;

(5) Depending on time and budget, select ten of these digital labour markets (2 per country) for more in-depth analysis, based on:
(5a) in-depth, thick qualitative case studies in the field (interviewing representatives of the digital labour markets, and a few contractors and employers),
(5b) online surveys of contractors and employers to be administered through digital labour markets,
(5c) if possible, econometric analysis of primary data obtained by such markets (replicating some of the studies reviewed in Section 3), and
(5d) design and realise field experiments (replicating some of the studies reviewed in Section 3).

(6) In parallel to the above steps, launch a survey in the five major EU countries based on nationally representative samples to measure the 'prevalence' of employment in digital labour markets and to obtain data on workers' socio-demographic profiles, employment status and histories, earnings, motivations, how they consider the choice between gig and other forms of work and how they assess the experience of working for digital labour markets

Triangulating the various methods/sources of such project will lead to a first set of policy relevant findings that will inform a wider and longer term research programme.

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5 Technical annex

5.1 Method for the formal review of the scientific literature

The 'scoping review method' was adopted to identify and subsequently formally analyse 70 sources. Recently two 'reviews of reviews' have conceptually mapped the field and, if used jointly, identified as many as 17 different review methods (Grant & Booth, 2009; Paré et al., 2015); from these two sources the differences between a systematic and a scoping review have been extracted in the table below.

Table 4: Scoping reviews vis-à-vis systematic reviews

Parameters	Systematic	Scoping
Scope of question	Narrow (Longitudinal)	Broad (Cross-sectional)
Search strategy	Comprehensive	Comprehensive
Nature of sources	Empirical only	Empirical and conceptual
Explicit inclusion criteria	Yes (strict, protocol-based)	Yes, (Yes, but not rigid)
Quality assessment	Yes	Not essential
Reporting	Statistical method plus narrative reporting	narrative (content/thematic), possibly tabular synthesis

Source: adapted from (Grant & Booth, 2009; Paré, et al., 2015)

First of all, a possible terminological misunderstanding must be avoided in that a scoping review is performed as systematically as a 'systematic review', since the connotation of the latter as systematic concerns the type of coverage and the rigidity of the criteria for inclusion of items in the analysis.

Scoping reviews attempt to provide an initial indication of the potential size and nature of the available literature (Paré et al., 2015, p. 186), and are useful to inform policymakers as to whether a full systematic review is needed and over which topics (Grant & Booth, 2009, p. 101); they tend to privilege breadth and relevance over depth of coverage (Paré et al., 2015, p. 187), but they strive to be as comprehensive and transparent as the systematic reviews (Grant & Booth, 2009, p. 102). Inclusion and exclusion criteria are usually established in scoping reviews to eliminate studies that do not address the initial research questions, but usually this does not involve exclusion based on quality assessment (as in systematic reviews) but rather based on the criteria of relevance. More concretely, whereas systematic review may include only experimental or quantitative observational studies, scoping reviews tend to also include qualitative empirical analysis, as well as non-empirical work that henceforth will be indicated with the general labels 'other' or 'conceptual' (although they may be theoretical essays, review essays, or legal and regulatory essays).

5.2 Process and sources

The first step was a comprehensive but unstructured free text search of newspapers, magazines, and other non-academic online sources (i.e. blogs) using the Lexis Nexis dataset. Expressions such as 'sharing economy and labour/employment/ contractor', 'collaborative economy and labour/employment/ contractor', 'crowdsourcing labour/employment/ contractor', 'gig economy and labour/employment/ contractor', 'on demand workers', 'crowds employment', were used. The about 40 items of this kind cited in this essay are just a very arbitrary selection out of a wide pool of sources thus identified. This first step, however, was only instrumental and enabled to identify: a) most debated topics; b) a comprehensive list of platforms representing 2SOMLMs as defined in § 2.1; c) a few more frequently cited academic contributions. The results of this first step informed the search performed on key electronic datasets including: Scopus (Elsevier); JSTOR Archival Journals; Taylor & Francis Online – Journals; SciVerse

ScienceDirect (Elsevier); SpringerLink; Wiley Online Library; Emerald Journals (Emerald Group Publishing); IEEE Conference Publications; ACM Digital Library; SSRN; NBER; Google Scholars. The following search string with Boolean operators was used:

(Sharing economy OR collaborative economy OR gig economy, Or crowdsourcing OR crowds employment) AND (on-demand workers, OR contractors, OR micro-entrepreneurs, OR Drivers, OR Turkers) AND (motivation, OR socio-demographic, OR agency, OR incentives) AND (work conditions OR control OR salary, OR surveillance, OR privacy, OR moral hazard, OR moral valence) AND (employment effects, OR inequality, OR social welfare, OR disadvantaged groups, OR unemployed), AND (regulatory status, Or regulation, OR Labour laws, OR labour policy, OR legal disputes, OR court decisions)

This general string was then applied for several specific platforms (i.e. MTurk, Uber, Elance-oDesk, and many more replaced the items in the first parenthesis). The criteria used for inclusion of items in the formal review were that:

a) they discussed either platforms in general or (better) specifically platforms that meet the criteria for inclusion in the definition of OMLMs used in this essay;

b) they presented empirical evidence (although a few non-empirical contributions were also included);

c) they were published preferably after 2013 (40 out of 70 formally reviewed items meet this criterion); the criteria were applied with some flexibility.

The search, selection, retrieval, and analysis of the sources took place between October 20 2015 and November 30, 2015. Selective updates were performed in January 2016, and between April 18 and May 9 2016.

