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'Digital divide' among European entrepreneurs: Which types benefit most from ICT implementation?

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Abstract

This paper explores the extent to which information and communication technology (ICT) is used by different types of self-employed individuals and how it affects their earnings. We investigate independent own-account workers (IOA), self-employed with employees (SEwE) and dependent self-employed workers (DSEW). Using recent survey data for 35 European countries, we find that earnings rise with the level of ICT use but only from a threshold of utilisation accounting for at least 25 per cent of the time. Moreover, we find that the increase in earnings associated with ICT adoption and usage is larger for SEwE types when compared to both IOA and DSEW. Finally, we find an indirect negative *inertia* effect of job tenure (i.e., entrepreneurs who have been running their business for a relatively long period of time) on earnings (via low ICT adoption and use). Policy implications are also discussed.

JEL codes: J24, L25, L26, L53, O30, O52.

Keywords: Digital divide, ICT adoption and usage frequency, entrepreneurial earnings, inertia effects, types of entrepreneurship, *European Working Conditions Survey*, Europe.

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1. Introduction

The worldwide diffusion of information and communications technology (ICT) has increased over the last decade at a rapid pace. Digital skills are necessary to participate in modern society as well as to carrying out many types of work and business. However, there are huge inequalities in access and adoption of ICT, affecting both households and businesses. Many scholars have defined this phenomenon as the "digital divide". So there are grounds to expect that differences in the usage of ICT among firms may affect firm performance. However, although many studies exist on performance effects of ICT in large firms (Devaraj and Kohli, 2003), less is known about ICT effects in (very) small firms let alone in one-person businesses operated by own-account workers. In this paper we investigate the relationship between ICT implementation by entrepreneurs and their performance (as measured by earnings) while focusing on three specific elements in this relationship.

Firstly, we make a distinction between ICT adoption (i.e. whether or not ICT is used at all in daily business operations) versus usage frequency (i.e. frequent versus infrequent use) as we consider that the first step (adoption) may have more impact on earnings than variations in ICT usage frequency at more advanced levels. This may especially be the case for one-person businesses where ICT usage may be less usual. Secondly, we consider that the relationship may differ between different types of entrepreneurs, in particular self-employed with employees (SEwE), independent own-account self-employed (IOA) and dependent self-employed workers (DSEW). Thirdly, we pay attention to the potential role of inertia effects, i.e. a reluctance to implement ICT in daily business operations as a result of being used to operating in a certain way (e.g. hanging on to old habits involving older techniques). Such inertia effects, in turn, may negatively impact entrepreneurial performance in the long run.

Our empirical methodological approach involves estimation of econometric models using a big micro database which enables us to quantify the importance of ICT adoption and usage for the earnings of entrepreneurs. In particular, we use data on entrepreneurs in 35 European countries for the years 2010 and 2015. ICT adoption and usage frequency is measured in terms of the degree to which respondents use "computers, laptops, smartphones, etc." during their daily business operations, varying from *never* (level 1) to *all of the time* (level 7). Although it is intuitive that ICT implementation will increase the business earnings of entrepreneurs, to our knowledge this relationship has never been quantified. While in principle, we are interested in the causal effect of ICT adoption and usage on entrepreneurial earnings, we recognise that the results from our (cross-sectional) base models cannot exclude the possibility that coefficients may actually represent a reversed effect. This is because higher earnings make it easier for entrepreneurs to pay for the adoption and implementation of (costly) ICT tools. Therefore, in this paper we will also conduct a robustness test aiming to correct for this reversed causality issue. In this regard we refer to the seventh robustness test in Section 4.2.3.

We contribute to the existing research literature in several ways. Firstly, most studies on ICT effects focus on large firms (Bayo-Moriones et al., 2013) or SMEs (e.g. Barba-Sánchez et al., 2007; Arendt, 2008; Alam and Noor, 2009), whereas the present paper focuses on the segment of the smallest firms (micro firms with either no or less than ten employees), as the vast majority of entrepreneurs captured by our data base either operate on their own (IOA and DSEW) or operate a small micro business (most SEwEs). This is an important distinction because smaller firms may use a different approach to ICT adoption and usage compared to larger firms (Lucchetti and Sterlacchini, 2004). Secondly, the existing research literature on barriers and effects of ICT usage analyses data as the level of the firm as the units of observation (e.g. Hollenstein, 2004; Hempell, 2005; Alam and Noor, 2009; Haller and Siedschlag, 2011), in the present paper we use data at the individual person-level as the units of observation. Thirdly, whereas many studies on the effects of ICT focus on the effects of *investments* in ICT, the present paper follows the seminal paper by Devaraj and Kohli (2003), who argued that *actual usage* of ICT may be more relevant for business performance than the amount of investments spent on ICT. Fourthly, while most authors studying ICT impact rely on measures based on the opinion of managers regarding perceived effects (Campo et al., 2010; Bayo-Moriones et al., 2013), the present paper uses a more objective performance measure; namely, entrepreneurial earnings. Fifthly, to our knowledge, the present paper is the first to investigate non-linear effects of ICT adoption and usage on entrepreneurial

performance and to allow for differential ICT effects on earnings for different types of entrepreneurs. Our research is motivated by the view that just as small and large firms may use different approaches towards ICT, different types of entrepreneurs (IOA, SEwE and DSEW) may also deal with ICT in different ways. This, in turn may imply different ICT-performance relationships between different types of entrepreneurs.

The rest of the paper is structured in the following manner. In the next section we discuss the literature and derives hypotheses. This is then followed by sections dealing with data and methodology which in turn are followed in sequence by sections outlining the results, conclusions and policy implications.

2. Literature review and hypotheses

2.1 ICT adoption and usage by different types of entrepreneurs

Information and communication technologies (ICTs) can serve a number of functions in an organisation. In terms of financial performance, it can be seen as a means of enhancing productivity thereby raising profits for any given business opportunity being exploited. Moreover, it may enhance information systems (intra-company, but also externally with suppliers, customers and government), and it may facilitate market expansion. In short, ICT may serve as an efficiency enhancing driver of business performance and competitiveness (Bharadwaj, 2000; Stiroh, 2002; Levy and Powell, 2003; Zwick, 2003; Bertschek and Kaiser, 2004; Matteucci et al., 2005; Ong and Ismail, 2008; Liang et al., 2010). However, ICT may help fulfill organizational targets in non-profit organisations as well (Gombault et al., 2016).

In cases where ICT has the potential to enhance firm productivity, adoption depends on both sufficient financial resources to pay for inputs such as ICTs and complementary resources (e.g. human capital), operations systems and management techniques necessary in order to adopt, integrate and successfully operate an ICT system (Milgrom and Roberts, 1990). So a well-resourced firm is more likely to have the ability to adopt ICTs. In addition, a business with high complementary skills is also more likely to be aware of higher productivity benefits of ICTs and hence more likely to want to adopt them.

But ICTs can also play an entrepreneurial-enabling role in helping a business to exploit a new profit opportunity (Mozas-Moral et al., 2016). This is especially the case when a new profit opportunity necessitates a new configuration of technological resources to exploit it and in particular, when ICTs are pivotal components of these necessary resources required (Giotopoulos et al., 2017). As with productivity, more agile businesses with sufficient finance and complementary resources necessary for the successful adoption of ICTs are more likely to have the ability (i.e. option) of adopting it.

Considering both the productivity and entrepreneurial motives for adopting ICTs, it seems that in most cases one would expect adoption to be higher among independent rather than dependent self-employed. The former are likely to be more aware of the benefits and more able to adopt ICTs to enhance their business performance. By contrast, dependent self-employed are by definition dependent on an existing profit opportunity and hence unable to find and/or exploit another one to make them less depending on their main customer (Román et al., 2011; Lyalkov et al., 2019; Burke et al., 2019; Millán et al., 2019). On the other hand, self-employed with employees are typically better resourced than independent own-account workers and hence in a better position to adopt ICTs. Our discussion so far leads to hypotheses 1a and 1b.

> *H1a: Independent own-account self-employed adopt and use ICT more often at work than dependent self-employed workers.*
>
> *H1b: Self-employed with employees adopt and use ICT more often at work than independent own-account self-employed.*

2.2 The relationship between ICT adoption and usage and entrepreneurial performance
Of course if the productivity and entrepreneurial performance enhancing effects that firms expect to derive from adopting ICTs actually materialise then one would expect a positive performance effect of ICT adoption but also of a higher ICT usage frequency (Yunis et al., 2018).

> *H2: There is a direct (linear) positive relationship between ICT adoption and usage frequency at work and entrepreneurial performance.*

It is notable among empirical studies that finding categorical evidence to support this hypothesis has proved to be difficult with many contrasting results (Dedrick et al.; 2003, Melville et al., 2004; Liang et al., 2010; Bayo-Moriones et al., 2013). In fact, part of the problem could be attributable to the fact there might not be a continuous positive relationship between ICTs use and performance simply because the main effect might be a discrete impact which occurs at the threshold when a firm first starts to adopt ICTs. In the case of productivity gains from ICTs, this might occur because even something as simple as first adoption of email or smart phones can have a dramatic productivity effect in terms of lowering costs, increasing communication volume/speed and lowering the time span required to execute any particular function. Likewise, in the case of the entrepreneurial effect, even simple minimalistic adoptions of ICTs to exploit new markets – such as digital payments or a new website – can open up significantly new customer bases for firms. Finally, a threshold performance effect may also occur because the simple act of adopting ICTs for the first time may indicate a relaxation of financial constraints and/or the acquisition of new skills or systems, complementary to the newly adopted ICTs, but which enhance performance in their own right.

As a counterargument, in cases where it takes time for the productivity and entrepreneurial performance enhancing benefits to occur this lagged effect may lead to minimal productivity or performance gains at the initial threshold point of ICT adoption (Brynjolfsson et al., 2002, Lee and Kim, 2006 and Das et al., 2011).

Nevertheless, we deem it possible that there are decreasing marginal returns in implementing ICT, i.e. the impact on performance from *adopting* ICT (i.e. first implementation of ICT systems in the business) may be bigger than the performance impact of *using* ICT with a higher frequency (compared to a lower frequency).

> *H3: There is a threshold performance effect from adoption of ICT which is manifested by a discrete increase in entrepreneurial performance at the initial point of ICT adoption.*

There are also grounds to believe that the external business environment may affect the adoption of ICTs and hence indirectly influence firm performance. Highly competitive and disruptive economic environments may shift firms out of their comfort zone and put pressure on them to catch-up (Leibenstein, 1966). Indeed, this may represent an 'innovate or die' continuous innovation environment. Firms that don't innovate will suffer in such circumstances. If entrepreneurs adopt and internalise such an attitude of continuous change, a longer job tenure will be a benefit to them as they are used to changing their ways more frequently, compared to entrepreneurs who just started their business. In that case, the entrepreneur's job tenure (i.e. the time he or she is already running the business) will be positively related to ICT adoption and use. If, in addition, there is a positive performance effect of ICT (see hypothesis 2), longer job tenure will indirectly have a positive influence on performance.

By contrast, firms may also fall victim to inertia effects (Hannan and Freeman, 1984). In particular, we consider that entrepreneurs who have been running their business for a relatively long time (as measured by job tenure), may be less willing to change the operations of the business by implementing ICT (i.e., a negative relationship between job tenure and ICT adoption). It is often in human nature to hang on to old habits rather than changing their ways of doing things. This holds for the behavior of individuals in everyday life (e.g. using mobile banking rather than traditional ways of banking; Choudrie et al., 2018)

as well as for the behavior of entrepreneurs in the way they run their firms (Hannan and Freeman, 1984).[1] It may be that in the short-term, strong job tenure positively impacts performance (as the entrepreneurs are very good in how they are currently running the business), but that in the long term, the reluctance of implementing ICT may negatively influence earnings.

In practice, both of the above lines of argumentation regarding the relationship between job tenure and ICT adoption may be true at the same time so that it is an empirical issue in terms of which of the two effects dominates. We will investigate this matter in our empirical analysis.

Finally, we consider that the relationship between ICT and performance may vary across different types of entrepreneurs. In particular, for certain types, e.g. employer entrepreneurs, there is much more to be gained from a proper implementation of ICT than for solo self-employed. This is because in larger firms, the management of (a greater amount of) resources is much more complex and hence the benefit of using ICT is also greater (Flamholtz and Brzezinski, 2016). Noting that both IOA and DSEW are forms of solo self-employment, this gives rise to the following hypotheses.

> *H4a: The (positive) relationship between ICT adoption and usage frequency on the one hand and entrepreneurial performance on the other hand, is stronger for self-employed with employees than for independent own-account self-employed.*
>
> *H4b: The (positive) relationship between ICT adoption and usage frequency on the one hand and entrepreneurial performance on the other hand, is stronger for self-employed with employees than for dependent self-employed workers.*

These hypotheses illustrate that while the motivation to adopt ICTs can be fairly straightforward, the actual rate of adoption and impact on performance is likely to exhibit a greater deal of heterogeneity across differetn types of entrepreneurs and their contextual circumstances. We now move on to test the validity of our hypotheses.

3. Data and methods

3.1. Data and sample

We use data from waves 5 and 6 of the *European Working Conditions Survey* for 35 European countries, including the EU-28 together –EWCS 2010 and 2015– (Eurofound, 2012, 2016a, 2018). This survey is carried out every five years by the EU Agency *Eurofound* (*European Foundation for the Improvement of Living and Working Conditions*)[2] and offers key work-related information on 44,000 workers (including both employees and self-employed individuals) covering 35 European countries.[3] These workers are interviewed about several working condition aspects, including physical environment, workplace design, working hours, work organization and social relationships in the workplace.

As comparability and reliability of information are key requirements when carrying out cross-national investigations, a unified methodological approach and a quality assurance system was developed to provide comparable and reliable data on working conditions across Europe. Thus, in order to adjust samples in a way that properly reflects probabilities of selection (via *design weights*), the EWCS design uses a multistage, random sampling of the active population of the respective countries. To this end, population statistics are derived from Eurostat's Labour Force Survey (LFS). Moreover, *post-stratification weights* are used where the country samples are adjusted according to the country's distribution by region, locality size, gender, age, economic activity and occupation. Regarding the

[1] Such inertia effects may occur particularly in a low competitive environment which may allow firms to accumulate monopolistic supernormal profits which takes off the pressure to innovate (see Audretsch et al., 2001, for an overview of these countervailing influences of the competitive environment on innovation).

