Perfect competition in the digital economy?

A Schumpeterian, evolutionary perspective on the "perfect contradictions" between theory and reality.

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1. Introduction

The neoclassical theoretical construct of "perfect competition" is criticised in some fields of economic research for its rigorous assumptions, whereas it is still very popular in much of mainstream economics. For instance, general equilibrium theory is inseparably intertwined to the key attributes of perfect competition, the latter serving as a reference point for modelling and analysis (see e.g. Kirman, 2016 for a critical appraisal). In this regard, the salient features of perfectly competitive markets are:

- price-taking behaviour of market agents,
- product homogeneity,
- free market entry and exit,
- no transaction costs,
- full rationality on the side of market agents and
- complete information.

If these conditions hold, the market outcome is a pareto-efficient allocation characterised by the absence of market power; further the market is well-functioning and there is no failure plus no government intervention is needed.

The growing popularity and the upswing of neoclassical concepts fell into a period, in which enduring phases of radical technological change – triggered by the diffusion of several general purpose technologies such as the steam engine, railway, the electric dynamo or mass production – gave rise to the Industrial Society and transformed deeply the economy (cf. Lipsey et al., 2005). Currently, we are in the later stage of the digital era that took off in the 1970s with the invention of another general purpose technology – the microprocessor (cf. Perez, 2013). Computers have entered almost every realm of society since then, and, at present rapid advances in micro- and nanoelectronics as well as complementary technological trends in e.g. advanced robotics, artificial intelligence etc. further spur the digitalisation. The diffusion of these technologies and other types of digital innovation has had and will have far-reaching consequences on the way we work and live.

While technological change in neoclassical thought was treated as a purely exogeneous force, innovations have been described by Schumpeter (1912) as endogenous, as "new combinations" that arise from within the economy and appear in various forms, such as new technologies, products, new organisational or institutional forms. Through their diffusion they create change and the more radical they are, the deeper the transformation processes they cause. Schumpeter (1942) introduced the

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concept of "creative destruction" to capture these economic dynamics. Such a process of creative destruction is not just bound to the economy but applies equally to science, culture and other realms of society; it is a process that creates disruptions, is far from even and may go along with paradoxes and antagonism.

Against this background, in this essay we will look at the digital transformation from a Schumpeterian viewpoint and use the notion of "creative destruction" as a conceptual framework to discuss some of the socioeconomic phenomena the digitalisation brings forth. By means of two examples we show that the neoclassical perception of perfect competition and its underlying assumptions fall short and are inappropriate to grasp the broad spectrum of socioeconomic peculiarities and consequences of the digitalisation. The first example concerns the antagonism between the absence of market power and the global dominance of the so-called "Big Five" comprising the "superstar firms" of the digital economy, that is Google, Amazon, Facebook, Apple and Microsoft. The second example relates to changes of the skills landscape, qualifications and work tasks arising through the digitalisation (Hirsch-Kreinsen, 2015). In light of the digital economy and the novelty of phenomena it is characterised by, it is the objective of this essay to illustrate some of the perfect contradictions between theory and reality.

We proceed as follows: Section 2 contains a short overview on what is usually understood as the "digital revolution". Section 3 is dedicated to the theoretical background of our work and in section 4 we discuss two examples of the digital economy, showing the inadequacy of the neoclassical concept of perfect competition for explaining the former. Finally, in section 5 we summarise our arguments and provide some concluding remarks.

2. The digital revolution

It is safe to say that computers, and the new information and communication technologies (ICTs) in general, through their diffusion and absorption into the economy have revolutionised the way we work and live, as also did other pathbreaking technologies in the past, such as the wheel, the steam engine, electricity etc. (so-called general purpose technologies). Put simply, a computer can be described as a programmable machine that does routine calculations automatically. The first programmable machine was an automatic flute player that was invented by the Banu Musa brothers in Mesopotamia in the 9th century AC while the first mechanical system used for solving mathematical functions – the difference engine – that is usually considered as a predecessor of modern computers goes back to the 19th century, to Charles Babbage.

