Decomposing the Effects of Digitalization on Workers' Job Satisfaction

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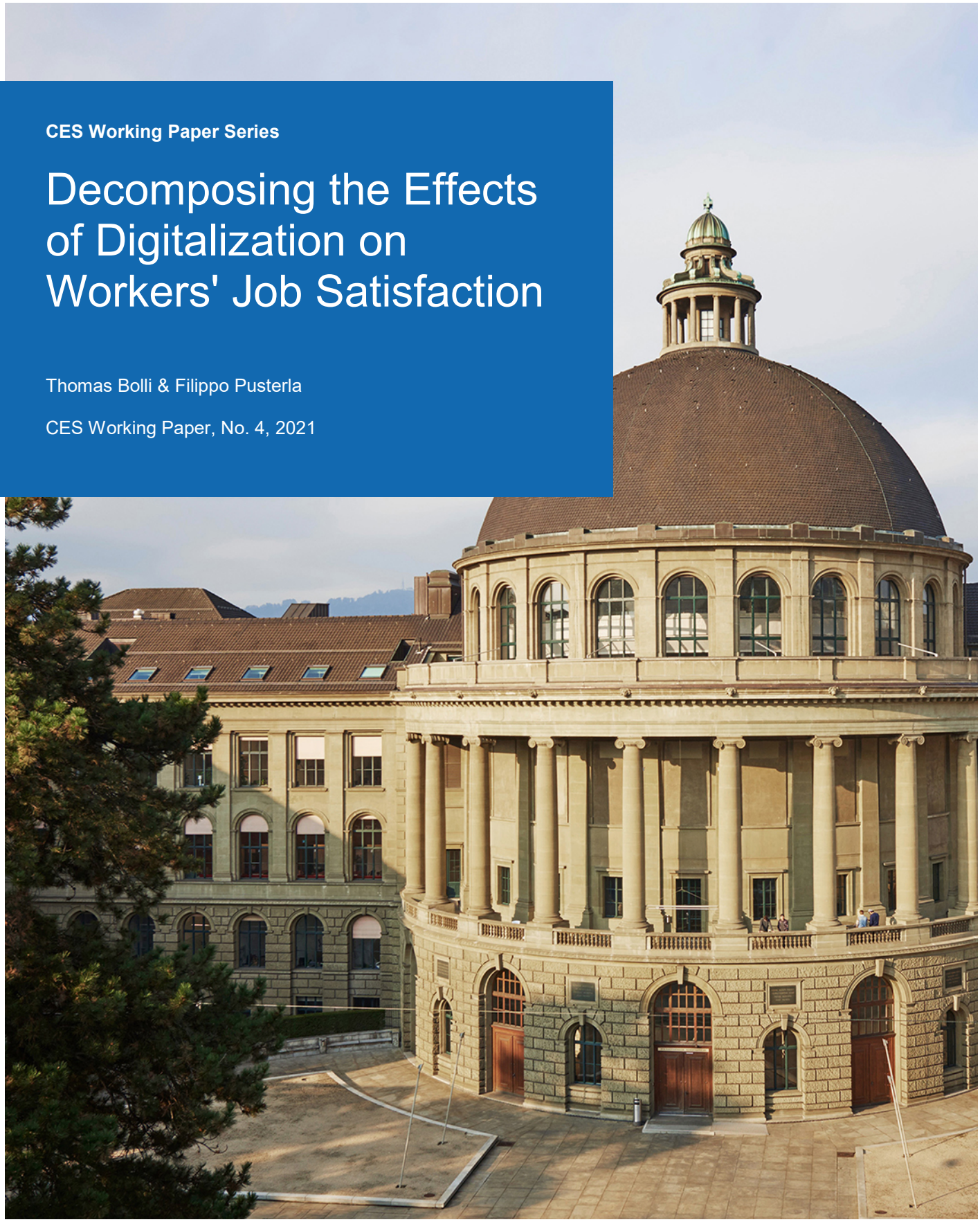

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Thomas Bolli & Filippo Pusterla

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Decomposing the Effects of Digitalization on Workers' Job Satisfaction*

Thomas Bolli & Filippo Pusterla‡

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Abstract

This paper provides a conceptual framework for analyzing the importance of the multiple channels through which digitalization affects job satisfaction. Our framework investigates four distinct groups of channels allowing digitalization to shape job satisfaction: change in time use, creation of new activities, access to information, and adoption of communication tools. Using graduates of professional education and training colleges in Switzerland as a case study, we investigate the relative strength of the channels through which digitalization affects job satisfaction. We find that digitalization increases job satisfaction mainly through the creation of new activities, specifically by increasing productivity and making work more interesting. Our results further suggest that among the channels negatively affecting job satisfaction, increase of time pressure and worsening of work-life balance are much more important than the threat of losing one's job. Furthermore, we present evidence on the heterogeneity of these results across gender, age, management position, and field of study.