5.3 Limitations

The main limitations are intrinsic to the scoping review and stem from the application of some discretion in using the dimension of relevance when including or excluding items with respect to the three criteria illustrated above. This is why there may be some purposive and possibly 'subjective' elements of selection. As this is a scoping review, the sources cut across several disciplinary fields and methods and are based on different underlying conceptual and theoretical apparatus, as well as different academic traditions (i.e. labour economics versus Computer Human Interaction and Computer Supported Cooperative Works or anthropology, or sociology, or legal studies). The search, by combining two broad fields (broadly speaking 'crowdsourcing' and 'sharing economy') returned a very large number of items whose review would have exceeded the time and space available for this essay; this means that a fairly large amount of contributions was excluded as a combination of the three criteria listed above and of relevance. For instance, MTurk has been used by the academic communities to conduct surveys, behavioural experiments, and user studies; as a result there is a growing body of research discussing the reliability and validity of this platform for research purposes (Grysman, 2015; Kittur et al., 2008; Layman & Sigurdsson, 2013; Paolacci & Chandler, 2014; Rand, 2012; Rouse, 2015; Schmidt, 2015) [xl]. Although such studies present indirectly relevant insights, their focus is methodological and only one contribution of this kind was reviewed based on a relevance judgement (Downs, et al., 2010)[xli] On reputational ratings in OMLMs only a few contributions were included (Horton & Golden, 2015; Kokkodis & Ipeirotis, 2015; Mill, 2011), out of body of literature that is also vast and burgeoning; such literature, however, deserves a more focussed self-standing review. Finally, there is a vast body of engineering and design-oriented literature that is mostly excluded with a few illustrative exceptions (Bernstein, et al., 2015; Kittur et al., 2013; Kittur et al., 2011; Satzger, et al., 2013). Last but not least, all the items included in the formal review are either general or focussed on US empirical realities. This may be the result of performing only an English language search and there may be other contributions focussing on European contexts that have been published in other languages. Possibly a multi-language review of the literature to capture contributions in languages other than English could be part of the next research step; though most

European scholars when they have a good piece of research publish it in English in peer-reviewed journals or in pre-publication platforms such as SSRN and similar.

5.4 Summary overview of sources

A total of 70 items were formally reviewed and an analytical summary table for each of them is presented in next paragraph. In the first table below the items have been re-grouped into 5 topics; within each of the topics there are nuances that can be appreciated by consulting the aforementioned analytical table.

Table 5: Reviewed sources by topic and platform of focus

Platform Topic	Misc.	MTurk[1] type	Upwork[2] type	Task Rabbit[3] type	Uber	Total by row
(1) Technical design	2	5				**7**
(2) Motivations and socio-demographics		11		1	1	**13**
(3) Economics of 2SOMLMs	4	3	21	3	1	**32**
(4) Workers conditions & surveillance in 2SOMLMs	2	8			3	**13**
(5) Legal and regulatory aspects	4	1				**5**
Total by column	**12**	**28**	**21**	**4**	**5**	**70**

1. Out of 28 entries, 21 focussed on MTurk and only one on another similar platform, one entry analyses comparatively MTurk and Crowdflower;
2. 17 entries focusing on Upwork and 4 on Freelancers;
3. Two entries just on TaskRabbit, one just on Gigwalk, and one on both.

As can be appreciated from the table above, the largest group of contributions (32/70) is about the economics of OMLMs, followed by studies focussing on motivations and/or the socio-demographic characteristics of on-demand workers (13/70), and by analyses of various aspects of the conditions of work (13/70). Studies dealing with technical design or with regulatory and legal aspects are less numerous. It is also noticeable that as many as 58 studies were identified that reported data on MTurk or similar (28), Upwork (21) or similar, TaskRabbit or similar (4), and Uber (5). This suggests that some of these platforms are willing to let researchers use their primary administrative data or perform experiments on their platform; this does not, however, apply to Uber for which primary data are used only in one paper with a Uber researcher as co-author (Hall & Krueger, 2015); the others are based on either qualitative research (Anderson, 2014; Lee*, et al.*, 2015; Rosenblat & Stark, 2015) or web-scraped data (Chen*, et al.*, 2015).

In terms of method/sources, there are as many as 57 empirical contributions while 13 comprise non-empirical essays of varied nature. There are 40 quantitative empirical studies, 14 qualitative studies and three modelling simulations.

Table 6: Reviewed sources by topic and method/sources

Platform \ Method	Other	Qual.	Stat.	Obs.	Exp.	Mod.	Total by row
(1) Technical design	3	1				2	**6**
(2) Motivations and socio-demographics		4	5		4		**13**
(3) Economics of 2SOMLMs	3		3	18	8	1	**33**
(4) Workers conditions & surveillance in 2SOMLMs	2	9	1	1			**13**
(5) Legal and regulatory aspects	5						**5**
Total by column	**13**	**14**	**9**	**19**	**12**	**3**	**70**

1. Other= Various studies of non-empirical nature such as reviews (some reporting empirical data), theoretical, conceptual, and prescriptive/futuristic essays;
2. Qual. = Empirical qualitative studies (interviews, ethnographies, focus groups, etc.);
3. Stat. = Empirical quantitative studies providing descriptive and multivariate statistics of survey results and of administrative data;
4. Obs. = Empirical quantitative studies using econometric methods to recover causal parameters or to model the data
5. Exp. = Empirical quantitative studies based on natural experiments or online experiments
6. Mod. = Modelling simulations

5.5 Analytical tabulated summary of reviewed sources

The following two abbreviations are used to classify the primary field from which the contribution originates: HCI (Human Computer Interaction) and CSCW (Computer Supported Cooperative Work). Please note that the field classification for the sake of space and brevity only indicates the primary one, although some contributions are truly multidisciplinary (two fields have been added in a few cases only).

Table 7: Analytical Summary of formally reviewed sources

Source	Topic /field	Type/Method & Sources (if applicable)	Platform/ other
1. (Agrawal*, et al.*, 2013a)	• Digitization and contract labour market • Economics	• Empirically informed review essay • Secondary sources and primary data from platform	• oDesk
2. (Agrawal*, et al.*, 2013b)	• Geographical distribution effects and experience information effects in online labour platform • Economics	• Quantitative study • Observational (primary data from platform)	• oDesk
3. (Aloisi, 2015)	• On demand work in online platform • Economics	• Mixed method • Case studies using secondary sources and statistics	• Several (AMT, Uber, Lyft, TaskRabbit, etc.)
4. (Anderson, 2014)	• Ride sharing drivers motivation and strategy • Anthropology	• Qualitative study • Ethnographic interviews	• Uber and Lyft
5. (Banker & Iny, 2008)	• Effects of measures of past performance in affecting buyer's decisions in online labour platform • Economics	• Quantitative study • Observational (primary data from platform)	• Elance
6. (Bederson & Quinn, 2011)	• Ethical issues on working condition in online labour • CHI/CSCW	• Review essay • Secondary sources	• Online labour in general
7. (Bergvall-Kåreborn & Howcroft, 2014)	• Commodification of labour • Social Informatics	• Empirical informed critical essay • Secondary sources plus materials from the MTurk website	• MTurk
8. (Beerepoot & Lambregts, 2015)	• International wage differentials in online labour markets • Economics	• Quantitative study • Observational (primary data from platform)	• oDesk
9. (Berg, 2016)	• Survey of crowdworkers • Labour studies	• Quantitative study • Statistical analysis of survey results	• MTurk and Crowflower