Yet, the milestone event that actually heralded what today is known as the "digital era" took place much later, namely in the second half of the 20th century: In 1971 the first commercially offered microprocessor, the Intel 4004 became available. This pioneering invention was facilitated by sophisticated engineering performance and scientific progress in the fields of physics, material science and not least, the emerging field of semiconductor electronics. It allowed for the processing of information at large scale by means of electronic devices. Thanks to a process of continuous miniaturisation of integrated circuits (i.e. chips), which are at the heart of any microprocessor, computers disseminated at an incredibly high speed and pervaded every realm of society and hence, also the economy. Characteristic to this wave of innovation was the "digitisation" that means the conversion of analogue information to digital format. Related to that, but from a more socioeconomic viewpoint, it went alongside with the "digitalisation" of the economy showing in the adoption and use of computers and other digital technologies for economic activity and business purpose. Typical of the

digitalisation was a steady increase in the ease of production, processing, storage and communication of data – as the small bits and bytes of knowledge. The digitalisation of the economy manifested also in a changing functionality of knowledge which has turned into the fundamental economic resource in advanced capitalist societies. Unlike conventional economic resources, such as fixed capital or natural resources, knowledge is not exhaustible and moreover it is renewable. With the widespread adoption of computers, the digitalisation gave thus rise to what came to be known as the "knowledge-based economy" (cf. David and Foray, 2003), meaning the inalienability on personal, individual as well as collective knowledge as a factor of production, as an immaterial resource that drives productivity growth and economic development.

For many years, progress in microprocessors followed what had been predicted by G. Moore already in 1965 (p. 1): "With unit cost falling as the number of components per circuit rises, by 1975 economics may dictate squeezing as many as 65,000 components on a single silicon chip." What only later came to be known as "Moore's law" can be described as a quickly rising performance and speed of computers, while at the same time their physical size dropped profoundly as also did their costs of production. Through progress in microelectronics and, later on, in nanoelectronics the efforts of miniaturisation could be continued and hence, the density of transistors on an integrated circuit and the power as well as the reliability of computers and computer-based devices were increased further (this technological trend is usually referred to as "More Moore", see e.g. ITRS, 2005).

Currently, the idea is prevailing among policy-makers and other stakeholders that a new wave of innovation has arrived that will further boost the digitalisation. It reflects in the technological trend called "More than Moore" the aim of which is to integrate digital and non-digital functions in semiconductor-based devices (see e.g. Schütz and Strohmaier, 2019, p. 3 ff). On top of that, the emerging trend of More than Moore technologies together with complementary innovation in the fields of cloud computing, advanced robotics, artificial intelligence, the Internet of Things etc. (cf. OECD, 2017) gave rise to "smart systems" that are "bringing smartness in all products, enabling intelligence, processing, communication, and networking capabilities in all products, systems, and processes, influencing all parts of society."(Beernaert and Fribourg-Blanc, 2017, p. 567).

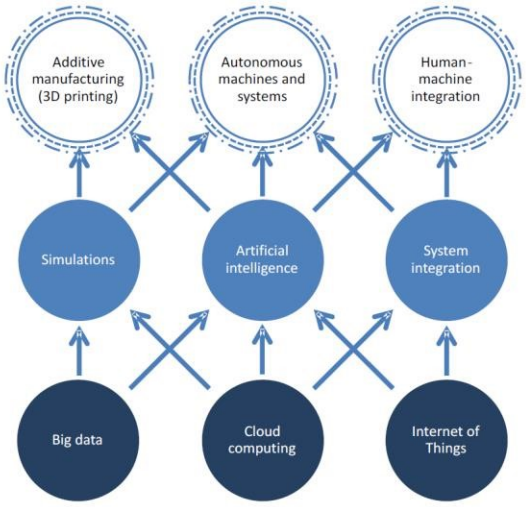

Figure 1: The confluence of key technologies enabling the industrial digital transformation. Source: OECD, 2017, p. 14.