JEL-Classification: J28, O33

Keywords: digitalization, job satisfaction.

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1 Introduction

Digitalization is the rapidly growing sociotechnical phenomenon of adopting information and communication technologies (ICT) (Legner et al., 2017). Most of the economic literature analyzing the labor market effects of digitalization focuses on the number of jobs that new technologies replace (e.g., Autor, 2015; Frey & Osborne, 2017; Acemoglu & Restrepo, 2018; Graetz & Michaels, 2018). Yet relatively little attention has been paid to the effects of ICT adoption on jobs not replaced by digitalization, with only limited evidence on the mechanisms through which digitalization affects workers' job satisfaction.

However, firms' ability to assess the way in which digitalization affects job satisfaction is crucial, because understanding through which channels digitalization affects workers' job satisfaction might help them better evaluate the introduction of new technologies. Likewise, workers' knowing how digitalization will affect their job satisfaction might help them to assess the consequences of increasingly diffuse work practices (e.g., home offices).

Theoretically, digitalization can affect workers' job satisfaction either positively (e.g., by decreasing the percentage of repetitive tasks and increasing that of interesting ones) or negatively (e.g., by increasing the level of stress or decreasing work-life balance). A growing body of literature at the intersection of economics and psychology suggests an overall positive effect of digitalization on workers' job satisfaction and well-being (e.g., McMurtrey et al., 2002; Salanova et al., 2004; Golden & Veiga, 2005; Day et al., 2010; Limbu et al., 2014). However, no study looking at how digitalization might affect job satisfaction has yet examined more than one channel through which that effect might operate. For example, Moqbel et al. (2013) highlight the role of social networks in increasing workers' job satisfaction, while Martin & Omrani (2015) show that information technology use positively affects job satisfaction due to an increase in labor productivity. Thus far, no paper systematically identifies and assesses the multiple channels through which digitalization affects job satisfaction.

This paper provides a comprehensive framework of the channels through which digitalization may affect job satisfaction. In all channels, digitalization affects job satisfaction by first changing some characteristic of the job itself, and then that change impacts the worker's satisfaction. Therefore, all of the channels through which digitalization might affect job satisfaction are changes in job characteristics caused by digitalization. Castellacci & Tveito (2018) argue that digitalization shapes workers' job characteristics in four main ways: change in time use, creation

of new activities, access to information, and use of communication tools. We further subdivide these broad dimensions into 10 specific ways that digitalization affects job characteristics. Based on the existing evidence, we formulate hypotheses on how the 10 channels affect job satisfaction.

Specifically, we hypothesize that digitalization decreases job satisfaction by increasing time pressure at work, by increasing the fear of losing one's job, by deteriorating work-life balance, and by smoothing the transition between working hours and leisure time. Conversely, we hypothesize that digitalization increases job satisfaction by making work more interesting, by reducing the proportion of repetitive tasks, by increasing productivity, and by increasing autonomy at work. Furthermore, we hypothesize that digitalization also increases job satisfaction by making forms of working more flexible and by simplifying interactions with colleagues and superiors.

We empirically test our hypotheses by using a survey conducted among students and graduates of professional education and training (PET) colleges in Switzerland in 2019. Beyond general information on workers, our survey contains specific questions on digital transformation in the workplace, including asking respondents to evaluate statements about the effects of digitalization on different job characteristics and to self-assess the effect of digitalization on their job satisfaction. Having information on both the total effect of digitalization on job satisfaction and the effect of digitalization on single job characteristics allows us to assess the relative importance of the channels through which digitalization affects job satisfaction.

Our results suggest that digitalization increases job satisfaction among PET graduates by increasing work productivity, making work more interesting, fostering interactions with coworkers and supervisors, increasing workers' autonomy, and allowing flexible forms of work. Furthermore, our results suggest only a moderate negative effect of digitalization on job satisfaction through an increase in time pressure. However, we find that digitalization negatively affects job satisfaction by worsening work-life balance but not by smoothing the transition between working hours and leisure time. Finally, our estimates provide no evidence that digitalization positively affects job satisfaction by reducing repetitive tasks. Although the widespread notions that the fear of losing one's job to digitalization negatively affects job satisfaction is confirmed, it remains small in magnitude in our sample.