10.	(Bernstein, *et al.*, 2015)	• Design of a word processor with a crowd inside • Computer Science	• Computer architecture design description	• Soylent
11.	(Chan & Wang, 2015)	• Female hiring bias in online labour markets • Economics	• Quantitative study • Observational (primary data from platform)	• oDesk
12.	(Chandler & Kapelner, 2013)	• Motivation in crowdsourced work • Economics	• Quantitative study • Natural experiment	• MTurk
13.	(Chen, *et al.*, 2015)	• Algorithm management and control • Computer Science	• Quantitative study • Observational (web scraped data)	• Uber
14.	(Cheng, 2014)	• Worker conditions in the sharing economy • Media studies	• Non empirical essay of regulatory and prescriptive nature	• Sharing economy platforms in general
15.	(Cherry, 2011)	• Legal analysis of different form of digital work • Law	• Legal analytical essay • Secondary sources	• Online and mobile labour markets in general
16.	(Cherry, 2016)	• Misclassification issues (employees vs. contractors) • Law	• Legal analytical essay • Secondary sources	• Online and mobile labour markets in general
17.	(Cullen & Farronato, 2015)	• Microstructure of matching mechanism in online labour platform • Economics	• • Quantitative study • Observational (primary data from platform)	• TaskRabbit
18.	(Dettling, 2016)	• Impact of digitized work on female labour force participation • Economics	• Quantitative study • Observational (instrumental variable strategy using official statistics)	• Home digitized work in general
19.	(Downs, *et al.*, 2010)	• Motivation and gaming in MTurk • Social-psychology/ Information studies	• Quantitative study • Multivariate and descriptive statistics (survey of MTurk based on convenience sample)	• MTurk
20.	(Felstiner, 2011)	• Legal analysis of digital crowds employment • Law	• Legal analytical essay • Secondary sources	• Crowdsourcing in general with focus on MTurk

21.	(Fish & Srinivasan, 2012)	• Agency and motivation in crowdsourced work • Anthropology	• Qualitative study • 2 case studies based on ethnographic work	• MTurk
22.	(Gandini et al., Forthcoming)	• Reputation and trust in online labour markets • Labour studies	• Quantitative study • Observational (primary data from platform)	• Elance
23.	(Ghani*, et al.*, 2014)	• Geographical distribution effects in online labour platform • Economics	• Quantitative study • Observational (primary data from platform)	• oDesk
24.	(Gonen et al., 2014)	• Pricing efficient algorithms • Engineering	• Modelling presentation of a pricing algorithm	• MTurk
25.	(Gurvich et al., 2015)	• Modelling the operation of on demand economy with self-scheduling • Economics	• Theoretical essay	• On demand labour in general
26.	(Hall & Krueger, 2015)	• Socio-demographics and earnings of Uber drivers • Economics	• Quantitative study • Descriptive statistical analysis (primary data from platform)	• Uber
27.	(Hong & Pavlou, 2014)	• Effects of cultural differences in affecting buyer's decisions in online labour platform • Economics	• Quantitative study • Observational (primary data from platform)	• Freelancers
28.	(Hong*, et al.*, 2014)	• Open versus sealed bid auctions in online labour platforms • Economics	• Quantitative study • Observational (primary data from platform)	• Freelancers
29.	(Horton, 2010)	• Online labour markets in general • Economics	• Theoretical essays	• Online labour markets In general (with data on MTurk and oDesk)
30.	(Horton, 2011)	• MTurk perception of their employers • Economics	• Quantitative study • Online field experiment	• MTurk
31.	(Horton et al., 2011)	• Using platforms for online experiment • Research methodology	• Online experiment • Natural field experiment	• MTurk
32.	(Horton, 2014)	• Misdirected search effort in an online matching labour market • Economics	• Quantitative study • Observational (primary data from platform)	• oDesk
33.	(Horton, 2015a)	• Frictions in online labour market • Economics	• Quantitative study • Online field experiment •	• Elance-oDesk

34.	(Horton, 2015b)	• Supply constraints and congestion in an online labour market • Economics	• Quantitative study • Observational (primary data from platform)	• Elance-oDesk
35.	(Horton & Chilton, 2010)	• Labour economics of crowdsourced work • Economics	• Quantitative study • Experiment	• MTurk
36.	(Horton & Golden, 2015)	• Reputational ratings effects in an online labour market • Economics	• Quantitative study • Observational (primary data from platform)	• Elance-oDesk
37.	(Horton & Johari, 2015)	• Market design mechanisms in an online labour market • Economics	• Quantitative study • Experiment	• Elance-oDesk
38.	(Ipeirotis, 2010a)	• Analysis of requests and prices in MTurk • Information Science / Economics	• Quantitative study • Observational (primary data from platform)	• MTurk
39.	(Ipeirotis, 2010b)	• Analysis of 'turkers' motivations and socio-demographics • Information Science / Economics	• Quantitative study • Multivariate and descriptive statistics (survey of MTurk based on convenience sample)	• MTurk
40.	(Ipeirotis & Horton, 2011)	• Standardization of crowdsourced work • Economics/ CHI	• Theoretical/ prescriptive essay	• MTurk
41.	(Irani, 2015a)	• Digital micro-work as source of social differentiation • Communication studies/Anthropology	• Qualitative study • Four years of participant-observation within MTurk communities	• MTurk
42.	(Irani, 2015b)	• Computational labour relations in MTurk as example of new forms of digital work • Communication studies/Anthropology	• Theoretical essays reflecting on four years of participant-observation within MTurk communities	• MTurk
43.	(Irani & Silberman, 2013)	• MTurk, as a site of technically mediated worker-employer relations • Communication studies/Anthropology	• Qualitative study • participant-observation within MTurk communities	• MTurk and Turkopticon
44.	(Kaufmann, et al., 2011)	• Workers motivation in MTurk • Social psychology/ HCI/CSCW	• Quantitative study • Multivariate and descriptive statistics (survey of MTurk based on convenience sample)	• MTurk