Noteworthy is that the digitalisation and the current technological trends surrounding smart systems and other digital technologies have not only changed production but its consequences are much more

far-reaching and systemic, affecting the skills landscape and the labour market in general, the distribution of wealth and income, nation states, modes of governance etc. (see also Kurz et al., 2018 for a discussion). In other words, the digitalisation manifests not only in novel production technologies but it equally causes organisational and institutional innovation. To mention an example of a changing organisational structure and changing institutional principles of the digital economy, one can refer to "data rich markets", meaning that data is replacing money as the driver of market behaviour (Mayer-Schönberger and Ramge, 2017). All this, as was already mentioned, has been caused by fundamental changes in the treatment of data over the years which are projected to continue in the future. In this regard, the philosopher Luciano Floridi (2012) shaped the idea of "hyperhistory", according to which mankind has entered a fully dependent relationship with the new ICTs – and may do so with other digital technologies in the near future; mankind is said to be not far away from the turning point in which data can both escape time and overcome space. Having outlined just briefly its core characteristics, the upheaval that the digital revolution has triggered off at various levels and in various dimensions can be aptly summarised in Schumpeter's words as "process of creative destruction" as will be discussed in greater detail in the next section.

3. Theoretical background

For Schumpeter "creative destruction" is a process that is inseparably intertwined to what he identified as the impetus of economic evolution – innovation. According to his view, innovations can be described as the introduction of pure inventions into the economy; they consist of combinations of new or a recombination of existing knowledge. Schumpeter (1934, p. 66) distinguishes between five different types of innovation including product innovation and process innovation, the conquest of a new source of supply of raw materials, the opening of new markets as well as organisational and institutional innovation. The mere availability of a novel idea, an invention, does not cause any change and it is only after the diffusion of an innovation as well as its absorption into the economy that the system changes. The more radical and path-breaking an innovation is, the deeper it affects the system and the more disruptive and far-reaching are the consequences it causes.

It is exactly at this point that Schumpeter's notion of creative destruction becomes relevant: The diffusion of an innovation, or a swarm of innovations, goes along with breaking with the old routines that characterise the economic system and stepwise the system adapts to changed and new circumstances. In this way one can understand "creative destruction" as a force in which the old economic structure is disrupted and replaced by a new one. According to Schumpeter's initial idea of innovation-driven economic development this is a process that is characterised by competitive forces. He introduced what later came to be known as the "Mark I model" in the *Theory of Economic Development* (1934) and in this framework the entrepreneur is the central economic figure that drives economic development and he is the one who yanks the economic system out of its static position. Based on motives such as social ambition and the joy of creating, it lies in his hands to introduce innovations into the economy and to impose change on the majority of hedonic agents. Introducing an innovation goes along with cost savings and temporary extra profits for the entrepreneur. In this framework, small, young firms innovate and old routine-based firms adapt to the new competitive environment. In case that they neither innovate nor imitate they are crowded out of the market. Innovative activities are rather dispersed and there are high entry rates into the market.

Different from that, in Schumpeter's later works (1939, 1942) it is no longer the entrepreneur that plays such a central role with regard to innovative behaviour. In advanced capitalist societies, innovative activities are concentrated to few big companies and markets are characterised by oligopolistic competition and there is thus an unequal distribution of power between firms. In this model framework, the later so-called "Mark II model", he describes economic evolution as a process that "is lopsided, discontinuous, disharmonious by nature—that the disharmony is inherent in the very modus operandi of the factors of progress" (Schumpeter, 1939, p. 100). See also Andersen (2012) for a discussion on the distinct features and differences of the Mark I and Mark II model. Despite obvious differences between Schumpeter's earlier and later model, what the two have in common is not least the evolutionary idea that innovation creates variety and that through a process of selection and adaptation the economy evolves, reflecting in cyclical dynamics.

This idea has also found its way into modern evolutionary economics: A precondition for economic dynamics is a cumulative sequence of innovations that through their diffusion are getting absorbed into the economy. On the opposite, a lack of innovation is the source of stagnation preventing economic evolution and the economy remains then in a circular flow position. On the other hand, economic evolution is a process that is disruptive and goes alongside with discontinuities. Modern evolutionary economic thought considers innovation further as a process of learning that involves imperfect, asymmetric information and uncertainty about the outcome (see also Metcalfe, 1995). Perceiving innovation in this way is tied to the assumption that actors are equipped with bounded rationality. In addition to the outlined salient features of innovation, evolutionary economics builds also on the premises that: „First, preferences, technology and institutions become objects of analysis rather than being treated as exogenously given. Second, […] the causes of economic change are in part considered to be endogenous, and not exclusively exogenous shocks. […] [T]hese causes are identified with the motivation and capacity of economic agents to learn and to innovate. Third, the evolutionary process in the economy is assumed to follow regular patterns […] rather than forming an erratic sequence of singular historic events." (Witt, 2008, p. 68)