Furthermore, heterogeneity analyses on subset of workers suggest that the worsening of the work-life balance is more relevant for men, for workers aged more than 35 years (roughly the average age in our sample), for workers with an executive position, and for workers whose field of study is technology-related. For the interestingness of work, we find a larger effect for males

and for workers er than 35. In contrast, the effect that digitalization has on job satisfaction through an increase in autonomy is lower for women, for young workers, and for workers who did not study in technology-related fields. In terms of productivity, we find that digitalization is more beneficial for women, for older workers, for workers without an executive position, and for workers who did not study in technology-related fields. Finally, the positive effect that digitalization has on job satisfaction by simplifying interactions with colleagues and superiors is larger for non-executive workers than for executives.

This paper contributes both theoretically and empirically to the current debate on the impact of digitalization on job satisfaction. We first build a comprehensive framework of the channels identified in the literature and formulate hypotheses for each of these channels. Second, we provide empirical evidence on the relative importance that these channels have in explaining the effect of digitalization on workers' job satisfaction.

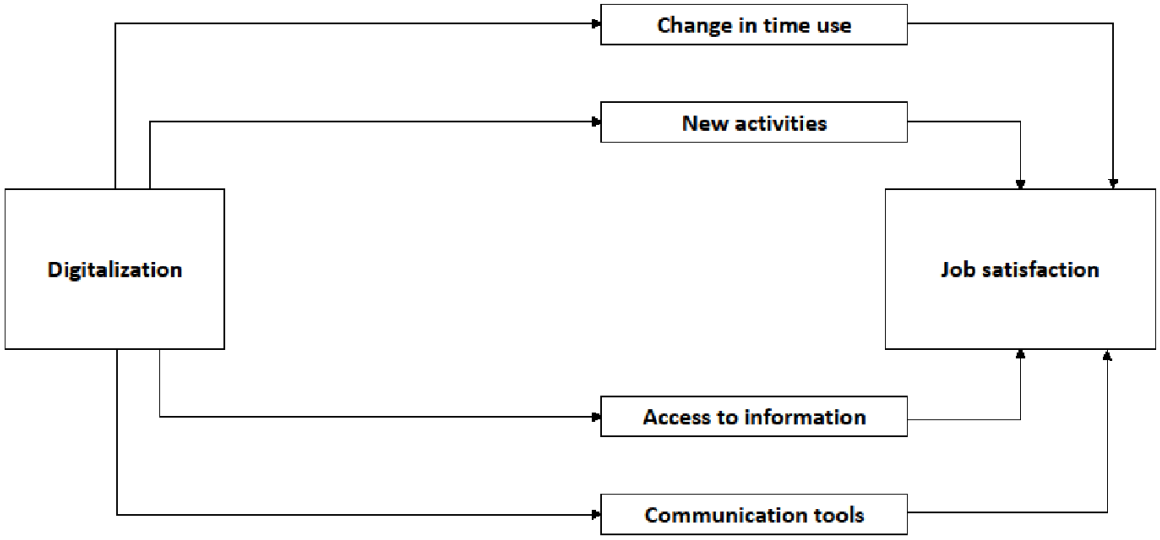
The rest of the paper is organized as follows. Section 2 presents the conceptual framework of the study and derives the hypotheses. Section 3 explains the estimation strategy, and Section 4 describes the data set. Section 5 presents the results and discusses the heterogeneity across workers. Section 6 concludes and discusses implications for future research.

2 Theoretical Framework and Hypotheses

A growing body of literature at the intersection of economics and psychology suggests a positive relationship between digitalization and workers' job satisfaction (e.g., McMurtrey et al., 2002; Salanova et al., 2004; Golden & Veiga, 2005; Day et al., 2010; Limbu et al., 2014; Martin & Omrani, 2015). However, no study in this literature has yet analyzed the channels through which digitalization affects job satisfaction in a comprehensive framework. To fill this gap, this paper decomposes the effects of digitalization on workers' job satisfaction into different channels and assesses their importance relative to one another.

To identify the channels through which digitalization affects job satisfaction, we use Castellacci & Tveito's (2018) theoretical model, which groups these channels into four distinct dimensions, which Figure 1 shows. First, while digitalization increases efficiency and frees up time, it can make some occupations obsolete. Thus, digitalization has an effect on job satisfaction through the "change in time use" dimension. Second, digitalization can create new activities that provide both security and personal control, in turn leading to a positive effect on job sat-