[2] This Foundation is an autonomous body of the European Union, created to assist in the formulation of future policy on social and work-related matters. Further information can be found on the Foundation website at www.eurofound.europa.eu.

[3] This set includes the EU-28 together, 5 candidate countries (Albania, the Former Yugoslav Republic of Macedonia, Montenegro, Serbia and Turkey) and 2 EFTA countries (Norway and Switzerland).

international dimension, the sample ranges from 1,000 to 4,000 workers per country, depending on country size and national arrangements. In this sense, *cross-national weights* are used to ensure that each country is represented in proportion to the size of its in-work population.[4] Our final sample includes men and women aged 18 to 65 who are classified as self-employed individuals. All individuals working part-time, i.e., working under 15 hours per week, and those working in the agricultural sector are excluded.[5] The final dataset, after removing cases with missing data for any of the relevant variables, yields 5,700 observations (5,481 when using post-stratification and cross-national weights).

3.2. Dependent variables

ICT ADOPTION AND USE FREQUENCY AT WORK

Workers in the EWCS are asked whether his or her main paid job involves working with computers, laptops, smartphones, etc. This variable ranges from level 1 to 7. It equals 1 for individuals answering *never* and 7 for individuals answering *all of the time*. This discrete ordered variable serves us to operationalize use frequency. As regards adoption, we operationalize it by means of a binary variable equaling 1 for workers with (at least) some use of ICTs (levels 2 to 7 in previous scale).

NET MONTHLY EARNINGS

Workers in the EWCS are asked to refer to his/her average net earnings in recent months and, in case he/she doesn't know, are asked to give an estimate.[6] The variable is defined in PPP dollars of 2015 and converted to natural logarithms.

3.3. Focal variables

OCCUPATIONAL STATUS

Conditional on self-classification, the EWCS allows identifying the entrepreneur main activity status: (i) self-employed with employees (SEwE); (ii) independent own-account self-employed workers (IOA); and (iii) dependent self-employed worker (DSEW). In this sense, the heterogeneous nature of the situations involved in the DSEW category and the lack of reliable data make the analysis of this topic a challenging task. Precisely to overcome this issue, we use data from the EWCS 2010 and 2015, which are the first waves in the EWCS series allowing identification of the group of DSEW. We refer here to those individuals who work exclusively (or mainly) for a specific firm (as opposed to IOA who work for different clients-firms). Hence, they are economically dependent in the sense that they generate their whole (or a substantial part of their) income from this business relationship and, obviously, take the entrepreneurial risk.[7] In both waves, an additional question is asked to those respondents who previously indicated being self-employed without employees, i.e., whether his/her firm generally has more than one client. Thus, those self-employed without employees answering negatively are considered DSEW whereas those answering positively are considered IOA.

ICT ADOPTION AND USE FREQUENCY AT WORK

In order to capture differentiated effects of ICTs use frequency at work on earnings, two strategies are followed. On one hand, we simply use the discrete ordered variable ranging from 1 to 7. On the other hand, we transform the scale from level 1 to 7 into a set of 7 binary variables, one per value of our scale.

[4] See Eurofound (2016b) for details.

[5] The motivation to become self-employed in part-time employment might be very different from the motivation to become self-employed in full-time employment. Similarly, since the agricultural sector is structurally different from the rest of the economy (e.g. subsidies sometimes play a big role), and the motivation to become self-employed in agriculture may be different from that in other sectors, we excluded observations from the agricultural sector as well.

[6] The interviewer is asked to explain, if necessary, that net monthly earnings are the earnings at one's disposal after taxes and social security contributions.

[7] The growth of online platforms and intermediaries have contributed to the general trend towards increasing the phenomenon of solo-self employment (Burke, 2019) which of course includes a significant proportion of DSEW (Stanford, 2017; Stewart and Stanford, 2017). High skilled solo self-employed in the gig and project economies typically earn more than equivalent employees (Burke, 2019). By contrast low skilled solo self-employed have little bargaining power in the labour market and yet these workers are usually beyond the scope of labour law (Muehlberger and Bertolini, 2008; Román et al., 2011; A. Millán et al., 2018, 2019), collective bargaining and trade union representation (Supiot, 2001; ILO, 2003). The challenges faced by these vulnerable workers is being widely discussed in international political and legal forums (ILO, 2003; EU Commission, 2006; Eichhorst et al., 2013; OECD, 2014).

As levels 2 to 7 imply (at least) some use of ICT, we operationalize adoption as the step from level 1 to 2.

3.4. Control variables

In order to isolate the effect of our hypotheses-related variables, the empirical models also include the following set of explanatory variables: educational attainment, job-related aspects (tenure, working hours, business sector), some demographic indicators (gender, immigrant, age, cohabitation status, children, and health status) and information at the household level (household ability to make ends meet). Notably, we thus include two empirical indicators for entrepreneurial ability as entrepreneurial ability is one of the main determinants of income or more generally, utility (Levine and Rubinstein, 2017; Lucas, 1978). These indicators are prior entrepreneurial experience (as measured by the job tenure of the entrepreneur) and formal education (Brüderl et al., 1992; Gimeno et al., 1997; Unger et al., 2011; Burke et al., 2018). We also include a dummy for the year 2015 (vs. 2010) and national unemployment rates in order to control for the business cycle. Finally, we also account for structural differences between countries.[8]

3.5 Estimation methods

Various analyses are part of this study. Regarding ICT use frequency at work, discrete choice models (binary and ordered logit) are used. To explore earnings linear regressions are used.[9] Furthermore, both single-level and multi-level (hierarchical) set-ups are part of our estimation methods. As stated previously, our data consist of 2 cross-sectional panel data sets, grouped by country, i.e., EWCS 2010 and 2015. To correct for biases in parameter estimates resulting from country groupings, we use multilevel (hierarchical) models (Guo and Zhao, 2000). A precondition for running such a model is that significant between-group (in this case, countries) variance exists for the dependent variable (Hofmann, 1997; Bliese, 2000; Hofmann et al., 2000; Autio and Acs, 2010). We therefore perform ANOVAs with both *ICT use frequency at work* and *net monthly earnings* as dependent variables and country group membership as the predictors. The *intraclass correlation* (ICC) coefficients indicate that the country-level variance for our dependent variables is, (i) nontrivial, (ii) highly significant, and (iii) within the normal range that can be expected of grouped data of this nature (Bliese, 2000). Hence, using multilevel models is legitimate. Finally, post-stratification and cross-national weights are used in all applications.

4. Results

4.1. Descriptive analysis

Firstly, we aim to explore how occupational status within self-employment affects ICT adoption and usage frequency. Table 1 below shows the associated figures for the individuals in our sample.

--- Insert Table 1 about here ---

We observe, in coherence with our Hypotheses 1a and 1b, that SEwE are the most likely to use ICT at work, followed by IOA and DSEW. Furthermore, we find that a remarkably high percentage (34.9) of the self-employed state that they *never* use ICT during their daily business operations. This figure, however, varies substantially among occupational statuses. Thus, it rises to around 54% for DSEW whereas it lies at 39% and 23% for IOA and SEwE, respectively.

Further inspection reveals the important role of business sectors in explaining these figures and, in particular, the prevalence of certain types of entrepreneurship in some particular sectors. Thus, low ICT use is particularly prevalent in the transport sector, where about 69% of (self-employed) workers

[8] Detailed definitions of all our variables are presented in the Appendix. A correlation matrix is also provided in the Appendix.
[9] Regarding earnings from self-employment, a considerable proportion of observations are zeros in some human population surveys (see e.g. Van Stel et al., 2018). In these cases the entrepreneur either only earns just enough to cover business expenses or might suffer losses (which are censored). This feature violates the linearity assumption so that the least squares method is inappropriate. As usual under these circumstances, earnings equations are estimated by means of *tobit* models (Tobin, 1958). This feature does not occur with our sample and, hence, using linear regressions seems a better option.

indicate to 'never' or 'almost never' (i.e. less than 1/4 of time) work with computers, smartphones and laptops, followed by the construction sector (about 55%), industry (about 54%) and commerce and hospitality (about 53%).[10] These results are intuitive: even though nowadays most truck drivers, construction workers and restaurant owners (who are often self-employed) will have a smartphone and a laptop, their actual use in work will take less than a quarter of their working time as their main work activities are performed on the road or scaffolding installation, or in the restaurant serving customers. Precisely in these sectors with low ICT use like transport, construction or industry, we observe a higher prevalence of DSEW in comparison to SEwE and IOA.[11]

Furthermore, cross-country differences are also relevant to explain low ICT use figures. Thus, the percentage of self-employed stating they never use ICT at work is particularly high in South-East European (i.e. Balkan) countries like Turkey (about 63%), Romania (about 62%), Albania and Serbia (about 60%), Greece (about 53%), and Macedonia and Montenegro (about 51%).[12]

In this sense, the seemingly low use of ICT among solo self-employed workers and micro businesses as revealed by these statistics may seem surprising at first sight but is actually in line with the large differences in ICT use that are also observed between small (10-49 employees), medium-sized (50-249) and large businesses (250+) in the EU where large businesses have higher ICT use due to scale advantages to adopt digital technologies (European Commission, 2018).

Secondly, we focus on the relationship between ICT use and entrepreneurial earnings. Table 2 below shows some descriptive statistics by occupational status and ICT adoption that help to establish preliminary associations.

--- Insert Table 2 about here ---

We observe that earnings of those self-employed who adopted ICT at work are markedly higher than those of self-employed not using ICT at work at all, which gives support to our Hypothesis 2. This difference remains noticeably high, irrespective of the occupational status (i.e., SEwE, IOA and DSEW). Consistent with this result, we also observe that those self-employed who adopted ICT have higher educational attainment than those not using ICT. In addition, we observe that those self-employed who adopted ICT have shorter tenures than those not using ICT, which may in part be explained by age, i.e., younger entrepreneurs may be expected to adopt ICT at work with higher likelihood. Finally, an interesting result emerges as regards working hours. We observe that those SEwE and IOA who adopted ICT work shorter hours than those not using ICT. We associate this result to the large efficiency gains associated to ICT use. For DSEW, however, those who adopted ICT seem to work a similar number of hours to those not using ICT.

4.2. Multivariate analysis

Although our univariate analysis seems to support the validity of some of our hypotheses, a conditional analysis is needed to draw robust conclusions, which is precisely the main aim of this section. In particular, section 4.2.1 presents our main results as regards the determinants of ICT adoption and usage frequency at work whereas section 4.2.2 concentrates on our results about net monthly earnings. Finally, section 4.2.3 presents some robustness checks which are part of the analysis.

4.2.1. ICT adoption and usage frequency

Table 3 below shows the results from 4 specifications (Specifications 1-4) regarding the determinants of ICT adoption and usage frequency at work, with special focus on the role of different occupational statuses within self-employment.

--- Insert Table 3 about here ---

[10] These figures are available in the On-line Appendix, Table A1. Similar figures for self-employed workers in the EU-28 in 2015 are highlighted in the Eurofound (2016a) report.
[11] These figures are available in the On-line Appendix, Table A2.
[12] These figures are available in the On-line Appendix, Tables A3 and A4.

Specifications 1 and 2 use ICT adoption as a binary choice (i.e., yes or no) as dependent variable and, hence, utilize binary logit models. In contrast, models 3 and 4 employ ICT use frequency (1-7) as an ordered dependent variable and, therefore, apply discrete choice ordered logit models. These models generate results for each frequency of ICT use but, for the clarity of our exposition, we will only present results regarding the probability that the self-employed (i) *never* use ICTs at work (ICT use frequency = 1), and (ii) use ICTs at work *all of the time* (ICT use frequency = 7). At the top of each specification, the predicted probabilities of ICT adoption and use frequency for the sample means are indicated. Below, the effects of the explanatory variables on these predicted probabilities are presented in terms of marginal effects (not coefficients). These marginal effects are expressed in levels, and also in relative terms (with respect to the predicted probabilities for the sample means). Additionally, t-statistics associated with marginal effects are reported in each specification.

Consistent with Hypothesis 1a, our results demonstrate how the predicted probability of ICT adoption is about 15% lower for DSEW, when compared with IOA (Specification 2). In addition, our results show how the predicted probability of ICT adoption is about 13% higher for SEwE, when compared with IOA, which gives support to our Hypothesis 1b. Both Hypotheses 1a and 1b are also supported when turning our attention to ICT use frequency. In particular, when focusing on the predicted probability of *never* using ICT (ICT use frequency = 1), this probability is observed to increase by about 19% for DSEW and decrease by 19% for SEwE, when compared with IOA (Specification 4, left panel). In relation to the predicted probability of using ICT at work *all of the time* (ICT use frequency = 7), we find that this probability decreases by about 21% for DSEW and increases by approximately 26% for SEwE, when compared with IOA (Specification 4, right panel).

The effects of other covariates are also analysed. Our findings indicate that there is a positive relationship between education and ICT adoption and use frequency. We also observe that longer tenures are negatively related with both ICT adoption and use frequency, which supports the aforementioned *inertia* effect which firms may fall victim to. The relationship between working hours and ICT adoption and use is observed to exhibit an inversed U-shaped pattern, where the turning point is reached when the number of working hours per week exceeds about 55. Otherwise stated, the likelihood of not using ICT at work increases once past this number of working hours per week. Entrepreneurs were also more likely to adopt and use ICT in 2015, when compared with 2010 data, which is consistent with the progressive incorporation of ICT use in all life facets that the society experiences. We also observe a lower ICT adoption and use for some particular groups such as females, individuals older than 43 years[13] and those with lower ability to make ends meet. Finally, from the sector dummy coefficients, we can see that adoption and use of ICT is by far the highest in the financial services sector, and lowest in the aforementioned construction (note that this is the reference group) and transport sectors.[14]

4.2.2. The relationship between ICT usage frequency and entrepreneurial earnings

Table 4 below shows the results from 5 model variants (Specifications 5-9) as regards net monthly entrepreneurial earnings, with special focus on the role of ICT use frequency. Specification 5 employs a set of dummies to capture ICT usage level. In contrast, specification 6 uses ICT use frequency in levels as its focal variable. Specification 7 uses both ICT use frequency in levels and its squared term in order to capture the presence of potential non-linearities in the analysed relationship. Finally, specifications 8 and 9 are aimed to test whether the strength of the relationship is different across different types of entrepreneurs, i.e., SEwE, IOA and DSEW. To this end, interaction terms between occupational statuses and ICT use frequency in levels are included. In particular, specification 8 uses IOA as the reference category whereas specification 9 uses DSEW.