Notwithstanding that some of Schumpeter's concepts, e.g. the circular flow, were influenced by marginalist ideas, it is safe to say that the Schumpeterian notion of innovation and its continuation in modern evolutionary economics are in sharp contrast with the neoclassical understanding of perfect competition: Different to the presence of uncertainty in the process of innovation-driven economic evolution going alongside with bounded rationality on the side of economic agents, in the neoclassical paradigm the central economic agent, the homo œconomicus, behaves rationally and is equipped with perfect foresight. In a situation of perfect competition, the homo œconomicus maximises her utility or her profits and from a more macro-level perspective the decisions of utility-maximising consumers and profit-maximising producers lead to an optimisation of the social surplus (the sum of consumer and producer rent). Without any difficulties in adoption or adaptation, producers choose from the available set of technologies the one that minimises costs and technological change simply enlarges this set of available technologies. Hence, contrary to evolutionary thought, innovation is a process that does not involve uncertainty and it takes place smoothly, without any disruption as economic agents adapt instantaneously to the new circumstances. Perfectly competitive markets share further the following characteristics: there is (i) complete information, (ii) a large number of buyers and sellers, (iii) free market entry and exit, (iv) product homogeneity and there are (v) no transaction costs and full mobility of factors of production. If these assumptions hold then market forces reach a pareto efficient allocation. In this equilibrium state the market mechanism leads to an outcome in which no other allocation of resources makes any economic agent better off without worsening the situation of at

least a single other one. Moreover, under such conditions there exists no market power, the market is well-functioning, there is no failure and no government intervention is needed.

In this section we briefly discussed some of the core characteristics of evolutionary economics, their Schumpeterian roots and we confronted them with the neoclassical perception of perfect competition and its key attributes. As will be shown by means of two examples in the next section, the neoclassical concept of perfect competition is inadequate to explain real-world phenomena of economic evolution such as technological change and other types of innovation of the digital economy, whereas Schumpeterian ideas and evolutionary thought provide a more reliable theoretical basis in this regard.

4. The digital economy – an illustration of creative destruction

Microeconomic textbooks and microeconomic undergraduate courses focus heavily on the analysis of perfectly competitive markets. It is usually argued that perfect competition is a simple model of an idealised world and can thus be used as an easily accessible benchmark against which actual real-world phenomena can be assessed. In this view, certain phenomena related to the process of digitalisation and its impact on the economy are analysed as deviations from the theoretical assumptions and ideal world. Policy advice is then usually directed as to how the ideal situation can be attained and is based on comparative statics.

However, as we will show by means of two examples (see table 1 for an overview), the digitalisation and its implications for the economy cannot be studied well within the static framework of perfect competition. Instead adopting a Schumpeterian and evolutionary perspective on the phenomena of superstar firms and crowd work seems well-grounded and much more promising.

Table 1 Digitalisation and violations of perfect competition assumptions: exemplary overview

Example	Characteristic	Textbook assumptions	Contradiction
Digitalisation, market power and superstar firms	Market dominance, Economies of scale	Product homogeneity	Imperfect substitution of products
		Free market entry and exit	Network effects (switching barriers), customer loyalty (established brands and lock-in technologies), Control of resources (data)
		No externalities	Joint consumption, network effects
Digitalisation and the labour market	form of outsourcing, from jobs to tasks, on-demand services, traded good: labour	Complete information	Asymmetric information due to one-sided rating systems

Wage (price)-taking market agents	Requesters (firms) are wage setters, ex-ante wage posting
Free market entry	Entry barriers due to access to Internet and devices as well as digital competences required