Figure 1: Dimensions through which digitalization affects job satisfaction



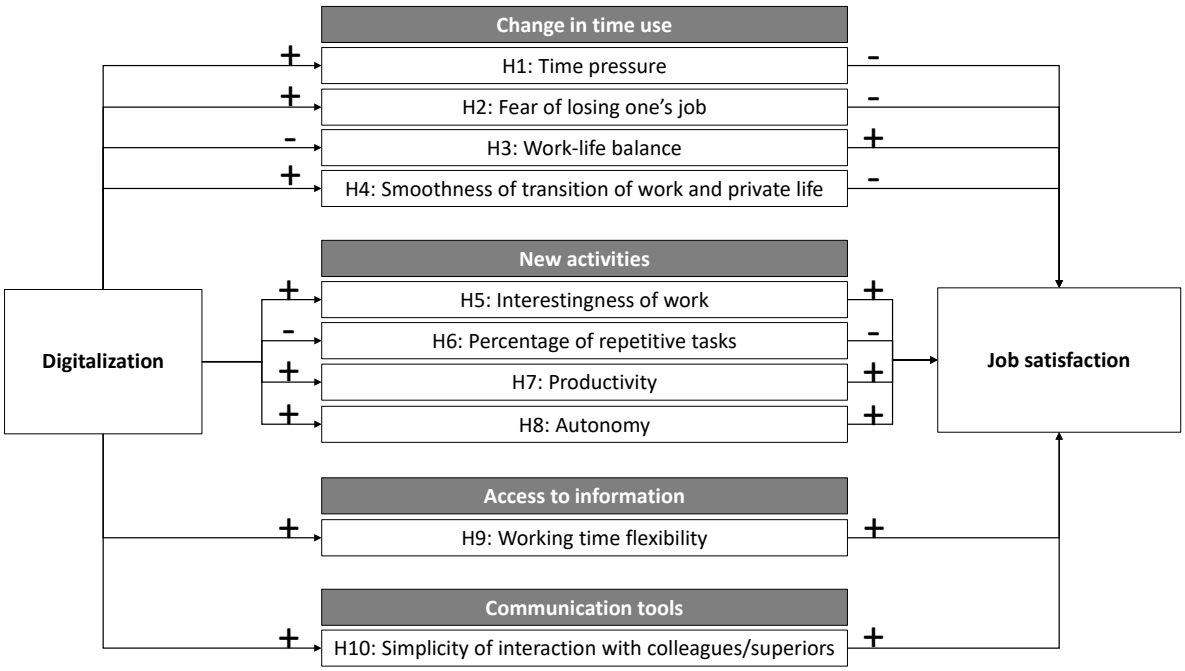
Source: Authors' depiction based on Castellacci & Tveito (2018)

isfaction and well-being. Digitalization has thus an effect on job satisfaction through the "new activities" dimension.

Third, digitalization enables individuals to obtain, access, process, and archive information much more systematically and rapidly than previously possible. Easier information access improves quality of work and eventually workers' job satisfaction. Digitalization thus has an effect on job satisfaction through the "access of information" dimension. Fourth, while digitalization increases the opportunities for communication and eventually fosters social capital and knowledge sharing, it also distracts workers and reduces their efficiency. Digitalization thus has an effect on job satisfaction through the "communication tools" dimension.

To understand the mechanisms through which digitalization affect workers' job satisfaction, we subdivide Castellacci & Tveito's (2018) four-dimensional theoretical model into 10 specific channels. Each of these describes one job characteristics affected by digitalization, and the changes in job characteristics drive changes in workers' job satisfaction. Specifically, we consider the following 10 job characteristics affected by digitalization as channels through which digitalization affects job satisfaction: Time pressure, fear of losing one's job, work-life balance, smoothness of transition between work and private life, interestingness of tasks, productivity, autonomy, working time flexibility, and the simplicity of interaction with colleagues and superiors. For simplicity, hereafter we refer to the effect that digitalization has on job satisfaction

Figure 2: Summary of hypotheses



through a job characteristic as "channels". A channel describes thus digitalization's effect on job satisfaction via a change in a specific job characteristic.

Figure 2 previews the hypotheses that we propose in this paper. The 10 job characteristics are grouped according to the four dimensions developed by Castellacci & Tveito (2018). The left side shows the hypothesized effect of digitalization on the 10 job characteristics (e.g., the effect of digitalization on time pressure at work). The right side displays the hypothesized effect of the 10 job characteristics on job satisfaction (e.g. the effect of time pressure at work on job satisfaction). The combination of these effects yields the effect of digitalization on job satisfaction for each job characteristic and, therefore, each channel.

By formulating our hypotheses, we refer on the entire sample and refrain from refining them according to workers' individual characteristics. Nevertheless, in Section 5.2 we present and discuss the heterogeneity of our results according to gender, age, management position, and field of study.