These results are presented as follows. Average predicted earnings are indicated at the top of each specification. These predicted earnings help to reveal the relative importance of our marginal effects

[13] The relationship between age and ICT adoption at work is shown to be inverted U-shaped. From specification 2 we find that the negative quadratic term begins to dominate the positive linear term at roughly the age of 43, indicating that past this age, people become less likely to adopt ICT at work, *ceteris paribus*.

[14] Sector dummies coefficients from Table 3 (Specifications 2 and 4) are available in the On-line Appendix, Table A5.

presented below. Thus, each specification is presented in a two-column format. The first column shows semi-elasticities in the form of [(dy/dx)/y]%., i.e., percentage changes of earnings caused by unit changes of the respective explanatory variables, whereas t-statistics associated with these effects are presented in the second column.

--- Insert Table 4 about here ---

Our results show a positive non-linear relationship between ICT frequency use and entrepreneurial earnings (specifications 5 and 7). In particular, the first adoption of ICT (the step from *never* using ICT –level 1– to *almost never* using ICT –level 2–) does not generate statistically significant increases in earnings whereas a longer step length, from *never* use (level 1) to *around ¼ of the time* (level 3), increases earnings by 9% (specification 5). These results are in line with Hypothesis 3 but with the important note that the threshold lies at step 3 (use ICT around ¼ of the time) rather than step 2 (almost never use). In other words, successful adoption of ICT in the sense that it may contribute to business earnings involves more than using ICT 'almost never' but requires an effort to work with ICT for around 25% of the time. This is intuitive as meaningful ICT usage requires practice and maintenance of skills. We also observe how the highest earnings are associated with the use of ICT *almost all of the time* (level 6), with 14.9% higher earnings relative to *never use* (specification 5). Specification 7, however, suggests that the optimun ICT use frequency is reached between half and ¾ of the time (turning point in our scale from 1 to 7 = 4.2).

In relation to our theorising around the indirect relationship between job tenure, ICT adoption and entrepreneurial performance, the positive relationship between ICT adoption and usage and earnings for the lower levels of ICT use frequency as demonstrated in specifications 5 and 7, in combination with the previous evidence obtained as regards inertia (i.e., a negative relationship between an entrepreneur's job tenure and ICT use, derived from Table 3), is consistent with a *negative* indirect relationship between the three variables. Performance seems to be hampered by a lack of ICT adoption and usage, which in turn, may be due to inertia effects associated with longer job tenures.

Concerning the possible strength differences in the relationship between ICT frequency use and entrepreneurial earnings across different types of entrepreneurs, our results show a significant positive interaction for SEwE in both specifications 8 and 9 (which have IOA and DSEW as reference groups, respectively), which suggests that SEwE benefit more from ICT use than their counterparts IOA and DSWE. These results are consistent with Hypotheses 4a and 4b. From specifications 8 and 9 it can be derived that the linear marginal effects for each step on the ICT usage scale for SEwE, IOA and DSEW are 4.24%, -1.46% and 0.66%, respectively. The marginal effects for the two groups of solo self-employed are thus close to zero while even slightly negative for independent own-account workers. On further inspection, it turns out that this is caused by a sharp drop in marginal effect from the sixth to seventh level on the scale of ICT use frequency, similar to the pattern in specification 5 for all the self-employed. The absence of a linear positive relationship for IOA and DSEW is thus due to a negative (in case of IOA) or non-significant (in case of DSEW) relation with earnings in the final category (use ICT *all of the time*). Since both of these types of self-employed operate solo, this may indicate that those (solo) self-employed who use ICT 'all of the time' do not have enough time left to maintain networks or visit clients face to face. For self-employed with employees we do not find such a drop in marginal effect for the final ICT usage category but rather a linear increase across the whole scale of ICT usage (from level 1 to 7). These additional results per type of entrepreneurship are available on request from the authors.

Now that we discussed all results, we can formally evaluate Hypothesis 2 as well. Regarding the direct (linear) positive relationship between ICT adoption and usage frequency at work and entrepreneurial performance (H2), based on specifications 8 and 9, which show a significant positive sign for SEwE only. So we can conclude that this hypothesis is confirmed for self-employed with employees but not for both types of solo self-employed (IOA and DSWE).

For other covariates, we observe that SEwE have the highest earnings whereas DSEW have the lowest. Education, tenure and the number of working hours increase earnings from entrepreneurship, as expected. Regarding tenure, the quadratic term begins to dominate the linear term when the length of self-employment spell exceeds 32 years. Concerning the number of working hours, the turning point is reached at 65 working hours per week, indicating that, beyond this number of hours, additional entrepreneurial efforts are no longer productive. Higher unemployment rates are associated with lower earnings, which is also expected. We also find that females earn less than their male counterparts. Regarding the age of the entrepreneur, we find a non-linear, inverted U-shaped impact on earnings where the turning point is reached when the entrepreneur is 45 years old. Reporting good health also seems to be positively associated with earnings from entrepreneurship. Finally, no effect of cohabitation status and children on earnings is observed.

4.2.3. Robustness checks

We perform several robustness checks. First, although we present only a few specifications in Tables 3–4, a complete stepwise regression approach (in which models incorporate covariates one by one) was followed, which serves as a robustness check for the results obtained in previous models. Second, our results are robust to the use of correction for biases in parameter estimates resulting from country groupings (i.e., multilevel –hierarchical– models). These approaches indicate no major changes relative to simple pooled regressions with country-specific fixed effects. Third, the robustness of our t-statistics was verified by re-estimating them from variance–covariance matrices of the coefficients obtained by bootstrapping. Fourth, our results are robust to the inclusion of those entrepreneurs working in the agricultural sector in the analysis.[15] Fifth, our empirical analysis is robust to the inclusion of European regions (NUTS 2) information. Concretely, we estimated standard errors that are clustered at the European regions level in single level models, whereas the European region was used as the grouping variable for multilevel models. Sixth, our results are also robust to the use of an alternative ICT use frequency classification where categories 'never' and 'almost never' as well as 'almost all of the time' and 'all the time' are grouped.[16] Seventh, our results remain stable to the inclusion of both country-and-time fixed effects (in order to better control for unobserved time-varying country-level heterogeneity) and sector-and-time fixed effect (in order to capture time-varying sector-level characteristics).[17] Finally, as we have previously argued, well-resourced firms are better equipped to adopt and implement ICT than more financially constrained firms. Hence, the relationship between ICT adoption and earnings may potentially reflect a reversed effect as higher earnings facilitate adoption of ICT. To control for this possibility we performed a robustness test in which we added into the earnings equations a variable measuring the household ability to make ends meet.[18] Our results are robust to this alternative specification.[19] All results regarding these robustness checks are available upon request.

5. Conclusions and policy implications

Adoption and usage of ICT by entrepreneurs may improve the performance of their firms. However, successful ICT implementation is by no means straightforward. There can be barriers like a misfit with the current business, a minimum level of digital skills that employees are required to have, a high cost of implementation, and a reluctance to adopt ICT due to a conservative managerial culture. These barriers may make a business refrain from a proper ICT implementation (Arendt, 2008; Barba-Sánchez et al., 2007; Harindranath et al., 2008; Sin Tan et al., 2010). In fact we found that for our sample of

[15] This exercise is available in the On-line Appendix, Tables A6-A7.

[16] By doing so, we have 5 categories with equal *distance* with respect to share of time ICT is used (0-1/4-1/2-3/4-1). This exercise is available in the On-line Appendix, Tables A8-A9.

[17] This exercise is available in the On-line Appendix, Tables A10-A11.

[18] This variable ('Ends meet') was already found to influence ICT adoption and usage frequency (see Table 3), capturing the impact of financial means to afford ICT adoption. Hence, when this variable is included in the earnings equations, the ICT variables should capture a 'pure' ICT effect on earnings as any potential 'reversed' (i.e. financial resources) effect should be captured by the make ends meet variable.

[19] When doing so, the positive relationship between ICT frequency use and entrepreneurial earnings is also observed to be non-linear. In particular, the first adoption of ICT (the step from *never* using ICT –level 1– to *almost never* using ICT –level 2–) does not generate statistically significant increases in earnings whereas a longer step length, from *never* use (level 1) to *around ¼ of the time* (level 3), increases earnings by 7.1%. We also observe how the highest earnings are associated with the use of ICT *almost all of the time* (level 6), with 11.3% higher earnings relative to *never* use.

entrepreneurs in 35 European countries, 35% indicated that they 'never use ICT during their daily business operations'. This was even 54 per cent among dependent self-employed workers and just 23 per cent amongst self-employed with employees. Further inspection revealed that sector differences played a big role where low ICT use prevailed particularly in the construction and transport sectors (agriculture, where ICT use is also low, was not part of our sample). We also found these percentages to be considerably higher in South-East European (i.e. Balkan) countries.

We also examined the relationship between the level of ICT use and entrepreneurial performance as captured by earnings. We found that this relationship is non-linear in the sense that the relationship only becomes positive and significant for a longer step length, i.e. from *never* use ICT (level 1) to use ICT *around ¼ of the time* (level 3). Hence, successful adoption of ICT involves more than using ICT 'almost never' (level 2) but requires an effort to work with ICT for around 25% of time. This is intuitive as meaningful ICT usage requires practice and maintenance of skills. We also found evidence for an indirect negative relationship between job tenure, ICT adoption and entrepreneurial performance in the sense that job tenure was found to be negatively related to ICT adoption and usage frequency (indicating an inertia effect), while ICT adoption and usage are positively related to performance.

Finally, our analysis also revealed that the relationship between ICT and performance was stronger for self-employed with employees (SEwE) than for independent own-account self-employed (IOA) and dependent self-employed workers (DSEW). Regarding SEwEs, this indicates that ICT adoption and usage is particularly efficient in relatively larger businesses (i.e. firms with employees) as ICTs can help in managing the greater complexity of such firms. The result for IOA and DSEW seemed to be driven by a negative relationship with earnings for entrepreneurs using ICT 'all of the time'. Since both of these types of self-employed operate solo, this may indicate that these self-employed do not have enough time left to maintain networks or visit clients. Perhaps a minimum amount of time spent on 'offline' maintenance of contacts is necessary for optimal performance as a solo self-employed. More (future) research on this particular finding is necessary though.

Our research has implications for researchers, entrepreneurs and policy makers. Regarding the first group, our research shows the importance of ICT adoption and usage for entrepreneurial performance in terms of earnings. Hence, entrepreneurship researchers working in the field of firm performance may consider including ICT-related control variable in their models. Regarding the second group, our research shows that (particularly lower-educated) entrepreneurs with long job tenures are at risk of falling victim to inertia effects, i.e. a reluctance to implement new ICT solutions resulting from unwillingness to change daily business operations or unawareness of the importance of doing so. Such inertia effects may hamper firm performance in the long run. Hence, it may be a good idea for entrepreneurs who already run their businesses for a longer time to have their business checked on efficient usage of ICT, possibly by an external expert. This may be especially advisable for IOA and DSEW as these types of entrepreneurs work alone and hence do not naturally receive feedback on their daily business operations. Moreover, our results are especially interesting for entrepreneurs who did not adopt ICT in their businesses yet. In this regard, these entrepreneurs would need to be aware that typically the successful adoption and implementation of ICT in the business requires a serious effort, up to spending around 25% of their time. Hence, they should not underestimate ICT adoption, as this involves more than just buying a smartphone or a computer. It also involves acquiring and maintaining digital skills, necessary for instance to be able to use a software package to organise one's financial administration.

Another area of interest for policy makers concerns the inertia effects described above. It is intuitive that inertia effects are more likely to occur among older entrepreneurs. However, our empirical analysis suggests that job tenure is the leading mechanism here, and not the age of the entrepreneur per se. In particular, we find a much stronger negative impact on ICT adoption and usage for job tenure than for age, while the VIF factors indicate the estimations do not suffer from multicollinearity. Hence, our analysis suggests that a middle-aged entrepreneur running his or her business for 10 or more years is more likely to fall victim to inertia effects than a senior entrepreneur starting a new business. Governments may want to consider encouraging entrepreneurs to have an expert make a recurrent check

on their business' ICT environment, in order to see whether they are still up-to-date or whether efficiency gains are possible by adopting the latest ICTs.

A limitation of our paper is that the main variables in our analysis, i.e. entrepreneurial earnings and ICT usage frequency are self-reported. Regarding ICT use, even though we know that much of the variation in ICT use can be explained by sector and country differences, future research may focus on asking additional survey questions to shed more light on what is behind the relatively high percentage of entrepreneurs indicating not to use ICT in their daily business operations. Moreover, the cross-sectional nature of our data base prevents longitudinal research. Such research would be highly interesting as it would enable the ability to observe what happens to entrepreneurial performance over time after certain ICTs have been adopted by an entrepreneur. In particular, even though we performed a simple robustness test on reversed causality, great caution is required in deriving causal effects from our empirical exercises. Finally, future research could extend the analysis by differentiating between different sorts of ICT to see whether certain types of ICT adoptions have bigger performance effects than others.

In spite of these limitations, we believe we have made an important contribution to the field of ICT performance effects with regard to the segment of the smallest businesses and solo entrepreneurs.

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Tables (*to be inserted in the text*)

Table 1. Descriptive statistics on ICT use frequency at work by occupational status

	ICT use frequency at work (1-7)												
	Obs.	Mean	Std. Dev.	Percentiles			Frequency distribution						
				25th	50th	75th	1	2	3	4	5	6	7
All self-employment	5,700 (5.481)	3.24 (3.33)	2.25 (2.24)	1	3	5	34.9 (32.7)	12.4 (12.0)	16.4 (16.6)	7.0 (8.2)	5.1 (6.0)	8.0 (8.0)	16.2 (16.5)
Occupational status													
Self-employed with employees	1,894 (1,883)	3.72 (3.70)	2.20 (2.15)	1	3	6	23.1 (22.7)	11.8 (11.9)	19.1 (18.7)	9.8 (10.9)	6.9 (8.3)	10.9 (10.8)	18.4 (16.7)
Independent own-account self-employed	3,400 (3,220)	3.06 (3.16)	2.24 (2.25)	1	2	5	39.0 (36.7)	12.6 (12.5)	15.9 (16.2)	5.8 (6.9)	4.2 (4.3)	7.1 (7.0)	15.4 (16.4)
Dependent self-employed worker	406 (378)	2.51 (2.88)	2.14 (2.28)	1	1	3	54.4 (49.1)	12.6 (8.7)	8.4 (9.3)	4.7 (5.6)	4.4 (8.9)	2.7 (2.7)	12.8 (15.7)

Data source: EWCS 2010, 2015. Information in brackets is corrected by using post-stratification and cross-national weights.