45.	(Kittur, *et al.*, 2011)	• General framework for digital crowdsourced work • HCI/CSCW, Organisational Behaviour	• Theoretical essay	• Crowdsourced paid work in general
46.	(Kittur, *et al.*, 2013)	• Future of digital crowdsourced work • HCI/CSCW, Organisational Behaviour	• Theoretical essay	• Crowdsourced paid work in general
47.	(Kokkodis & Ipeirotis, 2015)	• Reputation in online labour markets • Economics	• Quantitative study • Experiment	• oDesk
48.	(Kushner, 2013)	• online freelance translation marketplaces; • Media and communication	• Theoretical essay	• Online translation and algorithms in general
49.	(Lee, *et al.*, 2015)	• Algorithm as management and control tool • HCI/CSCW	• Qualitative study • Interviews with drivers and passengers triangulated with analysis of posts in drivers online forums	• Uber and Lyft
50.	(Martin, *et al.*, 2014)	• In depth analysis of working and acting within MTurk • HCI/CSCW	• Qualitative study • Ethno-methodological analysis of the online forum Turker Nation	• MTurk
51.	(Mason & Watts, 2010)	• Financial incentives and crowd workers performance • Economics	• Quantitative study • Two online field experiments	• MTurk
52.	(Mill, 2011)	• Geographical distribution effects in online labour platform • Economics	• Quantitative study • Observational (primary data from platform)	• Freelancers
53.	(Musthag & Ganesan, 2013)	• Labour dynamics in mobile micro-task market • Computer Science / Economics	• Quantitative data • Observational (primary data from platform)	• Gigwalk
54.	(Pallais, 2014)	• Entry level inefficient hiring in online labour market • Economics	• Quantitative study • Experiment	• oDesk
55.	(Pallais & Sands, Forthcoming)	• Effects of referrals in affecting buyer's decisions in online labour platform • Economics	• Quantitative study • Experiment	• oDesk

56.	(Pilz & Gewald, 2013)	• Motivational factors in paid and not for profit crowdsourced work • Information Management	• Quantitative study • Multivariate and descriptive statistics (survey of participants in not for profit platform)	• MobileWork
57.	(Rosenblat & Stark, 2015)	• Algorithm as a management and control tool • Data and Society	• Qualitative study • Data collection and observation from five online forums used by Uber's drives, plus 15 semi-structured interviews	• Uber
58.	(Ross, *et al.*, 2010)	• MTurk demographics • Informatics	• Quantitative study • Multivariate and descriptive statistics (survey of MTurk based on convenience sample)	• MTurk
59.	(Satzger, *et al.*, 2013)	• Auction based crowdsourced work and skill management • Information Systems	• Modelling simulation	• Modelled platform
60.	(Shaw, *et al.*, 2011)	• Incentive design in crowdsourced employment • Sociology/Economics	• Quantitative study • Experiment	• MTurk
61.	(Silberman & Irani, 2016)	• Workers' power and conditions in MTurk • Communication studies/Anthropology	• Qualitative study • Participant-observation within MTurk communities	• MTurk, Turkopticon
62.	(Silberzahn, *et al.*, 2014)	• Gender stereotyping in online labour markets hiring • Behavioural sciences	• Quantitative study • Study 1 experiment; Study 2 Observational (primary data from platform)	• Elance
63.	(Silberman, *et al.*, 2010a)	• MTurk, as a site of technically mediated worker-employer relations • Communication studies/Anthropology	• Qualitative study • Participant-observation within MTurk communities	• MTurk
64.	(Silberman, *et al.*, 2010b)	• Problems encountered by workers in MTurk • Communication studies/Anthropology	• Qualitative study • Four years of participant-observation within MTurk communities	• MTurk
65.	(Sprague, 2015)	• Regulatory and legal aspects of work in the sharing economy • Law	• Legal essay • Secondary sources	• Sharing platforms in general
66.	(Stanton & Thomas, 2014)	• Effects of intermediary agencies on matching • Economics	• Quantitative study • Observational (primary data from platform)	• oDesk
67.	(Teodoro, *et al.*, 2014)	• Motivation in online labour markets • Communication studies / CSCW	• Qualitative study • In depth interview	• TaskRabbit and Gigwalk

68.	(Thebault-Spieker*, et al.*, 2015)	• Geography of mobile crowdsourced work • CSCW / Urban studies	• Quantitative study • Multivariate and descriptive statistics (survey of TaskRabbit 'taskers' based on convenience sample)	• TaskRabbit
69.	(Vakharia & Lease, 2015)	• Cross-platform content analysis of seven crowd work platforms • Computer science	• Qualitative study • Cross-platform analysis	• Clickworker • CloudFactory, • CrowdComputing Systems • CrowdFlower • Crowdsource • MobileWorks • oDesk
70.	(Yoganarasimhan, 2013)	• Effects of measures of past performance and reputation in affecting buyer's decisions in online labour platform • Economics	• Quantitative study • Observational (primary data from platform)	• Freelancers

Notes

i   It must be noted, however, that limits to the automated computerisations have been pointed out and include the need for creative intelligence, social intelligence and perception and manipulation tasks that some jobs require (Autor*, et al.*, 2003).

ii   According to Autor the wiring of labour would be limited by information asymmetry and would not be capable of conveying the 'high bandwidth' kind of information needed of a job match.