Change in Time Use

The dimension change in time use includes four channels (in our model, 1-4): time pressure, fear of job loss, work-life balance, and transition smoothness between work and private life. The

first channel, time pressure, captures the possibility that digital technologies at work can expose employees to working under pressure, having frequent tight deadlines resulting from electronic workflows, and lacking sufficient time for carrying out daily tasks (Agypt & Rubin, 2012). These conditions create "technostress", which Tarafdar et al. (2010) define as the psychological effects stemming from the inability to cope with computer or software use at work. A large literature shows that technostress negatively affects job satisfaction (e.g., Tarafdar et al., 2007; Ragu-Nathan et al., 2008; Ayyagari et al., 2011). We therefore hypothesize as follows:

H1: Digitalization decreases job satisfaction by increasing time pressure at work.

The second channel, fear of job loss, captures the likelihood that digitalization will make certain jobs obsolete (Rotman, 2013; Autor, 2014 & 2015). Research shows that the perception of job insecurity is an important factor in stress (Hartley et al., 1990), which is negatively related to job satisfaction (Reisel et al., 2010). We therefore hypothesize as follows:

H2: Digitalization decreases job satisfaction by increasing the fear of losing one's job.

The third channel, work-life balance, captures the deterioration of work-life balance created by digitalization (Nam, 2014). The literature suggests that a worse work-life balance negatively affects subjective job satisfaction (Gallie & Russell, 2009; Scandura & Lankau, 1997). We therefore hypothesize as follows:

H3: Digitalization decreases job satisfaction by deteriorating the work-life balance.

The fourth channel, transition smoothness between work and private life, captures digitalization's allowing a smoother transition between working hours and leisure time (Boswell & Olson-Buchanan, 2007). A smoother transition between the two can have negative consequences for job satisfaction, for example, by exacerbating the work-family conflict (Boswell & Olson-Buchanan, 2007). We therefore hypothesize as follows:

H4: Digitalization decreases job satisfaction by smoothing the transition between working hours and leisure time.

New Activities

The dimension new activities includes four channels (in our model, 5-8): interestingness of tasks, percentage of repetitive tasks, productivity, and autonomy. The first of these channels (i.e., the

fifth channel), interestingness of tasks, captures the way in which digitalization leads to the creation and development of new working activities and tasks (Carlsson, 2004). These new activities often require specific skills, provide physical security, and increase personal control, all factors that are positive for job satisfaction (Warr, 2003; Castellacci & Viñas-Bardolet, 2019). We therefore hypothesize as follows:

H5: Digitalization increases job satisfaction by making work more interesting.

The sixth channel, percentage of repetitive tasks, captures the effect of digitalization in reducing the proportion of repetitive tasks and physically straining labor (Acemoglu & Autor, 2011). Such a reduction allows workers to allocate more time to more rewarding activities (Askenazy & Caroli, 2010), an outcome that, in turn, has a positive effect on workers' job satisfaction (Melamed et al., 1995; Kristensen & Johansson, 2008). Nevertheless, the introduction of new tasks might also increase the level of job stress, in turn negatively influencing job satisfaction (Konradt et al., 2003; Morris & Venkatesh, 2010). However, Castellacci & Viñas-Bardolet (2019) suggest that the effect of a reduction in repetitive tasks on job satisfaction is particularly positive for white-collar workers. As the survey sample in this paper consists of tertiary-educated workers, we favor the argument of more rewarding activities. We thus formulate the following hypothesis:

H6: Digitalization increases job satisfaction by reducing the proportion of repetitive tasks.

The seventh channel, productivity, shows that digitalization allows more productive activities (Brynjolfsson & McAfee, 2011). Activities that are more productive imply higher wages (all else being equal), which in turn lead to higher job satisfaction (D'Addio et al., 2007; Castellacci & Viñas-Bardolet, 2019). We therefore hypothesize as follows:

H7: Digitalization increases job satisfaction by increasing productivity.

The eighth channel, autonomy, captures the effect of digitalization on employees' autonomy at work. Mazmanian (2013) provides evidence that digital devices do not limit workers' discretion, freedom, or authority but instead enhance their autonomy. Bloom et al. (2014) further suggest that ICT makes accessing information less expensive, thereby giving workers more autonomy and a wider span of control. ICT thus acts as a decentralizing force that allows workers to handle situations more autonomously. Furthermore, the literature shows that workers with

a higher degree of autonomy are typically more satisfied (Golden & Veiga, 2005; Lopes et al., 2014). We therefore hypothesize as follows:

H8: Digitalization increases job satisfaction by increasing autonomy at work.