Table 2. Some descriptive statistics by occupational status and ICT adoption

		SE			SEwE			IOA			DSEW		
	No. observations	5,700			1,894			3,400			406		
	ICT adoption	Yes 65.2%	No 34.8%	t-test z-test	Yes 76.9%	No 23.1%	t-test z-test	Yes 61.0%	No 39.0%	t-test z-test	Yes 45.6%	No 54.4%	t-test z-test
	Min – Max	Proportion			Proportion			Proportion			Proportion		
Educational attainment													
Basic education [a]	0 – 1	3.1%	14.8%	-16.3***	2.6%	13.0%	-8.75***	3.3%	15.5%	-12.7 ***	4.9%	14.5%	-3.20***
Secondary education [a]	0 – 1	54.9%	73.7%	-13.9***	56.1%	72.6%	-6.17***	54.1%	73.6%	-11.4 ***	54.0%	76.0%	-4.65***
Tertiary education [a]	0 – 1	42.0%	11.5%	23.6***	41.3%	14.4%	10.3***	42.6%	10.9%	19.6 ***	41.1%	9.5%	7.43***
		Mean / *Median* / (*SE*)			Mean / *Median* / (*SE*)			Mean / *Median* / (*SE*)			Mean / *Median* / (*SE*)		
Job characteristics													
Tenure	1 – 53	10.9 *9* (*9.0*)	11.9 *10* (*9.8*)	-3.61***	12.2 *10* (*9.0*)	12.8 *10* (*9.9*)	-1.08	10.2 *8* (*8.9*)	11.8 *10* (*9.7*)	-4.88 ***	8.8 *5* (*8.5*)	10.4 *7* (*9.9*)	-1.78*
Working hours	15 – 98	46.0 *45* (*13.8*)	48.4 *48* (*16.6*)	-5.58***	48.7 *50* (*12.9*)	52.4 *50* (*15.0*)	-4.64***	44.2 *42* (*14.1*)	48.2 *48* (*17.0*)	-7.05 ***	43.9 *40* (*13.5*)	41.8 *40* (*15.1*)	1.44
Entrepreneurial earnings													
Net monthly earnings –in PPP $ of 2015–	1.25 – 55,210.9	2,611.8 *2,130.7* (*2,329.4*)	1,655.5 *1,366.8* (*1,263.3*)	20.1***	3,119.7 *2,548.4* (*2,643.9*)	2,131.9 *1,748.5* (*1,667.2*)	9.36***	2,279.2 *1,879.7* (*2,020.2*)	1,546.3 *1,284.9* (*1,085.6*)	13.7 ***	2,340.9 *1,879.7* (*2,214.5*)	1,366.9 *978.6* (*1,081.1*)	5.46***

Notes: [a] Dummy variable; * $0.1 > p \geq 0.05$; ** $0.05 > p \geq 0.01$; For dummy variables, mean values are presented. For continuous variables, mean values, median values (in italics) and standard deviations (in italics and brackets) are presented. t-statistic tests of the equality of means and z-statistic tests of the equality of proportions are presented. Data source: EWCS 2010, 2015.

Table 3. Determinants of ICT adoption and use frequency at work –*Weighted binary and ordered discrete choice models*–

# Specification	1			2			3						4					
Model	*Binary logit*			*Multilevel binary logit*			*Ordered logit*						*Multilevel ordered logit*					
Average predicted probability (*y*)	P[ICT adoption] = 0.673			P[ICT adoption] = 0.706			P[ICT use freq. = 1] = 0.330			P[ICT use freq. = 7] = 0.162			P[ICT use freq. = 1] = 0.335			P[ICT use freq. = 7] = 0.161		
Independent variables (*x*)	$\frac{dy}{dx}$	$\frac{dy/dx}{y}$%	t-statistic	$\frac{dy}{dx}$	$\frac{dy/dx}{y}$%	t-statistic	$\frac{dy}{dx}$	$\frac{dy/dx}{y}$%	t-statistic	$\frac{dy}{dx}$	$\frac{dy/dx}{y}$%	t-statistic	$\frac{dy}{dx}$	$\frac{dy/dx}{y}$%	t-statistic	$\frac{dy}{dx}$	$\frac{dy/dx}{y}$%	t-statistic
Focal variable: occupational status																		
SEwE [a]	0.094	14.0	3.70***	0.094	13.4	7.39***	-0.066	-20.1	-4.31***	0.045	27.8	3.99***	-0.064	-19.1	-6.54***	0.042	26.2	6.31***
IOA [a] (*ref.*)																		
DSEW [a]	-0.103	-15.3	-5.11***	-0.109	-15.4	-4.48***	0.059	17.9	2.72***	-0.031	-19.2	-2.75***	0.065	19.4	3.11***	-0.033	-20.7	-3.42***
Educational attainment																		
Basic education [a] (*ref.*)																		
Secondary education [a]	0.098	14.6	2.03**	0.104	14.7	3.89***	-0.102	-30.8	-1.13	0.037	22.9	1.53	-0.190	-56.8	-7.32***	0.057	35.5	9.24***
Tertiary education [a]	0.305	45.3	6.00***	0.301	42.6	9.53***	-0.293	-88.6	-2.82***	0.179	110.8	4.87***	-0.397	-118.8	-14.9***	0.213	132.5	20.2***
Job characteristics																		
Tenure *(1-53)*	-1.5E-03	-0.22	-1.22	-1.5E-03	-0.21	-2.07**	2.3E-03	0.71	1.95*	-1.5E-03	-0.94	-1.82*	3.2E-03	0.97	5.39***	-2.0E-03	-1.27	-5.31***
Working hours (*15-98*)	8.3E-03	1.23	3.58***	8.3E-03	1.18	4.75***	-7.1E-03	-2.16	-3.37***	4.6E-03	2.84	3.34***	-9.2E-03	-2.74	-5.95***	5.7E-03	3.57	5.89***
Working hours (squared)	-7.5E-05	-0.01	-3.30***	-7.5E-05	-0.01	-4.43***	7.0E-05	0.02	4.14***	-4.5E-05	-0.03	-3.98***	1.0E-04	0.03	6.70***	-6.5E-05	-0.04	-6.61***
Wave																		
2010 [a] (*ref.*)																		
2015 [a]	0.046	6.88	1.54	0.051	7.24	4.24***	-0.035	-10.4	-1.61	0.022	13.6	1.60	-0.028	-8.25	-2.91***	0.017	10.7	2.94***
Business cycle																		
National unemployment rate *(4.3-24.9)*	9.2E-03	1.37	2.66***	2.9E-03	0.41	0.95	-4.8E-03	-1.44	-1.45	3.1E-03	1.90	1.46	-3.4E-03	-1.01	-3.00***	2.1E-03	1.32	2.98***
Demographic characteristics																		
Female [a]	-0.050	-7.41	-1.81*	-0.051	-7.28	-3.87***	0.042	12.8	2.16**	-0.027	-16.6	-2.11**	0.040	12.1	3.84***	-0.025	-15.5	-3.91***
Immigrant [a]	-0.054	-8.00	-1.77*	-0.053	-7.55	-2.85***	7.8E-03	2.35	0.29	-5.0E-03	-3.07	-0.30	-0.033	-9.81	-2.42**	0.022	13.5	2.31**
Age (*18-65*)	0.019	2.76	2.85***	0.019	2.68	4.87***	-0.014	-4.36	-2.70***	9.3E-03	5.75	2.59***	-0.018	-5.42	-5.47***	0.011	7.08	5.43***
Age (squared)	-2.2E-04	-0.03	-3.06***	-2.2E-04	-0.03	-4.94***	1.7E-04	0.05	2.78***	-1.1E-04	-0.07	-2.64***	1.9E-04	0.06	5.05***	-1.2E-04	-0.07	-5.03***
Cohabiting [a]	-0.035	-5.23	-1.43	-0.035	-5.01	-2.45**	0.031	9.26	2.22**	-0.020	-12.6	-2.19**	0.027	8.18	2.31**	-0.018	-11.0	-2.25**
Number of children under 14	6.0E-03	0.90	0.18	6.9E-03	0.97	0.50	-8.0E-03	-2.42	-0.33	5.2E-03	3.21	0.33	-0.018	-5.46	-1.63	0.012	7.22	1.61
Health (1-5)	0.012	1.75	0.94	0.011	1.62	1.45	-2.5E-03	-0.76	-0.25	1.6E-03	1.00	0.25	-5.5E-04	-0.17	-0.08	3.5E-04	0.22	0.08
Ends meet (1-6)	0.021	3.19	4.62***	0.023	3.31	4.72***	-0.029	-8.66	-5.14***	0.018	11.4	4.67***	-0.035	-10.4	-8.26***	0.022	13.5	8.16***
Business sector dummies [b]	Yes			Yes			Yes						Yes					
Country dummies [c]	Yes			---			Yes						---					
Grouping variable [d]	---			Country			---						Country					
Intraclass correlation	---			15.9%			---						12.7%					
Log likelihood	-2,575.5			-2,631.5			-8,778.5						-9,006.8					

Notes: N = 5,700; Post-stratification and cross-national weights are used; For continuous variables, *dy/dx* captures absolute marginal effects whereas [(*dy/dx*)/*y*]% refers to marginal effects, but expressed in relative terms with respect to predicted probabilities. In the context of dummy variables, these reflects the impact for a discrete change of the dummy variable from 0 to 1; * $0.1 > p \geq 0.05$; ** $0.05 > p \geq 0.01$; *** $p < 0.01$; [a] Dummy variable; [b] 9 business sector dummies are used (*ref.* Construction). See the Appendix for a definition; [c] 35 European country dummies are used (*ref.* Spain); [d] A country indicator for 35 European countries is used as our grouping variable; The maximum correlation is 0.54 (between age and tenure), and the VIFs values (from specification 2) range from 1.04 to 2.14. Thus, multicollinearity does not pose a concern, especially in consideration of the large size of our sample; Data source: EWCS 2010, 2015.

Table 4. Determinants of net monthly earnings –*Weighted multilevel linear regressions*–

# Specification	5		6		7		8		9	
Predicted earnings (y) *–in PPP $ of 2015–*	2,597.3		2,596.8		2,596.9		2,597.2		2,597.2	
Independent variables (*x*)	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.
Focal variable: ICT use frequency at work										
ICT use frequency at work (1-7)			0.66	1.35	9.25	4.20***	-1.46	-2.42**	0.66	0.42
ICT use frequency at work (squared)					-1.09	-4.00***				
1 Never [a] (*ref.*)										
2 Almost never [a]	4.06	1.26								
3 Around ¼ of the time [a]	9.03	2.97***								
4 Around half of the time [a]	6.94	1.82*								
5 Around ¾ of the time [a]	11.9	2.75***								
6 Almost all of the time [a]	14.9	3.78***								
7 All of the time [a]	0.22	0.07								
Occupational status										
SEwE [a]	28.3	13.5***	29.2	13.9***	28.4	13.6***	9.19	2.39**	24.7	3.73***
IOA [a] (*ref.* for specif. 5-8)									15.5	2.54**
DSEW [a] (*ref.* for specif. 9)	-8.05	-2.12**	-8.81	-2.32**	-8.17	-2.15**	-15.5	-2.54**		
Interaction terms										
SEwE x ICT use frequency at work							5.70	6.19***	3.58	2.07**
IOA x ICT use frequency at work									-2.12	-1.29
DSEW x ICT use frequency at work							2.12	1.29		
Educational attainment										
Basic education [a] (*ref.*)										
Secondary education [a]	37.6	9.78***	38.9	10.2***	37.3	9.71***	39.3	10.3***	39.3	10.3***
Tertiary education [a]	61.1	14.2***	62.7	14.7***	60.8	14.2***	63.3	14.9***	63.3	14.9***
Job tenure										
Tenure *(1-53)*	2.30	6.91***	2.34	7.03***	2.32	6.99***	2.26	6.80***	2.26	6.80***
Tenure (squared)	-0.04	-3.75***	-0.04	-3.89***	-0.04	-3.81***	-0.04	-3.73***	-0.04	-3.73***
Working hours (*15-98*)	2.95	9.74***	2.96	9.78***	2.94	9.71***	2.96	9.81***	2.96	9.81***
Working hours (squared)	-0.02	-7.59***	-0.02	-7.65***	-0.02	-7.56***	-0.02	-7.63***	-0.02	-7.63***
Wave										
2010 [a] (*ref.*)										
2015 [a]	-1.02	-0.50	-0.43	-0.21	-0.94	-0.47	-0.08	-0.04	-0.08	-0.04
Business cycle										
National unemployment rate *(4.3-24.9)*	-4.18	-9.16***	-4.19	-9.14***	-4.22	-9.23***	-4.13	-9.02***	-4.13	-9.02***
Demographic characteristics										
Female [a]	-27.7	-12.7***	-27.6	-12.6***	-27.6	-12.7***	-27.9	-12.8***	-27.9	-12.8***
Immigrant [a]	-5.70	-1.93*	-6.06	-2.05**	-5.72	-1.93*	-5.63	-1.91*	-5.63	-1.91*
Age (*18-65*)	1.69	2.41**	1.76	2.51**	1.68	2.40**	1.67	2.40**	1.67	2.40**
Age (squared)	-0.02	-2.34**	-0.02	-2.43**	-0.02	-2.33**	-0.02	-2.31**	-0.02	-2.31**
Cohabiting [a]	2.83	1.13	2.72	1.09	2.74	1.10	3.03	1.21	3.03	1.21
Number of children under 14	-2.66	-1.14	-3.02	-1.29	-2.91	-1.25	-3.09	-1.32	-3.09	-1.32
Health (1-5)	7.60	5.78***	7.85	5.97***	7.67	5.83***	8.29	6.31***	8.29	6.31***
Business sector dummies [b]	Yes		Yes		Yes		Yes		Yes	
Grouping variable [c]	Country		Country		Country		Country		Country	
Intraclass correlation	21.6%		21.6%		21.6%		21.6%		21.6%	
Log likelihood	-5,761.7		-5,773.7		-5,765.7		-5,754.6		-5,754.6	

Notes: N = 5,700; Post-stratification and cross-national weights are used. Our dependent variable is the natural logarithm of monthly net earnings. Accordingly, we interpret the regression coefficients as semi-elasticities in the form of [(*dy/dx*)/*y*]%., i.e., they show the percentage changes of earnings caused by unit changes of the respective explanatory variables. In the context of dummy variables, these reflects the impact for a discrete change of the dummy variable from 0 to 1; * $0.1 > p \geq 0.05$; ** $0.05 > p \geq 0.01$; *** $p < 0.01$; [a] Dummy variable; [b] 9 business sector dummies are used (*ref.* Construction). See the Appendix for a definition; [c] A country indicator for 35 European countries is used as our grouping variable; The maximum correlation is 0.54 (between age and tenure), and the VIFs values (from specification 5) range from 1.03 to 1.78. Thus, multicollinearity does not pose a concern, especially in consideration of the large size of our sample; Data source: EWCS 2010, 2015.