iii   Since 2002, a growing body of mostly conceptual-theoretical economic literature has analysed situations where one economic operator (originally referred to as an intermediary and later increasingly as a platform) brings together at least two different groups of users as instances of 'two-sided' or 'multisided' (when there are more than two groups) markets. Though they did not use the expression 'two-sided markets', the first to look at firms serving two different types of customers and facing the 'chicken and egg problem' were Gawer & Cusumano (Gawer & Cusumano, 2002) and Caillaud & Julien (Caillaud & Jullien, 2003). These authors referred to 'intermediary markets' serving two distinct groups of customers. The expression 'two-sided market' was first introduced by Rochet & Tirole (Rochet & Tirole, 2003, 2006) and was used later by Wright (Wright, 2004) and Armstrong (Armstrong, 2006) In parallel, Evans used the expression 'two-sided platforms' (Evans, 2003a, 2003b) and was one of the first to systematically apply this perspective to what he called the web economy (Evans, 2008a, 2008b, 2009). On the other hand, Parker & Van Alstyne (Parker & Van Alstyne, 2000; Parker & Alstyne, 2005) were converging on 'two-sidedness' coming from network and information theory, and with Eisenmann were the first to talk about two-sided 'strategies' rather than 'markets' (Eisenmann et al., 2006). Rysman (Rysman, 2009) also used the expression 'two-sided strategies' to convey the idea that there are choices made by agents rather than an imposed endogenous industry structure. Hagiu & Wright also look at multisided platforms as a matter of firms' strategic choices. Building on the theory of the firm, they frame these choices as a trade-off between 'being a MSP or a vertical integrated firm ' (Hagiu & Wright, 2015c), or between 'controlling versus enabling' (Hagiu & Wright, 2015a). Initially, the main focus of this perspective was made up of payment systems, auctions, operating systems, and media markets. Lately, however, it has been increasingly applied to digital platforms under the slightly different heading of Multi-sided Platforms (henceforth MSPs). In particular, digital platforms, including some commonly considered as examples of the 'sharing economy', are discussed in the most recent work by Hagiu & Wright (2013, 2015a, 2015b, 2015c). Some digital platforms are also the object of controversy over whether or not they can be considered two-sided (Li, 2015; Luchetta, 2014).

iv   This expression is used in one of the articles (Ertzscheid, 2016) contained in a recent dossier on digital labour published by the French magazine *Numerique*.

v   Outsourcing is the decision of a firm to buy from another company part of a work process or a product previously produced internally, whereas off-shoring occurs when a company in one country purchases a service or product from a company in another country regardless of whether the latter is a subsidiary or a third party provider (Massini & Miozzo, 2012). Since the 1980s outsourcing and off-shoring have grown remarkably extending beyond software coding and call centres; in particular outsourcing is growing very rapidly not just because of technology but also as a result of 'innovative' contractual forms including, according to Ruckelshaus et al.(2014) multi-layered contracting, use of staffing or temp firms, franchising, misclassifying employees as independent contractors.

vi   A thesis already challenged empirically in 2007 by Pankaj Ghemawat (2007) by showing, amongst others, that 90% of the world's phone calls, Web traffic, and investments are local. According to the Wikipedia entry '*Indian development journalist P. Sainath, Rural Affairs Editor for The Hindu, says "it's not the 'world' that is flat, but Thomas Friedman's 'brain' is flat*' (https://en.wikipedia.org/wiki/The_World_Is_Flat). More recently, the globalization index produced by Pankaj Ghemawat and Steven Altman for DHL confirms that the world is still not flat at all (Fox, 2014).

vii   According to the Routine Based Technological Change (RBTC) approach (proposed by Autor, Levy and Murnane 2003 and refined by Acemoglu and Autor 2011), the production process can be defined in terms of tasks (as opposed to simply human or physical capital) and such tasks can be allocated to workers or to capital ("machines") depending on the degree to which they are automatable, separable from other tasks, and on the relative costs of using

"machines" vs. human beings, where "machines" should be intended as a hardware, software and combinations of the two (such as robots). From the RBTC hypothesis it is also possible to derive some relevant consequences for wage and job polarization. Workers employed in jobs that are highly routinized and standardized (and hence more substitutable) tend to have an intermediate level of education, while workers who are employed in highly cognitive and non-substitutable tasks typically have higher education. As for workers with lower education, some of them are employed in tasks that can be easily taken up by machines (e.g. tasks that involve manual and routine tasks) and the ICT revolution is going to affect them negatively. However, other workers with lower education are involved in tasks that – in spite of being manual- machines cannot easily perform (such as those related to people care and education). Moreover, the demand for such non-routine tasks appears to be growing (partly due to population ageing and partly due to the increased demand for personal services from the richer part of the population). The implication of this is that the ICT revolution can increase the demand for workers with higher and lower education, while reducing the demand for workers with intermediate levels of education, which is consistent with the *job polarization hypothesis* (but not necessarily with wage polarization).

[viii] Notice that these measures of growth are calculated using contractors' earnings; but another source reports that in 2012 the average hourly wage for administrative support was one fourth of that obtained for software development ($4 vs. $ 16) and lower than other growing categories (Agrawal et al., 2013a). Hence, though data on volumes of requests are not publicly available, it can be reasonable deduced that the number of requests and of people performing such tasks would score even higher in terms of growth rates measures in number of matched requests.

[ix] The hype on crowdsourcing originated with the popularization of the 'wisdom of crowds' narrative (Surowiecki, 2004) by Howe (2006, 2008). As noted (Bergvall-Kåreborn & Howcroft, 2014, pp. 213-214; Fish & Srinivasan, 2012, pp. 139-140), the divide in the broader debate on crowdsourcing (reflecting on MTurk and similar platforms) is between seeing it as a liberating and democratising phenomenon and a source of efficiency, and considering it instead as a new and heightened form of exploitation and encroachment of labour. On the celebratory side one finds the democratising effect of the 'long tail'(Anderson, 2006), the generosity stemming from 'cognitive surplus' (Shirky, 2010), the celebration of crowdsourcing as a model for problem solving (Brabham, 2013; Brabham, 2008; Gehl, 2011), the philosophical praise of its virtues (Benkler & Nissenbaum, 2006), and the promise of increased efficiency (Chandler & Kapelner, 2013; Djelassi & Decoopman, 2013; Satzger et al., 2013). According to a business blogger (Worstall, 2013), for instance, MTurk is a pure stripped down market where 500,000 individuals accomplish tasks at pay rate they are happy with so that the market clears (reaches equilibrium), while bad workers and employers are gradually left out as they actions become visible. On the opposite side, MTurk and other crowdsourcing platforms have been defined as the new sweatshops (Uddin, 2012; Zittrain, 2009), and analysed as new forms of encroachment and exploitation of labour (Carr, 2008; Deuze, 2007), underpaid free work (Kleemann et al., 2008; Scholz, 2013), and of new digitally enabled surveillance (Aneesh, 2009); the debate includes some contributions clearly inspired by the application of Marxian perspectives (Fuchs, 2014; Scholz, 2013), with commentaries and academic articles with titles such as, respectively, '*Marx and Mechanical Turk*' (Bradford Delong, 2014) or '*Web workers unite! Addressing challenges of online laborers*' (Bederson & Quinn, 2011).

[x] For instance, the paper by Hall & Krueger (2015) was included for it is the only source based on internal administrative data from Uber; although it is obviously not conducted by a disinterested third party given that one of the author is an employee of the platform.