4.1. Digitalisation, market power and superstar firms

In the recent past the market dominance of the tech giants Google, Apple, Facebook and Amazon (known under the acronym "GAFA" or as the "Big Five" – if Microsoft is included) has received much attention in the public, by policymakers and economists. Following Rosen's (1981) microeconomic investigation of the phenomenon of superstars in the areas of sports, arts, science etc., Autor et al. (2017) coined the term "superstar firms". Rosen (1981) describes how financial rewards and market shares tend to be concentrated on the most talented individuals whom he defines as the best performers in their respective domains. He identifies two underlying causes which contradict some assumptions of the Neoclassical framework: firstly, the "product" is not homogenous, i.e. less talent (mediocre basketball players) is not substitutable for more talent (e.g. LeBron James). This is not only reflected in the value of advertising contracts with superstars like LeBron James, Steph Curry or Marcel Hirscher, but also with the public interest in their performances: tickets for NBA games featuring superstars are among the most expensive in the league and the games are more likely to be well attended or even sold out.[4] Secondly, delivering such services is characterised by joint consumption: LeBron James does not have to put any more effort into his game if the size of the audience increases, thus his performance is independent of the size of the audience. In other words, his "production costs" do not rise with the size of the audience market he reaches; he can therefore enjoy economies of scale. Put together, due to imperfect substitutability and joint consumption, the distribution of market shares and financial rewards is skewed and gives rise to such superstars.

Analogously Autor et al. (2017) argue that the trends of globalisation and technological change help the most productive firms in each industry to capture a substantial market share. However, the aim of their paper was not to explain how these superstar firms arise, but rather how the rise of superstars has driven down the labour share and thus affected the functional income distribution. Focusing on the digital economy from a Schumpeterian view, Guellec and Paunov (2017), on the other hand, analyse the mechanisms by which digital innovations affect market structures: They emphasise network effects as well as economies of scale as the source of monopoly rents and a higher risk for individual entrepreneurs. Economies of scale are typical of the production of intangible capital goods such as software products, as these can be produced at low or no marginal costs. Network effects, which occur when the benefit of a good increases in a rising number of users, are also characteristic to

[4] The superstar effect is best demonstrated when comparing the gap between average asking prices on the secondary market for games of the LA Lakers and the Golden State Warriors between the season 2017/18 and the season 2018/19: while in both seasons the Warriors led the ranking of highest average asking price in the NBA followed by the Lakers, the gap between the two teams has shrunk considerably. In season 2017/18 the difference of the average amounted to 157 US-$. However, after LeBron James has joined the Lakers in season 2018/19 this gap dropped significantly to only 19 US-$ (see https://www.slamonline.com/nba/warriors-lakers-most-expensive-tickets-secondary-market/).

digital markets, which is particularly evident in the platform economy. These economies of scale and network effects favour the emergence of so-called "winner-takes-all" market structures, i.e. large market shares can be gained through only incremental changes and improvements. Such non-competitive market structures do not only enable the generation of monopoly rents, but they also increase the risk for individual entrepreneurs to become active in these markets, which in turn is reflected in higher risk premia for investors or shareholders. This affects not only business dynamism but may also increase income inequality on a general level since financial capital is very unevenly distributed and highly concentrated among the very top income earners.

The relationship between superstar firms and income inequality has been theoretically as well as empirically investigated. For example, in a working paper, Korinek and Ng (2017) propose a model in which the emergence of superstar firms is driven by digital innovation. Entrepreneurs invent these digital innovations consisting of information technologies that allow for the substitution of a fraction of the tasks in the production process. These digital technologies are associated with fixed costs but they are reproducible at zero marginal costs thereby allowing for increasing returns to scale. Furthermore, those digital technologies are assumed to be (partly) excludable so that the innovators can exert monopoly power. According to Korinek and Ng (2017), the exploitation of this monopoly power by the “superstar entrepreneurs” gave rise to excessive monopoly rents which significantly contributed to a rise in inequality.

Another work dedicated to the connection between superstar firms and income inequality on a macro-level is provided by Autor et al. (2017) who explain the falling labour share across the world by the increasing market power of these global players: the authors argue and show empirically, that superstar firms drive down the aggregate labour share as they are characterised by outstandingly large market shares and high rates of return while at the same time, labour input and thus aggregate wage payments are relatively low. As a consequence of these low labour shares *within* the superstar firms, their increasing importance in the economy ultimately drives down the aggregate labour share.