Appendix. Variable definitions and correlations

Variable	Description
	Dependent variables
ICT use	
ICT use frequency at work	Variable ranging from 1 to 7. The scale refers to the individual ICT (i.e., computers, laptops, smartphones, etc.) use frequency at work. It equals 1 for individuals answering *never* and 7 for individuals answering *all of the time*. This information is also used to generate our focal variables in our earnings equations.
ICT adoption	Dummy equals 1 for workers who declare using ICT at work (levels 2 to 7 in previous scale).
Earnings	
Net monthly earnings - PPP $ of 2015 (logs)	Average net earnings in recent months. The variable is defined in PPP $ of 2015 and converted to natural logarithms.
	Main independent variables
Occupational status within self-employment	
SEwE	Dummy equals 1 for workers who declare being self-employed with employees.
IOA	Dummy equals 1 for workers who declare being self-employed without employees and answer positively to the question on whether he/she generally has more than one client or customer.
DSEW	Dummy equals 1 for workers who declare being self-employed without employees and answer negatively to the question on whether he/she generally has more than one client or customer.
ICT use frequency at work	
ICT use frequency at work	Variable ranging from 1 to 7. The scale refers to the individual ICT (i.e., computers, laptops, smartphones, etc.) use frequency at work. It equals 1 for individuals answering *never* and 7 for individuals answering *all of the time*.
1 Never	Dummy equals 1 for workers who state they *never* use ICTs during their daily business operations.
2 Almost never	Dummy equals 1 for workers who state they *almost never* use ICTs during their daily business operations.
3 Around ¼ of the time	Dummy equals 1 for workers who state they use ICTs *around ¼ of the time* during their daily business operations.
4 Around half of the time	Dummy equals 1 for workers who state they use ICTs *around half of the time* during their daily business operations.
5 Around ¾ of the time	Dummy equals 1 for workers who state they use ICTs *around ¾ of the* time during their daily business operations.
6 Almost all of the time	Dummy equals 1 for workers who state they use ICTs *almost all of the time* during their daily business operations.
7 All of the time	Dummy equals 1 for workers who state they use ICTs *all of the time* during their daily business operations.
	Control variables
Educational attainment	
Basic education	Dummy equals 1 for workers with less than lower secondary education (ISCED-1997, 0-1).
Secondary education	Dummy equals 1 for workers with, at least, lower secondary education but non-tertiary education (ISCED-1997, 2-4).
Tertiary education	Dummy equals 1 for workers with tertiary education (ISCED-1997, 5-6).
Job aspects	
Tenure	Years of experience in the company or organization.
Working hours	Working hours per week.
Business sector dummies	
Industry	Dummy equals 1 for workers whose codes of main activity of the local unit of the business, by means of the Nomenclature of Economic Activities (NACE rev. 2, 2008) are B = Mining and quarrying, C = Manufacturing, D = Electricity, gas, steam and air conditioning supply, and E = Water supply; sewerage, waste management and remediation activities.
Construction	Dummy equals 1 for workers whose code of main activity of the local unit of the business, by means of the Nomenclature of Economic Activities (NACE rev. 2, 2008) is F = Construction.
Commerce and hospitality	Dummy equals 1 for workers whose codes of main activity of the local unit of the business, by means of the Nomenclature of Economic Activities (NACE rev. 2, 2008) are G = Wholesale and retail trade; repair of motor vehicles and motorcycles, and I = Accommodation and food service activities.
Transport	Dummy equals 1 for workers whose code of main activity of the local unit of the business, by means of the Nomenclature of Economic Activities (NACE rev. 2, 2008) is H = Transportation and storage.
Financial services	Dummy equals 1 for workers whose codes of main activity of the local unit of the business, by means of the Nomenclature of Economic Activities (NACE rev. 2, 2008) are K = Financial and insurance activities, and L = Real estate activities.
Public administration and defence	Dummy equals 1 for workers whose code of main activity of the local unit of the business, by means of the Nomenclature of Economic Activities (NACE rev. 2, 2008) is O = Public administration and defence; compulsory social security.
Education	Dummy equals 1 for workers whose code of main activity of the local unit of the business, by means of the Nomenclature of Economic Activities (NACE rev. 2, 2008) is P = Education.
Health	Dummy equals 1 for workers whose code of main activity of the local unit of the business, by means of the Nomenclature of Economic Activities (NACE rev. 2, 2008) is Q = Human health and social work activities.
Other services	Dummy equals 1 for workers whose codes of main activity of the local unit of the business, by means of the Nomenclature of Economic Activities (NACE rev. 2, 2008) are J = Information and communication, M = Professional, scientific and technical activities, N = Administrative and support service activities, R = Arts, entertainment and recreation, S = Other service activities, T = Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use, and U = Activities of extraterritorial organisations and bodies.
Demographic characteristics	
Female	Dummy equals 1 for females.

Immigrant	Dummy equals 1 for citizens of a different country of that of residence.
Age	Age reported by the workers.
Cohabiting	Dummy equals 1 for individuals cohabiting with spouse/partner.
Children under 14	Dummy equals 1 for individuals cohabiting with any son or daughter aged under 14.
Health	Variable ranging from 1 to 5. The scale refers to the level of health declared by the worker. It equals 1 for individuals whose health is very bad and 5 for individuals whose health is very good.
Ends meet	Variable ranging from 1 to 6. The scale refers to the household ability to make ends meet. It equals 1 for households which make ends meet very easily and 6 for households which make ends meet with great difficulty.
Business cycle	
Unemployment rate	Harmonised annual unemployment rate (source: Eurostat).
Wave	
2015	Dummy equals 1 for observations corresponding to the EWCS 2015 and 0 for observations corresponding to the EWCS 2010.
Country dummies	35 dummies equalling 1 for individuals living in the named country: Albania, Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Macedonia, Malta, Montenegro, Netherlands, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, and the United Kingdom.

Notes: Data source: EWCS.

Correlation matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1.	ICT use frequency at work															
2.	Net monthly earnings - PPP $ of 2015 (logs)	0.225														
3.	Self-employed with employees	0.150	0.246													
4.	Dependent self-employed worker	-0.090	-0.098	-0.195												
5.	Secondary education	-0.284	-0.128	-0.022	0.026											
6.	Tertiary education	0.391	0.221	0.056	-0.045	-0.854										
7.	Tenure	-0.081	0.131	0.083	-0.048	-0.004	-0.062									
8.	Working hours	-0.083	0.118	0.130	-0.076	0.071	-0.117	0.044								
9.	National unemployment rate	-0.128	-0.259	-0.048	0.030	0.026	-0.069	-0.007	0.043							
10.	Female	-0.013	-0.193	-0.092	-0.003	-0.047	0.077	-0.091	-0.198	0.013						
11.	Immigrant	0.076	0.038	-0.005	0.031	-0.044	0.074	-0.074	-0.047	-0.084	0.018					
12.	Age	-0.027	0.062	-0.004	0.005	-0.032	-0.002	0.543	-0.079	-0.066	0.000	0.006				
13.	Cohabiting	-0.049	0.047	0.071	-0.029	0.029	-0.057	0.131	0.064	0.015	-0.049	-0.006	0.183			
14.	Number of children under 14	0.008	0.031	0.048	-0.042	0.000	-0.004	-0.170	0.048	0.035	-0.015	0.023	-0.301	0.325		
15.	Health	0.088	0.110	0.031	-0.019	-0.056	0.102	-0.110	-0.007	0.018	-0.020	0.005	-0.243	-0.042	0.093	
16.	Ends meet	0.264	0.417	0.196	-0.068	-0.128	0.203	0.046	-0.046	-0.286	-0.047	0.025	0.007	-0.002	-0.032	0.217

Notes: N = 5,700; Correlations with an absolute value greater than 0.01 are significant with $p<0.01$; Data source: EWCS 2010, 2015.

ON-LINE APPENDIX

Table A1. Descriptive statistics on ICT use frequency at work for all self-employment, by business sector

	ICT use frequency at work (1-7)							
	1	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
Business sector								
Industry	297.0 (42.1)	85.5 (12.1)	117.4 (16.6)	57.6 (8.2)	37.4 (5.3)	44.5 (6.3)	66.1 (9.4)	705 (100)
Construction sector	285.7 (38.3)	126.5 (17.0)	164.6 (22.0)	66.5 (8.9)	24.7 (3.3)	36.5 (4.9)	42.0 (5.6)	747 (100)
Commerce and hospitality	680.9 (40.3)	221.1 (13.1)	259.0 (15.3)	112.2 (6.6)	123.1 (7.3)	99.2 (5.9)	194.9 (11.5)	1,690 (100)
Transport	164.8 (55.5)	39.0 (13.1)	39.7 (13.4)	6.9 (2.3)	4.7 (1.6)	11.6 (3.9)	30.3 (10.2)	297 (100)
Financial services	10.2 (4.5)	8.2 (3.6)	29.4 (13.0)	27.8 (12.3)	20.5 (9.1)	44.6 (19.7)	85.4 (37.8)	226 (100)
Public administration and defence	4.71 (32.1)	0.00 (0.0)	0.40 (2.7)	0.14 (1.0)	0.05 (0.4)	3.30 (22.5)	6.06 (41.3)	15 (100)
Education	21.5 (18.2)	14.0 (11.8)	22.8 (19.3)	21.2 (18.0)	5.4 (4.5)	14.8 (12.6)	18.4 (15.6)	118 (100)
Health	29.6 (9.1)	41.7 (12.8)	136.1 (41.9)	34.2 (10.5)	27.8 (8.6)	14.2 (4.4)	41.0 (12.7)	324 (100)
Other services	299.6 (22.1)	123.0 (9.0)	138.9 (10.2)	123.1 (9.1)	85.0 (6.2)	169.3 (12.5)	419.1 (30.9)	1,358 (100)
Total	1794 (32.7)	659 (12.0)	908 (16.6)	450 (8.2)	329 (6.0)	438 (8.0)	903 (16.5)	5,481 (100)

Data source: EWCS 2010, 2015. Information corrected by using post-stratification and cross-national weights. Data in brackets as % of total self-employment within the same business sector.

Table A2. Descriptive statistics on the prevalence of different types of entrepreneurs by business sector

	Self-employed with employees	Independent own-account self-employed	Dependent self-employed worker	**Total**
Business sector				
Industry	251.1 (13.3)	385.4 (12.0)	68.9 (18.2)	705 (12.9)
Construction sector	241.6 (12.8)	447.6 (13.9)	57.4 (15.2)	747 (13.6)
Commerce and hospitality	695.0 (36.9)	915.5 (28.4)	79.9 (21.1)	1,690 (30.8)
Transport	70.5 (3.7)	181.9 (5.7)	44.6 (11.8)	297 (5.4)
Financial services	76.0 (4.0)	133.0 (4.1)	17.3 (4.6)	226 (4.1)
Public administration and defence	8.0 (0.4)	5.7 (0.2)	0.9 (0.2)	15 (0.3)
Education	19.3 (1.0)	90.9 (2.8)	7.8 (2.1)	118 (2.2)
Health	121.3 (6.4)	180.4 (5.6)	22.8 (6.0)	324 (5.9)
Other services	399.8 (21.2)	879.5 (27.3)	78.7 (20.8)	1,358 (24.8)
Total	1,883 (100)	3,220 (100)	378 (100)	5,481 (100)

Data source: EWCS 2010, 2015. Information corrected by using post-stratification and cross-national weights. Data in brackets as % of total self-employment of each type.