[xi] One could reasonably argue that the inclusion of ride services contradicts condition (2) of the definition for using the car is as equally important in the production of the services as devoting time. Yet, at least three reasons can justify the inclusion. First, as mentioned, both Uber and Lyft have been the main sources of labour related litigation and debate on the distinction between being self-employed and being workers; this is a clear indication that this activity is about labour. Second, there is some qualitative evidence that some drivers do not possess the car but borrow it from family and friends to be able to work as drivers; Third, the main and patent differences with someone making the same amount of money renting his/her apartment is the amount of time needed to make that extra income.

xii To further explain this exclusion, it is useful to start from one of the many definitions of the sharing economy, such as the following: 'individual with under-utilized assets connected with other individuals or businesses in need of those assets' (Sprague, 2015, p. 2). The starting point is to make explicit what these assets can be: a house, a car, very special skills, networks, generic skills, or just free time. So, condition (1) excludes platforms where the delivery of services leverages a physical asset such as a home or a car, which excludes Airbnb and also RelayRides. Uber is included because, although a car is used, the predominant component for the delivery of the ride services is labour. On the other hand, BlaBlaCar is excluded because giving a ride to share the costs of a trip is an occasional and infrequent activity which evidently does not qualify as provision of on-demand work.

xiii From this entry in the blog summarising the overall results one can then proceed to access the city specific reports (Airbnb, 2012, 2013a, 2013b, 2013c, 2013d, 2014a, 2014b, 2015a, 2015b; Uber, 2014, 2015a, 2015b, 2015c, 2015d, 2015e, 2015f, 2015g).

xiv Disguised crowdsourcing, contest-based crowdsourcing or markets, expert networks or platforms where professionals collaborate in production processes as peers, charitable and public interest crowdsourcing (i.e. public funded platforms for innovators) are excluded. Disguised crowdsourcing refers to the fact that most Internet users, without knowing, perform small tasks when browsing, buying online, or playing games that, behind the veil of software, are used commercially (Cherry, 2011; Felstiner, 2011). In contest-based online markets such as '99Designs', 'InnoCentive', and 'Article One Partners', the buyers propose a contest for specific objects (i.e. solutions to engineering problems in InnoCentive) and then select the winner among the solutions proposed by different 'workers' and pay for it. Not-for-profit 'sharing' platforms, commercial 'sharing' platform focussing on the circulation of goods (i.e. eBay), and other 'sharing' platforms in the car and ride sharing domain (i.e. BlaBlaCar, Relay Rides) are not considered. Other 'sharing platforms' where the 'asset' component is predominant (i.e. Airbnb) are not the specific focus of this paper either.

xv It extends the definition proposed by Horton (2010, p. 516) to include labour markets such as Uber/Lyft and TaskRabbit / Gigwalk that have been referred to as 'Mobile Crowdsourcing Markets' (Musthag & Ganesan, 2013), 'Mobile Crowdsourcing Marketplaces' (Thebault-Spieker, *et al.*, 2015), and 'On-Demand Mobile Workforce'(Teodoro, *et al.*, 2014).

xvi A more fine grained set of distinctions, for instance, has been presented between different forms of OLMs (Vakharia & Lease, 2013); in this case where differences are documented for OLMs for micro tasks grouped together in the typology used in this essay. For the kind of empirical questions at hand, however, the simpler typology presented is sufficient.

xvii As noted (Vakharia & Lease, 2013), researchers remain fascinated with Amazon Mechanical Turks (MTurk) and most academic papers focus on this platform. While MTurk opened the field in 2006, currently a myriad of other platforms offers alternatives. Nonetheless, MTurk is described here as typical case. MTurk is a platform where 'requesters' (employers) can post micro-tasks (Human Intelligence Tasks, or HIT) such as object classification, tagging, transcriptions, marketing spam, data entry, content review, editing, website feedback, and much more. Individuals performing these tasks are called 'turkers'. The 500,000 registered turkers make on average up to $5 per hour. The Participation Agreement, which both requesters and turkers must sign, is the only governing agreement (though all participants must have an Amazon account) and stipulates that turkers complete tasks as independent contractors. All juridical rights are placed with the requesters. Amazon can cancel an account at any time for violation of the terms of the Participation Agreement and the worker may be deprived of any remaining earnings. Amazon declines all responsibility related to the transactions between requesters and workers in terms of quality, safety or payment issues, and explicitly states: 'you use the site at your own risk'. MTurk maintains an 'acceptance rate' for each worker so that requesters can recruit workers with higher rates of task acceptance from prior requests. Once the worker's bid for a given HIT has been accepted, it must be completed within a defined timeframe. However, there is no time limit in which firms should evaluate the task or provide reimbursement. The 'mandatory satisfaction' clause gives the requester the authority to reject an HIT without any justification and without payment. At the same time, they can access the work without forfeiting ownership. The requesters typically include the academic community (using turkers as subjects of surveys and experiments), start-ups and entrepreneurs, large corporations often using intermediary (consulting) agencies aggregating tasks and controlling quality.

xviii Upwork and Freelancers are the ideal-typical examples of the online labour market for more complex tasks and sometimes for working on entire projects. Elance and Guru were both launched in 1999, followed by oDesk in 2005 and Freelancer in 2009. In 2014, Elance and oDesk merged into Elance-oDesk, which today has become Upwork. While there are some platform-specific features, these online labour markets share several characteristics. They allow employers to hire short-term workers by registering with the platform and posting jobs. Registered contract workers then bid for the posted jobs and advertise their skills and experience in profiles pages. The platforms maintain a rating system and track records of the work completed. They earn revenues by charging a transaction fee (% of transaction) or membership fees (most often only to the contract workers, in some case to both employers and workers). oDesk is further described here as typical case. For registered employers, oDesk has information on company name, legal representative or owner, location and industry. Employers are free to post as many jobs as they need and are required to specify a task description, the employer's location, and the type of contract offered. oDesk supports both hourly wages (where employers must specify the expected number of hours per week and number of weeks needed for completion) and fixed price (where they must specify budget and deadline). In case of hourly wages, oDesk offers strict monitoring (up to keystrokes) enabled by its virtual office software. Registered contractors provide their names, contact details, and set up profile pages detailing their skills, education, work experience outside of oDesk, oDesk-administered test scores, certifications, whether or not they belong to an agency, and oDesk-specific work histories and feedback scores. They can apply for jobs by submitting cover letters and bids to job postings. Employers can interview and negotiate bids with applicants before hiring and can hire as many contractors as they like. Once hired, the contractor completes tasks remotely. Contractors submit their work to employers online and are paid via oDesk. Employers have the option to give contractors bonuses and can also reimburse expenses through oDesk. The platform charges $8.75 per transaction. oDesk contract workers are highly educated and come from a large number of countries across the world. Those from lower-level income countries are the most hired. 90% of the employers which request work in oDesk, according to a 2013 survey, were SMEs. The number of employers billing on the platform per quarter increased by over 800% between 2009 and 2013, and the number of working contractors per quarter increased by approximately 1,000% over the same period. The quarterly wage bill on oDesk increased by approximately 900%: from $10,000,000 to almost $100,000,000 over the same period. The average hourly wage in software development ($16) was approximately double that of writing and translation ($8) and more than triple that of administrative support ($4), customer support ($5) and sales and marketing ($5).