Access to Information

The dimension access to information has only one channel (in our model, 9). This ninth channel, working time flexibility, captures the way digitalization improves employees' access to information, with an increasing number of tasks no longer requiring a specific workstation (Popma, 2013). Workplace-independent access to information enables more flexible working time (Duxbury et al., 2007), and Raziq & Maulabakhsh (2015) show that flexible working hours increase job satisfaction. Similarly, Kelliher & Anderson (2010) find that flexible workers report higher levels of job satisfaction than their non-flexible counterparts. We therefore hypothesize as follows:

H9: Digitalization increases job satisfaction by making forms of working more flexible.

Communication Tools

The dimension communication tools has only one channel (in our model, 10). This tenth channel, simplicity of interaction with colleagues and superiors, captures digitalization's simplifying the interactions between individuals. For example, Koku et al. (2001) highlight the positive effect of the Internet in facilitating and maintaining off-line relationships. Zhao (2006) finds that individuals using the Internet for interpersonal contact usually have more social ties than those who do not. Furthermore, digital technologies also simplify workplace interaction. Moqbel et al. (2013) focus on the role of social networking sites (SNS), which are web-based services that allow workers to build social networks or relationships with other people. They find that the use of SNS at work increases organizational commitment and job satisfaction.

In a sample covering 13 countries, Amichai-Hamburger & Hayat (2011) investigate the influence of Internet use on social interactions, finding that Internet usage is positively correlated with the socially related interactions of people in the same profession. In turn, simplified interactions with colleagues and superiors increase workers' job satisfaction (Pincus, 1986; Warr, 2003). Additionally, Intranet use at work has been found to positively affect the sharing of internal knowledge within a firm (Hendriks, 1999), and knowledge sharing improves social capital

(Huysman & Wulf, 2006) and increases work quality (Haas & Hansen, 2007), in turn increasing job satisfaction (Requena, 2003).

Nevertheless, some recent studies also show that the use of communication tools at work (e.g., Facebook) can have negative effects on productivity, in turn negatively affecting workers' morale and job satisfaction (Brooks, 2015). However, despite these new contradictory results, we favor the argument of enhanced communication because more largely documented by the literature. We therefore hypothesize as follows:

H10: Digitalization increases job satisfaction by simplifying worker interactions with colleagues and superiors.

3 Empirical strategy

This section presents the empirical strategy we use to assess the relative importance of the channels through which digitalization affects job satisfaction. To do so, we start by presenting a structural model and discussing the challenges that such an approach could pose. We then apply a reduced form model, which allows us to test our hypotheses and poses fewer challenges to both measuring digitalization intensity and assessing job satisfaction.

3.1 Structural Model

Identifying the influence of each channel in a structural model requires estimating multiple equations. First, we need to estimate the effect of digitalization on 10 job characteristics for worker i as represented by the following system of equations:

$$Job\ Characteristic_i^c = \phi_c + \theta_c\ Digitalization_i + \vartheta_c\ X_i + \tau_{ci} \tag{1}$$

where $Digitalization_i$ stands for the digitalization of worker i's job, X_i is a vector of other variables that affect job satisfaction of worker i, and τ is the error term.

Second, the structural model contains an estimation of the relationship between the 10 job characteristics c and the job satisfaction of worker i:

$$Job\ Satisfaction_i = \alpha + \sum_{c=1}^{10} \beta_c Job\ Characteristic_i^c + \eta\ X_i + \vartheta_i \tag{2}$$

where β_c reflects the impact of job characteristic c on job satisfaction. The vector X is defined as above, while ϑ is the error term.

However, estimating this structural model faces a number of challenges in terms of measuring the variables in equations 1 and 2. An empirical challenge involves the difficulty in measuring digitalization. The literature often measures digitalization by counting the number of computer or digital devices (Caselli & Coleman, 2001). Nevertheless, the stock of computers measures digitalization imperfectly, because it measures only the availability of computers, not their effective use by workers. Therefore, we apply a reduced form model, which allows us to identify the relative importance of each channel.

3.2 Reduced Form Model

Inserting equation 1 into equation 2 and taking the first derivative with respect to digitalization yields the following reduced form:

$$\omega_i = \frac{\partial Job\ Satisfaction_i}{\partial Digitalization_i} = \sum_{c=1}^{10} \beta_c \theta_{ci} + \epsilon_i \tag{3}$$

where ω_i is the partial derivative of job satisfaction with respect to digitalization. θ_c denotes the effect of digitalization on job characteristic c. β_c reflects the impact of job characteristic c on job satisfaction.