Table A3. Distributions of ICT use frequency at work for <u>all</u> self-employment, by country

								ICT use frequency at work (1-7)							
EFTA [a]	EU candidate	EU12	EU15	EU25	EU27	EU28	Country	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
		x	x	x	x	x	Belgium	15.2%	11.4%	23.7%	11.7%	6.1%	12.3%	19.7%	100%
		x	x	x	x	x	Denmark	4.2%	18.3%	23.8%	8.5%	4.1%	18.9%	22.2%	100%
		x	x	x	x	x	France	15.0%	11.3%	20.1%	8.8%	5.7%	6.5%	32.4%	100%
		x	x	x	x	x	Germany	7.7%	14.4%	28.5%	17.1%	10.6%	10.1%	11.7%	100%
		x	x	x	x	x	Greece	52.9%	7.2%	12.3%	5.7%	4.3%	4.4%	13.3%	100%
		x	x	x	x	x	Ireland	21.9%	5.8%	17.3%	9.3%	8.3%	12.8%	24.7%	100%
		x	x	x	x	x	Italy	38.5%	15.0%	13.5%	12.2%	6.5%	6.4%	7.9%	100%
		x	x	x	x	x	Luxembourg	8.9%	6.6%	6.8%	6.3%	5.2%	15.6%	50.6%	100%
		x	x	x	x	x	Netherlands	8.9%	14.3%	28.5%	9.6%	9.8%	9.3%	19.5%	100%
		x	x	x	x	x	Portugal	49.9%	9.2%	10.1%	5.1%	2.2%	5.3%	18.2%	100%
		x	x	x	x	x	Spain	31.3%	10.6%	8.9%	5.1%	7.4%	10.2%	26.5%	100%
		x	x	x	x	x	UK	30.1%	9.4%	12.6%	7.9%	6.9%	11.0%	22.1%	100%
			x	x	x	x	Austria	16.8%	11.8%	30.6%	10.5%	4.1%	7.7%	18.5%	100%
			x	x	x	x	Finland	10.2%	18.2%	31.8%	5.8%	3.1%	13.9%	17.0%	100%
			x	x	x	x	Sweden	9.2%	21.4%	16.3%	8.2%	10.3%	10.5%	24.1%	100%
				x	x	x	Cyprus	44.5%	15.2%	7.5%	6.9%	8.5%	5.3%	12.0%	100%
				x	x	x	Czech Republic	19.1%	15.1%	34.6%	9.3%	5.3%	5.4%	11.3%	100%
				x	x	x	Estonia	16.5%	4.8%	22.3%	9.3%	2.7%	8.0%	36.4%	100%
				x	x	x	Hungary	42.5%	9.0%	16.3%	1.9%	6.2%	4.1%	20.0%	100%
				x	x	x	Latvia	31.6%	4.8%	21.1%	10.6%	4.8%	14.2%	12.9%	100%
				x	x	x	Lithuania	25.6%	17.3%	18.0%	8.3%	2.2%	15.8%	12.9%	100%
				x	x	x	Malta	51.6%	12.5%	6.6%	3.2%	2.2%	2.9%	21.0%	100%
				x	x	x	Poland	25.3%	20.7%	26.5%	6.1%	5.3%	7.7%	8.5%	100%
				x	x	x	Slovakia	40.9%	14.3%	11.0%	5.2%	3.5%	12.9%	12.3%	100%
				x	x	x	Slovenia	17.7%	8.6%	21.5%	8.8%	5.4%	8.9%	29.1%	100%
					x	x	Bulgaria	42.5%	9.5%	11.9%	5.8%	5.5%	7.4%	17.4%	100%
					x	x	Romania	62.4%	2.4%	6.5%	5.6%	0.5%	8.7%	13.9%	100%
						x	Croatia	16.2%	17.5%	30.3%	4.7%	2.7%	9.3%	19.3%	100%
	x						Albania	60.5%	21.6%	7.9%	3.4%	2.2%	2.3%	2.2%	100%
	x						Macedonia	51.0%	9.5%	8.0%	11.0%	4.3%	6.9%	9.3%	100%
	x						Montenegro	50.9%	9.7%	13.7%	11.2%	5.8%	6.9%	1.8%	100%
	x						Serbia	59.5%	8.0%	16.6%	10.9%	0.0%	0.0%	5.0%	100%
	x						Turkey	62.8%	9.5%	8.9%	3.8%	3.6%	4.6%	6.8%	100%
x							Norway	5.8%	13.6%	27.4%	13.8%	2.6%	10.9%	26.1%	100%
x							Switzerland	16.9%	13.7%	22.0%	12.0%	10.7%	16.2%	8.5%	100%
							Total	*32.7%*	*12.0%*	*16.6%*	*8.2%*	*6.0%*	*8.0%*	*16.5%*	100%

Data source: EWCS 2010, 2015. [a] European Free Trade Association; Information corrected by using post-stratification and cross-national weights.

Table A4. Distributions of ICT use frequency at work for dependent self-employment (DSEW), by country

								ICT use frequency at work (1-7)							
EFTA [a]	EU candidate	EU12	EU15	EU25	EU27	EU28	Country	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**Total**
		x	x	x	x	x	Belgium	17.8%	14.8%	18.0%	11.7%	0.0%	10.3%	27.4%	100%
		x	x	x	x	x	Denmark	53.5%	46.5%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
		x	x	x	x	x	France	11.2%	10.7%	24.7%	20.5%	11.7%	0.0%	21.3%	100%
		x	x	x	x	x	Germany	19.8%	15.4%	10.2%	0.0%	14.3%	0.0%	40.3%	100%
		x	x	x	x	x	Greece	83.7%	3.0%	3.4%	0.0%	0.0%	4.3%	5.5%	100%
		x	x	x	x	x	Ireland	68.2%	7.8%	6.4%	3.8%	0.0%	0.0%	13.8%	100%
		x	x	x	x	x	Italy	52.9%	6.6%	0.0%	4.6%	25.2%	3.0%	7.6%	100%
		x	x	x	x	x	Luxembourg	10.5%	18.2%	0.0%	0.0%	0.0%	0.0%	71.4%	100%
		x	x	x	x	x	Netherlands	9.1%	10.9%	23.5%	15.2%	11.9%	0.0%	29.4%	100%
		x	x	x	x	x	Portugal	76.5%	0.0%	0.0%	0.0%	0.0%	0.0%	23.5%	100%
		x	x	x	x	x	Spain	45.3%	4.7%	37.1%	0.0%	0.0%	8.1%	4.8%	100%
		x	x	x	x	x	UK	48.2%	3.9%	4.6%	5.6%	10.6%	3.2%	23.7%	100%
			x	x	x	x	Austria	88.3%	0.0%	0.0%	0.0%	0.0%	0.0%	11.7%	100%
			x	x	x	x	Finland	11.1%	11.2%	28.1%	0.0%	18.7%	0.0%	31.0%	100%
			x	x	x	x	Sweden	0.0%	0.0%	0.0%	0.0%	37.5%	0.0%	62.5%	100%
				x	x	x	Cyprus	59.0%	9.9%	10.1%	11.6%	3.9%	0.0%	5.5%	100%
				x	x	x	Czech Republic	30.9%	14.7%	35.3%	3.1%	0.0%	6.4%	9.7%	100%
				x	x	x	Estonia	38.4%	0.0%	6.7%	0.0%	5.3%	0.0%	49.5%	100%
				x	x	x	Hungary	76.5%	0.0%	0.0%	9.2%	0.0%	0.0%	14.3%	100%
				x	x	x	Latvia	63.8%	9.5%	0.0%	0.0%	0.0%	17.1%	9.6%	100%
				x	x	x	Lithuania	18.8%	58.1%	23.0%	0.0%	0.0%	0.0%	0.0%	100%
				x	x	x	Malta	43.1%	36.4%	0.0%	15.1%	0.0%	0.0%	5.4%	100%
				x	x	x	Poland	39.6%	30.5%	29.9%	0.0%	0.0%	0.0%	0.0%	100%
				x	x	x	Slovakia	71.3%	6.1%	11.4%	1.0%	2.8%	7.4%	0.0%	100%
				x	x	x	Slovenia	64.0%	13.7%	0.0%	0.0%	0.0%	0.0%	22.3%	100%
					x	x	Bulgaria	78.9%	0.0%	0.0%	0.0%	0.0%	0.0%	21.1%	100%
					x	x	Romania	77.1%	4.7%	0.0%	3.3%	3.4%	0.0%	11.5%	100%
						x	Croatia	59.1%	40.9%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
	x						Albania	67.6%	32.4%	0.0%	0.0%	0.0%	0.0%	0.0%	100%
	x						Macedonia	70.4%	0.0%	0.0%	19.5%	10.1%	0.0%	0.0%	100%
	x						Montenegro	79.0%	8.4%	0.0%	12.6%	0.0%	0.0%	0.0%	100%
	x						Serbia	94.2%	0.0%	0.0%	5.8%	0.0%	0.0%	0.0%	100%
	x						Turkey	64.1%	6.9%	2.1%	8.1%	6.5%	3.1%	9.2%	100%
x							Norway	0.0%	49.1%	0.0%	0.0%	12.2%	0.0%	38.7%	100%
x							Switzerland	0.0%	43.0%	13.3%	0.0%	43.8%	0.0%	0.0%	100%
							Total	*49.0%*	*8.7%*	*9.3%*	*5.6%*	*8.9%*	*2.7%*	*15.7%*	100%

Data source: EWCS 2010, 2015. [a] European Free Trade Association; Information corrected by using post-stratification and cross-national weights.

Table A5. Determinants of ICT adoption and use frequency at work
–Weighted binary and ordered discrete choice models–

# Specification	2			4					
Model	*Multilevel binary logit*			*Multilevel ordered logit*					
Average predicted probability (*y*)	P[ICT adoption] = 0.706			P[ICT use freq. = 1] = 0.335			P[ICT use freq. = 7] = 0.161		
Independent variables (*x*)	$\frac{dy}{dx}$	$\frac{dy/dx}{y}$%	t-statistic	$\frac{dy}{dx}$	$\frac{dy/dx}{y}$%	t-statistic	$\frac{dy}{dx}$	$\frac{dy/dx}{y}$%	t-statistic
Focal variable: occupational status									
SEwE [a]	0.094	13.4	7.39***	-0.064	-19.1	-6.54***	0.042	26.2	6.31***
IOA [a] (*ref.*)									
DSEW [a]	-0.109	-15.4	-4.48***	0.065	19.4	3.11***	-0.033	-20.7	-3.42***
Educational attainment									
Basic education [a] (*ref.*)									
Secondary education [a]	0.104	14.7	3.89***	-0.190	-56.8	-7.32***	0.057	35.5	9.24***
Tertiary education [a]	0.301	42.6	9.53***	-0.397	-118.8	-14.9***	0.213	132.5	20.2***
Job characteristics									
Tenure *(1-53)*	-1.5E-03	-0.21	-2.07**	3.2E-03	0.97	5.39***	-2.0E-03	-1.27	-5.31***
Working hours (*15-98*)	8.3E-03	1.18	4.75***	-9.2E-03	-2.74	-5.95***	5.7E-03	3.57	5.89***
Working hours (squared)	-7.5E-05	-0.01	-4.43***	1.0E-04	0.03	6.70***	-6.5E-05	-0.04	-6.61***
Business sector dummies									
Industry [a]	0.056	7.96	2.53**	-0.055	-16.5	-2.83***	0.025	15.7	2.80***
Construction sector [a] (*ref.*)									
Commerce and hospitality [a]	0.060	8.47	3.03***	-0.072	-21.5	-4.26***	0.034	21.1	4.42***
Transport [a]	-0.037	-5.26	-1.26	0.038	11.3	1.37	-0.014	-8.91	-1.42
Financial services [a]	0.310	43.9	10.1***	-0.302	-90.3	-16.5***	0.279	173.4	11.5***
Public administration and defence [a]	0.071	10.0	0.70	-0.231	-69.1	-3.12***	0.165	102.6	1.83*
Education [a]	0.079	11.2	1.73*	-0.082	-24.5	-2.35**	0.040	24.6	2.08**
Health [a]	0.162	23.0	4.68***	-0.032	-9.50	-1.26	0.014	8.55	1.23
Other services [a]	0.109	15.5	5.17***	-0.185	-55.4	-11.0***	0.115	71.8	11.7***
Wave									
2010 [a] (*ref.*)									
2015 [a]	0.051	7.24	4.24***	-0.028	-8.25	-2.91***	0.017	10.7	2.94***
Business cycle									
National unemployment rate *(4.3-24.9)*	2.9E-03	0.41	0.95	-3.4E-03	-1.01	-3.00***	2.1E-03	1.32	2.98***
Demographic characteristics									
Female [a]	-0.051	-7.28	-3.87***	0.040	12.1	3.84***	-0.025	-15.5	-3.91***
Immigrant [a]	-0.053	-7.55	-2.85***	-0.033	-9.81	-2.42**	0.022	13.5	2.31**
Age (*18-65*)	0.019	2.68	4.87***	-0.018	-5.42	-5.47***	0.011	7.08	5.43***
Age (squared)	-2.2E-04	-0.03	-4.94***	1.9E-04	0.06	5.05***	-1.2E-04	-0.07	-5.03***
Cohabiting [a]	-0.035	-5.01	-2.45**	0.027	8.18	2.31**	-0.018	-11.0	-2.25**
Number of children under 14	6.9E-03	0.97	0.50	-0.018	-5.46	-1.63	0.012	7.22	1.61
Health (1-5)	0.011	1.62	1.45	-5.5E-04	-0.17	-0.08	3.5E-04	0.22	0.08
Ends meet (1-6)	0.023	3.31	4.72***	-0.035	-10.4	-8.26***	0.022	13.5	8.16***
Grouping variable [b]	Country			Country					
Intraclass correlation	15.9%			12.7%					
Log likelihood	-2,631.5			-9,006.8					

Notes: N = 5,700; Specification numbers refer to the particular exercise in the main document for which this robustness check is performed; Post-stratification and cross-national weights are used; For continuous variables, *dy/dx* captures absolute marginal effects whereas [(*dy/dx*)/*y*]% refers to marginal effects, but expressed in relative terms with respect to predicted probabilities. In the context of dummy variables, these reflects the impact for a discrete change of the dummy variable from 0 to 1; * $0.1 > p \geq 0.05$; ** $0.05 > p \geq 0.01$; *** $p < 0.01$; [a] Dummy variable; [b] A country indicator for 35 European countries is used as our grouping variable; The maximum correlation is 0.54 (between age and tenure), and the VIFs values (from specification 2) range from 1.04 to 2.14. Thus, multicollinearity does not pose a concern, especially in consideration of the large size of our sample; Data source: EWCS 2010, 2015.