xix A description of how TaskRabbit worked between 2009 and mid 2014 is provided here. Currently the platform is present in 20 US cities and in London with a pool of about 30,000 individuals performing tasks as independent contractors and 1.2 million requesters. In the language of the platform, 'posters' outsource tasks to 'rabbits', who search the posted offers on city-specific lists. Until the change introduced in 2014 (see Section 3.3.2), posters could request any sort of task, even the oddest kind. The five largest categories between 2009 and mid 2014 were shopping and delivery (24%), moving help (12%), cleaning (9%), home repairs (6%), and furniture assembly (4%). It must be noted that TaskRabbit also allows tasks that can be delivered digitally and do not require direct interaction such as editing texts, carrying out usability testing of mobile apps, etc. (in the period considered, these tasks made up 10.4% of the total). In the original model, matching took two forms: a task was posted and then the posters accepted the first offer, or posters asked for bids as in an auction model. Posters and rabbits went through a vetting process, although the screening was more rigid for the latter. For the former, the platform checked the identity through social networks and their payment method and capacity. The latter were subject to a background check, they answered a digital survey (on motivations, skills, and availability), and were interviewed by TaskRabbit employees to assess their fit. The acceptance rate of applications by potential rabbits was on average 13.6% (though it varied greatly from month to month). This screening was, however, reduced in the spring of 2013 in an attempt to involve more rabbits. On average 78% of posted tasks received an offer (on average 2.8 offers); of these 63% were successfully completed at an average price of $57. TaskRabbit charged (to rabbits) a 20% commission fee on successful tasks. The unit of observation is a city-month (a poster is active if he/she posts at least one task in a given month for a given city, and in the same way a rabbit is active if he/she submits at least one offer within that city-month). On average,

there are 708 active posters and 255 active rabbits in a city-month. Typical posters are predominantly female (55% of buyers) and relatively affluent. The modal poster is a woman between the age of 35 and 44 with a household income between $150,000 and $175,000. The rabbits are younger and not surprisingly have lower incomes. The modal rabbit is 25-34 years old and has a household income between $50,000 and $75,000. Finally, it should be noted that TaskRabbit recently introduced a wage floor and an insurance policy. It is now not possible to earn less than $12.80 an hour (this is higher than any possible minimum wage in the US). A new insurance scheme covers both sides for possible property damage or bodily harm up to $1 million.

[xx] Uber and Lyft offer ride services and their business models have nothing to do with other models in the mobility/transportation sector domains. Indeed, in this domain a typology has identified three models: car sharing (Zipcar, Car2Go, Relay Rides), ride sharing (BlaBlaCar), and ride services such as those offered by Uber and Lyft (Cohen & Kietzmann, 2014). For instance, in car sharing there are business-to-consumers (Zipcar and Car2Go) and peer-to-peer (Relay Rides) platforms. There is a clear distinction between sharing a ride in BlaBlaCar and using a ride service with Uber. In the former (and in other short distance equivalents), the drivers and passengers share the costs and the use of the service occurs less frequently for passengers and especially for drivers. Although some BlaBlaCar drivers charge more than the actual costs as recommended by the platform, they do not spend every day of the week riding between, for instance, Milan and Rome, as many Uber and Lyft drivers do in cities. In Relay Rides, car owners and car renters schedule a rental and meet, but the owner does not perform any work, she simply rents an idle asset. Hence, Uber and Lyft are included among mobile labour markets because the labour component is clearly predominant, as compared to leveraging an underutilised tangible asset like a car. This can be further illustrated by using as the source the written comment sent by Relay Rides to the public consultation launched in the US by the Federal Trade Commission in the run up to a workshop on the sharing economy held in June 2015 (available at: https://www.ftc.gov/system/files/documents/public_comments/2015/07/02031-96671.pdf).

Relay Rides makes a clear case for distinguishing its business model – which defines it as a person-to-person car-sharing platform, connecting car owners who rent out their idle vehicles to travellers – from ride services business models such as Uber or Lyft. On this basis, the platform asked policy makers not to take a one-size-fits-all approach to regulation (see table below).

Car-Sharing	Ride-Services
Scheduled reservations	On-demand; short-lead
Driving for personal use	Driving for commercial use
Longer, mostly downtime	Higher utilisation
Owners & Renters	Drivers & Passengers

Source: RelayRides

The frequency of occurrences (high in ride services and low in car sharing, but also in ride sharing), the timing (on demand), and the role involved clearly indicate that Uber and Lyft are labour-based ride services, radically different from car sharing (Relay Rides) and ride sharing (BlaBlaCar).

[xxi] A large and growing body of of policy reports and academic articles describe and assess the trend and implication of NSW (DiPrete *et al.*, 2006; Eichhorst, 2013; Eichhorst *et al.*, 2013; Eurofound, 2015a, 2015b; European Commission, 2014a, 2014b, 2015, 2016; European Trade Union Institute, 2012, 2015; International Labour Office, 1997, 2015; Kahn, 2012; Nunez & Livanos, 2014; OECD, 2014, 2015a, 2015b; Van Lancker, 2012).

[xxii] Taken from: http://ec.europa.eu/eurostat/statistics-explained/images/0/0a/Labour_status_of_persons_aged_15_years_and_older%2C_EU-28%2C_2014.png.