We operationalize ω_i by asking respondents how strongly digitalization affects his or her job satisfaction, measured on a five-point Likert scale. Similarly, we operationalize θ_c by asking respondents to assess the impact of digitalization on the corresponding job characteristic c. We thus estimate via OLS the following equation:

$$\widetilde{\omega_i} = \sum_{c=1}^{10} \beta_c \widetilde{\theta_{ci}} + \gamma \widetilde{X_i} + \epsilon_i \tag{4}$$

where the superscript $\widetilde{}$ describes parameters that have been self-assessed by respondents. This equation also account for other workers' characteristics that might affect job satisfaction but are unrelated to digitalization. Specifically, $\widetilde{X_i}$ is a vector of control variables, a vector with the following worker characteristics: age, age^2, $gender$, a dummy for an executive position, 8 dummies for the field of study, and 13 dummies for the industry. Finally, the identification of β assumes that job characteristics c are orthogonal to any other potential characteristics through which digitalization affects job satisfaction. To account for this potential source of omitted

variable bias, $\widetilde{X_i}$ further includes a variable that captures how strongly respondents assess the impact of digitalization on their job in the previous year, measured on a five-point Likert scale. ϵ is the error term that is estimated robust.

Estimating equation 4 via OLS yields estimates for the impact of job characteristic c on job satisfaction. To analyze the effect of digitalization on job satisfaction, we multiply for each worker characteristic c the estimated $\widehat{\beta_c}$ with the corresponding $\widetilde{\theta_c}$. While the calculation of $\widehat{\beta_c}\widetilde{\theta_c}$ is straightforward, its interpretation is far from trivial. Indeed, this measure combines the effect of job characteristic c on job satisfaction ($\widehat{\beta_c}$) and the extent to which workers agree with their survey assessment of the impact of digitalization on this job characteristic ($\widetilde{\theta_c}$). Therefore, to simplify the interpretation, we decompose the overall goodness of fit R^2 into the explanatory power of individual regressors. The decomposition of R^2 translates into the importance of the different regressors by giving a measure that is more easily interpreted.

One convenient measure for decomposing the overall goodness of fit is the Shapley value (Shapley, 1953), which computes the contribution of a single variable to the goodness-of-fit of a statistical model. Assume, for example, a full regression model with k explanatory variables (x_1,x_2, ..., x_k). According to Huettner et al. (2012), to calculate the contribution of each variable, we need to estimate all possible submodels derived by the permutation of the regressors. Mathematically, to calculate the contribution of a given regressor j we need to estimate the same number of submodels as the number of permutations ($K!$) of k regressors:

$$R_j^2 = \frac{1}{K!} R^2(f(x_j^\mu, x_j)) - R^2(f(x_j^\mu)) \tag{5}$$

where μ maps all $K!$ variable permutations. By subtracting the R^2 of the model not including x_j from the R^2 of the model including x_j and all regressors preceding x_j in that particular order (x_j^μ), we obtain the Shapley value, which measures j's average marginal contribution to R^2 across all possible permutations.

4 Data and description of variables

The data stems from the ODEC Salary Survey conducted as an online survey among students and graduates of Swiss professional education and training (PET) colleges in 2019. This formal vocational tertiary education at level 6 of the ISCED-2011 classification takes from two to four years, depending on the PET college and on whether the education is full-time or part-time.

While students account for about 10% of the sample and have a response rate of about 20%, graduates account for the remaining 90%, with a response rate of about 11%[1].

Table 1 shows the summary statistics of variables used in the estimation. The dependent variable measures the influence of digitalization on job satisfaction on a five-point Likert scale (1="less satisfied"; 3="no change"; 5="more satisfied"). The mean of 3.47 suggests that digitalization on average increases job satisfaction of workers with a PET college diploma. This persistent positive effect of digitalization on workers' job satisfaction—in line with the findings in literature (e.g., McMurtrey et al., 2002; Salanova et al., 2004; Golden & Veiga, 2005; Day et al., 2010; Limbu et al., 2014; Martin & Omrani, 2015)—needs cautious interpretation, because it is specific to the subsample in this paper.

Breakdowns of the dependent variable by gender, age, management position, and field of study yield values above 3, suggesting an overall positive effect of digitalization on job satisfaction. Nevertheless, some differences are noteworthy. Men report a larger positive effect of digitalization on job satisfaction than women. Additionally, workers younger than age 35 also report higher levels of job satisfaction than do older workers. We also observe small differences between workers in executive positions, who report a slightly larger positive effect than non-executive workers. Finally, across fields of study, we find that workers in the fields of social work and adult education report almost no change in digitalization-induced job satisfaction, whereas workers from the fields of arts and business administration report a relatively large positive effect.