Table A6. Determinants of ICT adoption and use frequency at work
–Weighted binary and ordered discrete choice models–

# Specification	**2**			**4**					
Model	*Multilevel binary logit*			*Multilevel ordered logit*					
Average predicted probability (*y*)	P[ICT adoption] = 0.576			P[ICT use freq. = 1] = 0.432			P[ICT use freq. = 7] = 0.128		
Independent variables (*x*)	$\frac{dy}{dx}$	$\frac{dy/dx}{y}$%	t-statistic	$\frac{dy}{dx}$	$\frac{dy/dx}{y}$%	t-statistic	$\frac{dy}{dx}$	$\frac{dy/dx}{y}$%	t-statistic
Focal variable: occupational status									
SEwE [a]	0.087	15.1	7.48***	-0.066	-15.3	-7.22***	0.036	28.0	7.01***
IOA [a] (*ref.*)									
DSEW [a]	-0.097	-16.8	-6.54***	0.100	23.1	6.13***	-0.041	-31.8	-6.93***
Educational attainment									
Basic education [a] (*ref.*)									
Secondary education [a]	0.050	8.70	3.24***	-0.149	-34.4	-8.03***	0.041	32.2	9.41***
Tertiary education [a]	0.256	44.3	10.0***	-0.368	-85.1	-17.9***	0.172	134.3	20.5***
Job characteristics									
Tenure *(1-53)*	-2.3E-03	-0.40	-3.99***	3.5E-03	0.81	6.76***	-1.8E-03	-1.44	-6.62***
Working hours (*15-98*)	6.8E-03	1.18	4.88***	-7.9E-03	-1.83	-5.94***	4.1E-03	3.23	5.90***
Working hours (squared)	-6.2E-05	-0.01	-4.62***	8.8E-05	0.02	6.59***	-4.6E-05	-0.04	-6.52***
Wave									
2010 [a] (*ref.*)									
2015 [a]	0.048	8.40	4.97***	-0.031	-7.21	-3.69***	0.016	12.6	3.73***
Business cycle									
National unemployment rate *(4.3-24.9)*	6.8E-03	1.19	2.72***	-3.6E-03	-0.83	-3.51***	1.9E-03	1.47	3.49***
Demographic characteristics									
Female [a]	-0.045	-7.80	-4.39***	0.036	8.30	3.86***	-0.018	-14.4	-3.92***
Immigrant [a]	-0.045	-7.80	-3.04***	-0.038	-8.81	-2.95***	0.021	16.3	2.81***
Age (*18-65*)	0.014	2.35	4.39***	-0.017	-3.98	-5.97***	9.0E-03	7.02	5.91***
Age (squared)	-1.6E-04	-0.03	-4.45***	1.8E-04	0.04	5.48***	-9.5E-05	-0.07	-5.44***
Cohabiting [a]	-0.015	-2.67	-1.29	0.018	4.22	1.70*	-0.010	-7.56	-1.67*
Number of children under 14	-0.013	-2.31	-1.21	-3.0E-03	-0.70	-0.30	1.6E-03	1.25	0.30
Health (1-5)	5.5E-03	0.95	0.86	1.3E-03	0.30	0.22	-6.8E-04	-0.53	-0.22
Ends meet (1-6)	0.025	4.30	6.10***	-0.037	-8.50	-9.98***	0.019	15.0	9.78***
Business sector dummies [b]	Yes			Yes					
Grouping variable [c]	Country			Country					
Intraclass correlation	16.9%			21.9%					
Log likelihood	-3,274.2			-10,195.7					

Notes: N = 7,082; Specification numbers refer to the particular exercise in the main document for which this robustness check is performed; Post-stratification and cross-national weights are used; For continuous variables, *dy/dx* captures absolute marginal effects whereas [(*dy/dx*)/*y*]% refers to marginal effects, but expressed in relative terms with respect to predicted probabilities. In the context of dummy variables, these reflects the impact for a discrete change of the dummy variable from 0 to 1; * $0.1 > p \geq 0.05$; ** $0.05 > p \geq 0.01$; *** $p < 0.01$; [a] Dummy variable; [b] 10 business sector dummies are used (*ref.* Construction). See the Appendix in the main document for a definition; [c] A country indicator for 35 European countries is used as our grouping variable; The maximum correlation is 0.55 (between age and tenure), and the VIFs values (from specification 2) range from 1.04 to 1.96. Thus, multicollinearity does not pose a concern, especially in consideration of the large size of our sample; Data source: EWCS 2010, 2015.

Table A7. Determinants of net monthly earnings –*Weighted multilevel linear regressions*–

# Specification	5		6		7		8		9	
Predicted earnings (y) *–in PPP $ of 2015–*	2,283.4		2,282.9		2,283.2		2,283.7		2,283.7	
Independent variables (*x*)	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.
Focal variable: ICT use frequency at work										
ICT use frequency at work (1-7)			1.52	3.21***	13.1	6.37***	-0.59	-1.02	2.79	2.01**
ICT use frequency at work (squared)					-1.49	-5.79***				
1 Never [a] (*ref.*)										
2 Almost never [a]	5.34	1.85*								
3 Around ¼ of the time [a]	14.7	5.23***								
4 Around half of the time [a]	11.5	3.14***								
5 Around ¾ of the time [a]	19.0	4.65***								
6 Almost all of the time [a]	18.7	4.81***								
7 All of the time [a]	4.24	1.37								
Occupational status										
SEwE [a]	29.2	14.9***	30.2	15.4***	29.3	15.0***	12.5	3.62***	38.4	8.02***
IOA [a] (*ref.* for specif. 5-8)									25.9	6.40***
DSEW [a] (*ref.* for specif. 9)	-16.8	-6.11***	-17.8	-6.47***	-16.7	-6.08***	-25.9	-6.40***		
Interaction terms										
SEwE x ICT use frequency at work							5.44	6.23***	2.06	1.35
IOA x ICT use frequency at work									-3.38	-2.36**
DSEW x ICT use frequency at work							3.38	2.36**		
Educational attainment										
Basic education [a] (*ref.*)										
Secondary education [a]	30.3	10.8***	31.4	11.2***	30.1	10.7***	31.6	11.3***	31.6	11.3***
Tertiary education [a]	53.9	15.7***	55.6	16.2***	53.8	15.7***	55.8	16.3***	55.8	16.3***
Job tenure										
Tenure *(1-53)*	1.80	6.45***	1.81	6.47***	1.80	6.47***	1.73	6.21***	1.73	6.21***
Tenure (squared)	-0.03	-4.26***	-0.03	-4.36***	-0.03	-4.28***	-0.03	-4.17***	-0.03	-4.17***
Working hours (*15-98*)	2.52	9.82***	2.55	9.92***	2.52	9.82***	2.55	9.93***	2.55	9.93***
Working hours (squared)	-0.02	-7.99***	-0.02	-8.11***	-0.02	-7.99***	-0.02	-8.07***	-0.02	-8.07***
Wave										
2010 [a] (*ref.*)										
2015 [a]	-2.41	-1.34	-1.78	-0.99	-2.45	-1.36	-1.33	-0.74	-1.33	-0.74
Business cycle										
National unemployment rate *(4.3-24.9)*	-3.90	-9.10***	-3.90	-9.06***	-3.91	-9.12***	-3.86	-8.99***	-3.86	-8.99***
Demographic characteristics										
Female [a]	-27.1	-14.1***	-27.0	-14.0***	-27.0	-14.0***	-27.3	-14.2***	-27.3	-14.2***
Immigrant [a]	-6.69	-2.31**	-7.16	-2.46**	-6.73	-2.32**	-6.60	-2.27**	-6.60	-2.27**
Age (*18-65*)	1.52	2.53**	1.59	2.63***	1.52	2.53**	1.54	2.56**	1.54	2.56**
Age (squared)	-0.02	-2.30**	-0.02	-2.38**	-0.02	-2.30**	-0.02	-2.29**	-0.02	-2.29**
Cohabiting [a]	5.41	2.39**	5.37	2.37**	5.27	2.33**	5.58	2.47**	5.58	2.47**
Number of children under 14	-4.12	-1.95*	-4.53	-2.14**	-4.27	-2.02**	-4.49	-2.13**	-4.49	-2.13**
Health (1-5)	7.49	6.36***	7.78	6.60***	7.56	6.43***	8.06	6.86***	8.06	6.86***
Business sector dummies [b]	Yes		Yes		Yes		Yes		Yes	
Grouping variable [c]	Country		Country		Country		Country		Country	
Intraclass correlation	25.0%		25.0%		25.0%		25.0%		25.0%	
Log likelihood	-7,523.3		-7,544.4		-7,527.7		-7,524.3		-7,524.3	

Notes: N = 7,082; Specification numbers refer to the particular exercise in the main document for which this robustness check is performed; Post-stratification and cross-national weights are used. Our dependent variable is the natural logarithm of monthly net earnings. Accordingly, we interpret the regression coefficients as semi-elasticities in the form of $[(dy/dx)/y]$%., i.e., they show the percentage changes of earnings caused by unit changes of the respective explanatory variables. In the context of dummy variables, these reflects the impact for a discrete change of the dummy variable from 0 to 1; * $0.1 > p \geq 0.05$; ** $0.05 > p \geq 0.01$; *** $p < 0.01$; [a] Dummy variable; [b] 10 business sector dummies are used (*ref.* Construction). See the Appendix in the main document for a definition; [c] A country indicator for 35 European countries is used as our grouping variable; The maximum correlation is 0.55 (between age and tenure), and the VIFs values (from specification 5) range from 1.02 to 1.84. Thus, multicollinearity does not pose a concern, especially in consideration of the large size of our sample; Data source: EWCS 2010, 2015

Table A8. Determinants of ICT adoption and use frequency at work
–Weighted binary and ordered discrete choice models–

# Specification	2			4					
Model	*Multilevel binary logit*			*Multilevel ordered logit*					
Average predicted probability (*y*)	P[ICT adoption] = 0.574			P[ICT use freq. = 1] = 0.469			P[ICT use freq. = 5] = 0.232		
Independent variables (*x*)	$\frac{dy}{dx}$	$\frac{dy/dx}{y}$%	t-statistic	$\frac{dy}{dx}$	$\frac{dy/dx}{y}$%	t-statistic	$\frac{dy}{dx}$	$\frac{dy/dx}{y}$%	t-statistic
Focal variable: occupational status									
SEwE [a]	0.108	18.9	7.92***	-0.080	-17.1	-6.95***	0.060	25.9	6.77***
IOA [a] (*ref.*)									
DSEW [a]	-0.086	-14.9	-3.43***	0.062	13.1	2.80***	-0.040	-17.2	-2.93***
Educational attainment									
Basic education [a] (*ref.*)									
Secondary education [a]	0.098	17.1	3.33***	-0.142	-30.2	-5.47***	0.068	29.6	6.19***
Tertiary education [a]	0.367	63.9	11.5***	-0.400	-85.4	-14.5***	0.276	119.2	17.9***
Job characteristics									
Tenure *(1-53)*	-3.5E-03	-0.61	-4.33***	3.9E-03	0.82	5.51***	-2.8E-03	-1.21	-5.45***
Working hours (*15-98*)	7.5E-03	1.31	3.81***	-7.8E-03	-1.67	-4.38***	5.7E-03	2.46	4.36***
Working hours (squared)	-6.9E-05	-0.01	-3.49***	9.0E-05	0.02	5.01***	-6.6E-05	-0.03	-4.98***
Wave									
2010 [a] (*ref.*)									
2015 [a]	0.037	6.48	2.81***	-0.026	-5.48	-2.29**	0.019	8.0	2.30**
Business cycle									
National unemployment rate *(4.3-24.9)*	3.7E-03	0.65	1.11	5.6E-03	1.20	2.54**	-4.1E-03	-1.76	-2.54**
Demographic characteristics									
Female [a]	-0.047	-8.15	-3.32***	0.045	9.6	3.80***	-0.033	-14.1	-3.84***
Immigrant [a]	-0.021	-3.63	-1.07	-0.038	-8.17	-2.40**	0.029	12.4	2.33**
Age (*18-65*)	0.020	3.45	4.56***	-0.020	-4.22	-5.17***	0.014	6.22	5.14***
Age (squared)	-2.3E-04	-0.04	-4.62***	2.2E-04	0.05	4.95***	-1.6E-04	-0.07	-4.94***
Cohabiting [a]	-0.038	-6.63	-2.37**	0.031	6.60	2.26**	-0.023	-9.9	-2.22**
Number of children under 14	-6.3E-03	-1.11	-0.42	-6.2E-03	-1.33	-0.48	4.6E-03	1.97	0.48
Health (1-5)	9.3E-03	1.62	1.07	-1.4E-03	-0.30	-0.19	1.0E-03	0.44	0.19
Ends meet (1-6)	0.033	5.74	6.00***	-0.038	-8.1	-7.90***	0.028	12.0	7.79***
Business sector dummies [b]	Yes			Yes					
Grouping variable [c]	Country			Country					
Intraclass correlation	13.9%			10.9%					
Log likelihood	-2,948.8			-6,744.6					

Notes: N = 5,700; Specification numbers refer to the particular exercise in the main document for which this robustness check is performed; An alternative ICT use frequency classification is used, where categories 'never' and 'almost never' as well as 'almost all of the time' and 'all the time' are grouped. Therefore, we have 5 categories with equal distance with respect to share of time ICT is used (0-1/4-1/2-3/4-1); Post-stratification and cross-national weights are used; For continuous variables, *dy/dx* captures absolute marginal effects whereas [(*dy/dx*)/*y*]% refers to marginal effects, but expressed in relative terms with respect to predicted probabilities. In the context of dummy variables, these reflects the impact for a discrete change of the dummy variable from 0 to 1; * $0.1 > p \geq 0.05$; ** $0.05 > p \geq 0.01$; *** $p < 0.01$; [a] Dummy variable; [b] 9 business sector dummies are used (*ref.* Construction). See the Appendix in the main document for a definition; [c] A country indicator for 35 European countries is used as our grouping variable; The maximum correlation is 0.54 (between age and tenure), and the VIFs values (from specification 2) range from 1.04 to 2.14. Thus, multicollinearity does not pose a concern, especially in consideration of the large size of our sample; Data source: EWCS 2010, 2015.