[xxiii] The issue of Dependent Self-Employed Workers (DSEWs) in general (with no single reference to the kind of platforms discussed in this essay) is discussed at length in various reports published by the ILO (International Labour Office, 2015), the OECD (2014), the European Commission (2016), and the European Parliament (Eichhorst et *al.,* 2013). When individuals

without an employment contract work just for a single client they are also referred to as 'bogus' self-employed (European Commission, 2016, pp. 86-87). For the purposes of measurement in surveys, DSEWs are defined as '*own-account self-employed for whom at least two of the following conditions hold: i) they have only one employer/client; ii) they cannot hire employees even in the case of heavy workload; and iii) cannot autonomously take the most important decisions to run their business*' (OECD, 2014, p. 153).

xxiv   Please note that the kindle version of Atkinson's new book on inequality has been consulted and, thus, reference to exact pages is not possible.

xxv   Data from:
http://ec.europa.eu/eurostat/tgm/table.do?tab=table&init=1&language=en&pcode=tps00074&plugin=1

xxvi   Incorporated self-employed are individuals who work for themselves in corporate entities; unincorporated self-employed are those who work for themselves under other legal forms. As seen according to the December 2015 BLS data the latter are almost double in size compared to the former. Incorporated self-employed, on the other hand, have yearly median earnings more than double those of the unincorporated ones: in 2011 $ 46,872 versus $21,630 (http://smallbiztrends.com/2013/11/incorporated-versus-unincorporated-self-employment.html).

xxvii   The selection of the platforms should neither be considered exhaustive nor representative. It is based on what can be called 'theoretical sampling'. The most important platforms by type were included alongside others that were chosen either for illustrative purposes or to provide at least a few examples of platforms that originated in Europe. Hence, some larger U.S. based platforms were not included. Another important disclaimer that should be made for the figures that will follow is that the total number of registered contractors is a different variable from the number of those who have actually worked in a given year. To find out the latter, it would be necessary to have access to the administrative data of the platforms. In the sources reviewed and presented later in Section 3, there is ample evidence of frictions and 'superstar effects' so that (i) at any given time, not all contractors are matched to an employer and/or (ii) some contractors are matched more frequently and intensively than others. It is also important to stress that individuals may be registered with many platforms. Finally, for platforms with global and international reach, the search performed did not enable us to quantify how many contractors are based in country X, Z, or Y. This kind of information may be retrieved through intense web scraping of data.

xxviii   The report illustration of the survey methodology is succinct and not fully clear to say the least (see Elance-oDesk, 2014, pp. 81-82). The sample was extracted from 9 countries representing developed and non-developed countries according to the World Bank categorisation.

xxix   'Mobile Work' is a pseudonym the authors used to maintain the anonymity of the platforms. However, from the description of the tasks performed, the author believes that the data come from Gigwalk.

xxx   A total of 192 subjects (convenient sample) were randomly allocated to answer one of two questions. One group answered a question about the fairness of other employers they had had; the other answered a question about the fairness of employers in MTurk. There is an inherent limit to the reliability of these results due to the sample size and recruitment method. In addition, the results may suffer from 'experimenter effects': subjects may have been encouraged to exaggerate how honest and fair they find AMT employers. Furthermore, the subjects were turkers with a 95% completion rating (i.e. the best workers).

xxxi   The '1099' label refers to the kind of tax forms that these individuals file.

xxxii   Some are digital ethnographic analyses of online forums such as 'Turker Nation' (Martin*, et al.*, 2014) or 'Turkopticon' (Irani & Silberman, 2013). Others are based on both online ethnography and e MTurk website, and industry sources (Bergvall-Kåreborn & Howcroft, 2014). The more in-depth and sustained analysis presented by Irani (2015a; 2015b), on the other hand, is based on four years of involvement in crowdsourcing by the author, both as a participant and an observer.

xxxiii They made 43 copies of the Uber smartphone app and distributed them throughout downtown San Francisco (SF) and midtown Manhattan to individuals who were acting as drivers and/or passengers.

xxxiv Superstar effects should produce increased income inequality because employers choose the best workers based on global rather than on local search. When there is a large difference in wages between the global online market and the local physical one (as between higher and lower income countries), the superstar effect will drive the wages of high quality global online workers up, and as a result, those of local workers will be driven down. If information asymmetries are present, they may exacerbate the superstar effects. Vertical differentiation in quality may produce superstar effects, whereas horizontal differentiation (variety) may drive long-tail effects (Bar-Isaac et al., 2012). The long-tail effect, in fact, may occur for workers offering less common and less locally-demanded areas of expertise, wages for less common skills may be low because local demand is limited and digitization with access to many different and distant markets could greatly increase the demand for such skills relatively to supply and, hence, greatly increase wages.

xxxv It must be noted that, though focussing on a different type of market such as Freelancers, an analysis of a dataset containing both open auctions and sealed bid transactions, shows that the latter attract more bids but the former offer buyers higher surplus (Hong *et al.*, 2014).

xxxvi They estimate the average value per match at $37 and the average number of tasks per requester at 1.23 per month. In addition, they make the assumption that 20% of US households in the 18 cities post requests and that platforms are able to match 80% of them.

xxxvii Hagiu, A. (2015), Multi-Sided Platforms, Vertical Integration and Input Suppliers. Presentation delivered at the workshop on platforms organised by JRC-IPTS, Brussels, 11 November 2015.

xxxviii These estimates, as well as the discussion of the trade-offs between control and costs, are presented in Hagiu, A. (2015), Multi-Sided Platforms, Vertical Integration and Input Suppliers, op. cit.

xxxix The European Union (EU) has adopted three measures concerning 'atypical' workers: (1) a Social Partners' Agreement on part-time work (Directive 97/81concerning the framework agreement on part-timework concluded by ETUC, UNICE and CEEP [1998] OJ L14/9; extended to the UK by Directive 98/23 [1998] OJ L131/10; (2) a Social Partners' Agreement on fixed-term work (Directive 1999/70 concerning the framework agreement on fixed-term work concluded by ETUC, UNICE and CEEP [1999] OJ L175/43); (3) a Directive on temporary agency work known as the 'agency work Directive' (Directive 2008/104 [2008] OJ L327/9. Member States had to apply this Directive by 5 December 2011: Art 11(1)).

xl These sources are just some examples from a burgeoning field.

xli It sheds light on incentives and motivation.

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