To illustrate the lower labour intensity of the goods provided by the digital superstars, Makridakis (2017, p.56) compares some key figures: While the digital superstars Apple, Google, Amazon and Facebook employed a total of 458,000 people in 2016, the number of employees at the traditional superstar companies Walmart, Johnson and Johnson, Berkshire and Toyota totalled more than 3 million. This marked difference is reflected accordingly in figures such as market capitalisation per employee (4.13 million in digital vs. 0.38 million US dollars in traditional companies) and revenue per employee (950,000 vs. 310,000 US dollars). This is consistent with what Rosen (1981) describes as two distinguishing features of superstars: their income is closely related to their market dominance. The market share and (financial) rewards are concentrated on only few individuals.

To sum up, digitalisation facilitates the emergence of superstar firms due to market imperfections such as network externalities, economies of scale and various entry barriers are getting established that can be exploited by the incumbents. On top of that, these changing market structures have far-reaching consequences and empirical evidence suggests that they will further aggravate the problem of rising income inequality (see also Zilian et al. 2016).

4.2. Digitalisation and the labour market

Having discussed the phenomenon of superstar firms and changing market structures due to the diffusion of digital technologies, this subsection highlights how digital technologies affect the labour

market and the ways in which this contradicts the neoclassical way of thinking about them. There are several trends regarding digital technologies and the nature of work that go beyond the spectre of job destruction due to automation: For instance, the use of digital technologies not only transforms existing jobs (Berger and Frey, 2015, OECD, 2019), but also leads to the emergence of new jobs (Bainbridge, 2015, OECD, 2019) and new forms of work organisation and employment, e.g. crowd employment or platform work (Eurofound, 2015). This process of creative destruction and, so to speak, "destructive creation", requires workers to adapt their skills and competences, as digitalisation may lead to an increasing demand for specific skills and skill bundles (Grundke et al., 2018). Digital competences to handle and use digital technologies are of great importance to keep up with the digital transformation, but the OECD (2019) stresses that not only digital skills but also a broader mix of skills are important for digital workplaces. This is of course in stark contrast to the neoclassical assumption of homogeneous production factors. Furthermore, skill mismatches may appear due to the fact that by getting absorbed into the economy digital technologies require other than the available skills and hence, this process is disruptive and far from smooth. This in turn may increase transaction costs due to over- or underqualification of workers. However, this may be counteracted as innovation in work organisation and new forms of employment facilitate outsourcing specific (digital) work tasks, reducing thereby transaction costs.

As another novelty on labour markets triggered by the digitalisation on must refer to platform work. At a first glance, crowd employment platforms are an excellent example of markets characterised by perfect competition since they enable a new form of employment without any external regulations. There are many types of these platforms, e.g. Amazon Mechanical Turk (AMT), Clickworker, Uber, with different mechanisms to match supply and demand of paid work. Some of these platforms mediate local services through apps ("work-on-demand via app"), while others focus on the mediation of online professional tasks or online micro tasks ("crowdwork"). What makes these markets to look highly competitive is their main objective, namely, to match a large number of sellers and buyers of products or tasks. On top of that, the entry and exit to these platforms is assumed to be low, the labour services offered on (each) platform are homogenous and there are no transactions costs and a full mobility of factors of production seems possible.

However, a more thorough analysis of these platforms reveals a fairly different picture. As Kingsley et al. (2014) argue in their analysis of AMT, this platform exhibits characteristics of monopsony rather than perfect competition: AMT is a platform where mostly low-skilled micro-tasks (so-called "human intelligence tasks) are posted by so-called "requesters". Workers perform this task-based labour for a wage which is set *ex ante* by the requester – hence, requesters are wage setters and workers have no power to bargain wages. The requesters review the work and only need to pay those workers, whose submitted work they approve. The number of approved tasks, the approval rating, serves as reputation score for workers. Individuals with a high job performance so-called "master workers" are offered special accounts with access to special, privileged work tasks instead of the general account available to all individuals. This reputation system is one-sided as only requesters are aware of the past performance of workers and workers are not provided with information on the previous employer behaviour of requesters[5], hence, this mechanism violates the assumption of complete information. On top of that, employer-based wage setting, ex-ante wage-posting, substantial barriers to market entry, asymmetric information problems and price-discrimination are present on AMT, contradicting the

[5] Workers use informal reputation systems (e.g. Turkopticon) to protect themselves from unscrupulous employers, which increases costs for workers.