Table A9. Determinants of net monthly earnings *–Weighted multilevel linear regressions–*

# Specification	5		6		7		8		9	
Predicted earnings (y) *–in PPP $ of 2015–*	2,597.3		2,596.5		2,596.3		2,596.9		2,596.9	
Independent variables (*x*)	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.
Focal variable: ICT use frequency at work										
ICT use frequency at work (1-5)			1.02	1.57	11.0	2.84***	-1.92	-2.34**	1.02	0.45
ICT use frequency at work (squared)					-1.68	-2.62***				
1 (Almost) never [a] (*ref.*)										
2 Around ¼ of the time [a]	7.54	2.65***								
3 Around half of the time [a]	5.44	1.48								
4 Around ¾ of the time [a]	10.5	2.52**								
5 (Almost) all of the time [a]	3.85	1.43								
Occupational status										
SEwE [a]	28.7	13.7***	29.1	13.9***	28.7	13.7***	9.62	2.52**	25.4	3.69***
IOA [a] (*ref.* for specif. 5-8)									15.7	2.46**
DSEW [a] (*ref.* for specif. 9)	-8.74	-2.30**	-8.83	-2.33**	-8.67	-2.29**	-15.7	-2.46**		
Interaction terms										
SEwE x ICT use frequency at work							7.48	6.10***	4.54	1.88*
IOA x ICT use frequency at work									-2.94	-1.27
DSEW x ICT use frequency at work							2.94	1.27		
Educational attainment										
Basic education [a] (*ref.*)										
Secondary education [a]	38.0	9.91***	38.9	10.2***	38.1	9.94***	39.2	10.3***	39.2	10.3***
Tertiary education [a]	61.4	14.4***	62.6	14.7***	61.5	14.4***	63.3	14.9***	63.3	14.9***
Job tenure										
Tenure *(1-53)*	2.36	7.10***	2.34	7.04***	2.35	7.07***	2.26	6.82***	2.26	6.82***
Tenure (squared)	-0.04	-3.93***	-0.04	-3.89***	-0.04	-3.89***	-0.04	-3.74***	-0.04	-3.74***
Working hours (*15-98*)	2.94	9.70***	2.96	9.79***	2.96	9.77***	2.97	9.81***	2.97	9.81***
Working hours (squared)	-0.02	-7.57***	-0.02	-7.66***	-0.02	-7.63***	-0.02	-7.63***	-0.02	-7.63***
Wave										
2010 [a] (*ref.*)										
2015 [a]	-0.64	-0.32	-0.43	-0.21	-0.65	-0.32	-0.09	-0.04	-0.09	-0.04
Business cycle										
National unemployment rate *(4.3-24.9)*	-4.22	-9.23***	-4.18	-9.13***	-4.21	-9.21***	-4.15	-9.07***	-4.15	-9.07***
Demographic characteristics										
Female [a]	-27.5	-12.6***	-27.6	-12.6***	-27.6	-12.6***	-27.9	-12.8***	-27.9	-12.8***
Immigrant [a]	-5.87	-1.98**	-6.09	-2.06**	-5.96	-2.01**	-5.68	-1.92*	-5.68	-1.92*
Age (*18-65*)	1.68	2.40**	1.76	2.51**	1.72	2.45**	1.67	2.39**	1.67	2.39**
Age (squared)	-0.02	-2.33**	-0.02	-2.43**	-0.02	-2.38**	-0.02	-2.30**	-0.02	-2.30**
Cohabiting [a]	2.81	1.13	2.72	1.09	2.68	1.07	2.94	1.18	2.94	1.18
Number of children under 14	-2.99	-1.28	-2.99	-1.28	-2.97	-1.27	-3.02	-1.30	-3.02	-1.30
Health (1-5)	7.73	5.87***	7.85	5.97***	7.78	5.92***	8.29	6.31***	8.29	6.31***
Business sector dummies [b]	Yes		Yes		Yes		Yes		Yes	
Grouping variable [c]	Country		Country		Country		Country		Country	
Intraclass correlation	21.6%		21.6%		21.6%		21.6%		21.6%	
Log likelihood	-5,769.0		-5,773.4		-5,770.0		-5,754.9		-5,754.9	

Notes: N = 5,700; Specification numbers refer to the particular exercise in the main document for which this robustness check is performed; An alternative ICT use frequency classification is used, where categories 'never' and 'almost never' as well as 'almost all of the time' and 'all the time' are grouped. Therefore, we have 5 categories with equal distance with respect to share of time ICT is used (0-1/4-1/2-3/4-1); Post-stratification and cross-national weights are used. Our dependent variable is the natural logarithm of monthly net earnings. Accordingly, we interpret the regression coefficients as semi-elasticities in the form of [(*dy/dx*)/*y*]%., i.e., they show the percentage changes of earnings caused by unit changes of the respective explanatory variables. In the context of dummy variables, these reflects the impact for a discrete change of the dummy variable from 0 to 1; * $0.1 > p \geq 0.05$; ** $0.05 > p \geq 0.01$; *** $p < 0.01$; [a] Dummy variable; [b] 9 business sector dummies are used (*ref.* Construction). See the Appendix in the main document for a definition; [c] A country indicator for 35 European countries is used as our grouping variable; The maximum correlation is 0.54 (between age and tenure), and the VIFs values (from specification 5) range from 1.03 to 1.77. Thus, multicollinearity does not pose a concern, especially in consideration of the large size of our sample; Data source: EWCS 2010, 2015.

Table A10. Determinants of ICT adoption and use frequency at work
–Weighted binary and ordered discrete choice models–

# Specification	**2**			**4**					
Model	*Multilevel binary logit*			*Multilevel ordered logit*					
Average predicted probability (*y*)	P[ICT adoption] = 0.706			P[ICT use freq. = 1] = 0.305			P[ICT use freq. = 7] = 0.166		
Independent variables (*x*)	$\frac{dy}{dx}$	$\frac{dy/dx}{y}$%	t-statistic	$\frac{dy}{dx}$	$\frac{dy/dx}{y}$%	t-statistic	$\frac{dy}{dx}$	$\frac{dy/dx}{y}$%	t-statistic
Focal variable: occupational status									
SEwE [a]	0.095	13.4	7.67***	-0.064	-21.1	-6.73***	0.045	27.1	6.43***
IOA [a] (*ref.*)									
DSEW [a]	-0.124	-17.6	-5.09***	0.080	26.1	3.77***	-0.041	-24.7	-4.22***
Educational attainment									
Basic education [a] (*ref.*)									
Secondary education [a]	0.092	13.0	3.45***	-0.093	-30.5	-3.46***	0.036	21.4	4.04***
Tertiary education [a]	0.292	41.4	9.82***	-0.283	-92.6	-10.1***	0.187	112.5	13.95***
Job characteristics									
Tenure *(1-53)*	-1.5E-03	-0.21	-2.00**	2.5E-03	0.81	4.10***	-1.6E-03	-0.98	-4.07***
Working hours (*15-98*)	7.8E-03	1.10	4.47***	-6.6E-03	-2.16	-4.34***	4.4E-03	2.62	4.31***
Working hours (squared)	-7.1E-05	-0.010	-4.19***	6.7E-05	0.02	4.31***	-4.4E-05	-0.03	-4.29***
Wave									
2010 [a] (*ref.*)									
2015 [a]	0.039	5.48	0.88	-0.017	-5.62	-0.54	0.011	6.78	0.55
Business cycle									
National unemployment rate *(4.3-24.9)*	-0.011	-1.51	-3.03***	4.5E-03	1.46	1.98**	-2.9E-03	-1.77	-2.04**
Demographic characteristics									
Female [a]	-0.059	-8.30	-4.39***	0.050	16.3	4.77***	-0.032	-19.2	-4.85***
Immigrant [a]	-0.049	-6.98	-2.64***	-3.8E-05	-0.012	0.00	2.5E-05	0.015	0.00
Age (*18-65*)	0.018	2.60	4.79***	-0.015	-4.94	-4.61***	9.9E-03	5.98	4.57***
Age (squared)	-2.1E-04	-0.03	-4.82***	1.8E-04	0.06	4.69***	-1.2E-04	-0.07	-4.63***
Cohabiting [a]	-0.041	-5.75	-2.82***	0.038	12.6	3.35***	-0.027	-15.9	-3.19***
Number of children under 14	0.010	1.39	0.71	-0.011	-3.44	-0.95	7.0E-03	4.21	0.94
Health (1-5)	0.014	1.95	1.74*	-5.5E-03	-1.80	-0.84	3.6E-03	2.18	0.84
Ends meet (1-6)	0.024	3.43	4.91***	-0.031	-10.2	-7.53***	0.021	12.4	7.31***
Business sector dummies [b]	Yes			Yes					
Business sector-and-time fixed effects [c]	Yes			Yes					
Grouping variable [d]	Country-wave			Country-wave					
Intraclass correlation	17.2%			13.5%					
Log likelihood	-2,608.7			-8,812.6					

Notes: N = 5,700; Specification numbers refer to the particular exercise in the main document for which this robustness check is performed; Post-stratification and cross-national weights are used; For continuous variables, *dy/dx* captures absolute marginal effects whereas [(*dy/dx*)/*y*]% refers to marginal effects, but expressed in relative terms with respect to predicted probabilities. In the context of dummy variables, these reflects the impact for a discrete change of the dummy variable from 0 to 1; * $0.1 > p \geq 0.05$; ** $0.05 > p \geq 0.01$; *** $p < 0.01$; [a] Dummy variable; [b] 9 business sector dummies are used (*ref.* Construction). See the Appendix in the main document for a definition; [c] 9 variables of the type 'business sector dummy * wave 15 dummy' are used.; [d] An indicator for 70 pairs country-wave is used as our grouping variable; The maximum correlation is 0.54 (between age and tenure), and the VIFs values (from specification 2) range from 1.04 to 2.14. Thus, multicollinearity does not pose a concern, especially in consideration of the large size of our sample; Data source: EWCS 2010, 2015.

Table A11. Determinants of net monthly earnings –*Weighted multilevel linear regressions*–

# Specification	5		6		7		8		9	
Predicted earnings (y) *–in PPP $ of 2015–*	2,597.3		2,596.5		2,596.3		2,596.9		2,596.9	
Independent variables (*x*)	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.	$\frac{dy/dx}{y}$%	t-stat.
Focal variable: ICT use frequency at work										
ICT use frequency at work (1-7)			1.19	2.43**	10.4	4.74***	-0.63	-1.05	0.09	0.06
ICT use frequency at work (squared)					-1.17	-4.30***				
1 Never [a] (*ref.*)										
2 Almost never [a]	6.96	2.18**								
3 Around ¼ of the time [a]	10.9	3.58***								
4 Around half of the time [a]	10.8	2.86***								
5 Around ¾ of the time [a]	13.7	3.20***								
6 Almost all of the time [a]	16.2	4.14***								
7 All of the time [a]	4.69	1.47								
Occupational status										
SEwE [a]	26.8	13.0***	27.7	13.5***	26.9	13.1***	9.65	2.55**	21.1	3.23***
IOA [a] (*ref.* for specif. 5-8)									11.5	1.90*
DSEW [a] (*ref.* for specif. 9)	-8.04	-2.13**	-9.04	-2.40**	-8.23	-2.19**	-11.5	-1.90*		
Interaction terms										
SEwE x ICT use frequency at work							5.14	5.66***	4.43	2.60***
IOA x ICT use frequency at work									-0.72	-0.44
DSEW x ICT use frequency at work							0.72	0.44		
Educational attainment										
Basic education [a] (*ref.*)										
Secondary education [a]	36.9	9.56***	38.2	9.90***	36.9	9.55***	38.7	10.1***	38.7	10.1***
Tertiary education [a]	59.6	13.9***	61.1	14.3***	59.5	13.9***	61.9	14.5***	61.9	14.5***
Job tenure										
Tenure *(1-53)*	2.19	6.69***	2.23	6.83***	2.21	6.75***	2.15	6.58***	2.15	6.58***
Tenure (squared)	-0.03	-3.39***	-0.03	-3.54***	-0.03	-3.43***	-0.03	-3.37***	-0.03	-3.37***
Working hours (*15-98*)	3.28	11.0***	3.29	11.0***	3.28	11.0***	3.28	11.0***	3.28	11.0***
Working hours (squared)	-0.03	-8.59***	-0.03	-8.63***	-0.03	-8.60***	-0.03	-8.56***	-0.03	-8.56***
Wave										
2010 [a] (*ref.*)										
2015 [a]	-0.64	-0.32	-4.78	-0.52	-5.07	-0.56	-5.17	-0.56	-5.17	-0.56
Business cycle										
National unemployment rate *(4.3-24.9)*	-3.52	-4.48***	-3.61	-4.52***	-3.51	-4.47***	-3.64	-4.52***	-3.64	-4.52***
Demographic characteristics										
Female [a]	-25.6	-11.9***	-25.5	-11.8***	-25.5	-11.9***	-25.8	-12.0***	-25.8	-12.0***
Immigrant [a]	-7.42	-2.50**	-7.91	-2.67***	-7.43	-2.51**	-7.51	-2.54**	-7.51	-2.54**
Age (*18-65*)	1.79	2.61***	1.85	2.69***	1.79	2.61***	1.79	2.61***	1.79	2.61***
Age (squared)	-0.02	-2.56**	-0.02	-2.65***	-0.02	-2.57**	-0.02	-2.56**	-0.02	-2.56**
Cohabiting [a]	2.37	0.97	2.26	0.92	2.32	0.95	2.62	1.07	2.62	1.07
Number of children under 14	-1.61	-0.70	-1.86	-0.81	-1.75	-0.76	-1.94	-0.84	-1.94	-0.84
Health (1-5)	7.20	5.55***	7.43	5.72***	7.24	5.59***	7.84	6.05***	7.84	6.05***
Business sector dummies [b]	Yes		Yes		Yes		Yes		Yes	
Business sector-and-time fixed effects [c]	Yes		Yes		Yes		Yes		Yes	
Grouping variable [d]	Country-wave		Country-wave		Country-wave		Country-wave		Country-wave	
Intraclass correlation	22.9%		22.9%		22.9%		22.9%		22.9%	
Log likelihood	-5,769.0		-5,773.4		-5,770.0		-5,754.9		-5,754.9	

Notes: N = 5,700; Specification numbers refer to the particular exercise in the main document for which this robustness check is performed; Post-stratification and cross-national weights are used. Our dependent variable is the natural logarithm of monthly net earnings. Accordingly, we interpret the regression coefficients as semi-elasticities in the form of [(*dy*/*dx*)/*y*]%., i.e., they show the percentage changes of earnings caused by unit changes of the respective explanatory variables. In the context of dummy variables, these reflects the impact for a discrete change of the dummy variable from 0 to 1; * $0.1 > p \geq 0.05$; ** $0.05 > p \geq 0.01$; *** $p < 0.01$; [a] Dummy variable; [b] 9 business sector dummies are used (*ref*. Construction). See the Appendix in the main document for a definition; [c] 9 variables of the type 'business sector dummy * wave 15 dummy' are used.; [d] An indicator for 70 pairs country-wave is used as our grouping variable; The maximum correlation is 0.55 (between age and tenure), and the VIFs values (from specification 5) range from 1.03 to 1.78. Thus, multicollinearity does not pose a concern, especially in consideration of the large size of our sample; Data source: EWCS 2010, 2015