neoclassical perception of perfect competition. ”Work-on-demand via app” (e.g. Uber) violates assumptions of perfect competition in a similar manner: Platforms relying on one-sided rating systems lead to “the rich get richer” effect, also known in the extant literature as the “Matthew effect”: Workers with good ratings for accomplished work in the past face better chances to get hired in the future – so there is a certain path-dependency and information asymmetries do prevail. In this regard, Rosenblat and Stark (2016) emphasise the information and power asymmetries at Uber. The wage-posting takes place *ex-ante* (determined by algorithms that calculate fares based on supply and demand) and the bargaining power of workers is limited. While Uber advertises their work as flexible, independent and self-determined, the company exerts indirect control over their drivers through the Uber app’s design with several nudging mechanisms (e.g. heatmaps, incentives or frequent messaging).

To sum up, this example provided some first insights into the contradiction between perfect competition and changes as well as trends on labour markets triggered by the digitalisation. Yet, an in-depth analysis of the various types of crowd employment platforms could reveal different patterns. However, it is safe to say that all platforms – regardless of the nature of the tasks and the platform design – face significant entry barriers resulting from (i) the access to broadband connectivity and (digital) devices, as well as (ii) the basic digital competences required to perform these tasks.

5. Discussion and concluding remarks

It was the aim of this essay to highlight some of the contradictions of theory and real-world phenomena. To be more precise, what we showed by means of two examples related to the current digital transformation is that the neoclassical notion of perfect competition falls short of explaining current market phenomena in capitalist economies. We are convinced that a Schumpeterian, evolutionary perspective on the digital revolution at both a micro- and macro-level seems more promising. As was outlined in section 2, the digital revolution is characterised by the emergence of several radical technological changes and the diffusion of these technologies have already had deep socioeconomic consequences and will probably have even more so in the future. While this is not a process that proceeds smoothly and instantaneously as neoclassical thought would assume, it is rather a process, that involves creative destruction and equally destructive creation like each and very technological revolution did in the past.

The first example we discussed referred to the emergence of superstar firms in the digital economy: rent-seeking behaviour including lobbying and tax evasion, unreasonably high superstar salaries for managers and increasing returns to scale for shareholders are the result of market imperfections and affect the income distribution, the welfare state and therefore endanger social cohesion. This has already been recognised by public decision-makers. For instance, Google was sentenced to a fine amounting to 4.3 billion Euros by the European Court of Justice for competition violations (see for example Hegemann, 2018). As the second example has shown, digitalisation has triggered innovation in labour markets the consequences of which also cannot be satisfactorily explained by the concept of perfect competition. The analysis of crowd employment platforms highlights that a labour market without external regulations is not well-functioning but leads to market power on the labour demand side and several other characteristics of perfectly competitive markets are not satisfied either.

We are well aware that in this short essay we only touched on this late-breaking topic and we provided a fairly brief and sketchy outline of our arguments. We also understand that there are mainstream approaches that acknowledge market failure, allow for market power and try to cope with some of the

difficulties that the harsh assumptions of perfectly competitive markets do involve. Moreover, we notice that the outlined examples need to be substantiated in order to be turned into a really sound analysis and that the work would benefit from empirical evidence. Hence, there is clearly room for future research on this topic.

Still, what we conclude from our work is that a Schumpeterian, evolutionary perspective does well in verifying the two outlined examples: While in a Schumpeterian, evolutionary framework market power, oligopolistic and monopolistic tendencies etc. do play a substantial role in explaining the dynamics of capitalist economies, this is lesser the case in neoclassical approaches and even not the case at all within a fully competitive framework. Especially, the role of innovation as creating variety and driving economic evolution is unsatisfyingly accounted for in neoclassical thought. This we consider as a serious shortcoming in view of the high sequence and speed of innovation that we currently face. Therefore, due to the far-reaching socioeconomic consequences and challenges that the digital revolution will probably evoke, a theoretical perspective that falls short in explaining phenomena of the digital economy is problematic as, not least, it may lead to wrong policy implications. Instead of a too narrow, static and partial perspective on such important phenomena and processes as the digital revolution for sure is, we plead for a dynamic, long-term and systemic perspective that understands economic evolution as a path-dependent process driven from within the system itself.