The main explanatory variables capture, on a five-point Likert scale, to what extent respondents agree with statements about the impact of digitalization on the 10 job channels through which we hypothesize that digitalization affects job satisfaction (1="I don't agree at all"; 5="I fully agree"). The results suggest that the strongest effect of digitalization lies in increasing productivity (3.65), followed by simplifying interactions with colleagues and superiors (3.41) and making work more interesting (3.4). Moreover, we find an average effect in terms of an increase in more flexible forms of working time (3.25), a reduction in the proportion of repetitive tasks (3.24), an increase in time pressure (3.23), an increase in autonomy (3.15), and a smooth transition between working hours and leisure time (3.01). The least strong effects appear in terms of worsening work-life balance (2.72) and fear of losing one's job (1.94).

[1]Estimations based solely on graduates provides qualitatively similar results as those on the whole sample.

Table 1: Variables description

	N	Mean	SD	Min	Max
DEPENDENT VARIABLE					
Dig. affects my job satisfaction	3089	3.47	0.91	1	5
MAIN EXPLANATORY VARIABLES					
Dig. increases the time pressure at work	3089	3.23	1.18	1	5
Dig. puts my job at risk	3089	1.94	1.06	1	5
Dig. worsens the work-life balance	3089	2.72	1.18	1	5
Dig. leads to a smooth transition between working hours and leisure time	3089	3.01	1.2	1	5
Dig. makes my work more interesting	3089	3.4	1.09	1	5
Dig. reduces the proportion of repetitive tasks	3089	3.24	1.16	1	5
Dig. increases my productivity	3089	3.65	1.04	1	5
Dig. increases my autonomy at work	3089	3.15	1.06	1	5
Dig. enables more flexible forms of working time	3089	3.25	1.35	1	5
Dig. simplifies interactions with colleagues and superiors	3089	3.41	1.11	1	5
CONTROL VARIABLES					
How strongly does Dig. affect the work over the last year?	3089	3.44	1.14	1	5
Women	3089	0.19	0.4	0	1
Age	3089	35.7	9.65	20	72
Executive (dummy for being firm's board director or member of management)	3099	0.29	0.45	0	1
Field of study					
Agronomy	3089	0.01	0.1	0	1
Catering	3089	0.05	0.22	0	1
Health	3089	0.06	0.25	0	1
Arts	3089	0.01	0.1	0	1
Social work and adult education	3089	0.04	0.19	0	1
Technology	3089	0.66	0.47	0	1
Business administration	3089	0.17	0.37	0	1
Industry					
Manufacturing	3089	0.33	0.47	0	1
Construction	3089	0.12	0.32	0	1
Wholesale and retail trade; repair of motor vehicles and motorcycles	3089	0.03	0.16	0	1
Transportation and storage	3089	0.03	0.17	0	1
Accommodation and food service activities	3089	0.04	0.2	0	1
Information and communication	3089	0.08	0.27	0	1
Financial and insurance activities	3089	0.05	0.21	0	1
Professional, scientific and technical activities	3089	0.06	0.25	0	1
Administrative and support service activities	3089	0.08	0.27	0	1
Public administration and defence; compulsory social security	3089	0.05	0.21	0	1
Education	3089	0.04	0.19	0	1
Human health and social work activities	3089	0.1	0.3	0	1
Other service activities	3089	0	0.06	0	1

If digitalization has only a moderate effect on a given job characteristic, we hardly identify the overall effect of digitalization on job satisfaction through this job characteristic, and thus independently on the effect that this job characteristic has on job satisfaction. Therefore, these results cast doubt on both hypotheses H3 and H5. However, these two low values do not necessarily mean that work-life-balance and the fear of losing one's job have no effect on job satisfaction. Instead, it means that digitalization does not affect them.

The control variables in the bottom part of Table 1 show that most respondents are male and between ages 20 and 72. The average age of respondents is about 36 years, meaning

that our sample is relatively young. About 30% hold executive positions, either as a member of a firm's board of directors or as part of management. The summary statistics show that about two-thirds of respondents chose technology-related field of study. About one sixth are in business administration, while the remaining sixth are subdivided among the other five fields. Finally, for the industry of activity, Table 1 shows that one third of the respondents are active in manufacturing. Moreover, financial and insurance activities, as well as human health and social work activities, represent a large portion of the sample.

A comparison between these summary statistics and the values collected by the Swiss Federal Statistical Office (SFO) through the Survey on Professional Education[2] suggests that our sample is not completely representative of the specific subgroup of workers having a degree from a PET college. Concretely, our sample overrepresents men and graduates in technology-related fields. Nevertheless, the average age at graduation in our sample is in line with the ones reported by of respondents is close to the one reported by the SFO.

5 Estimation Results

5.1 Main Results

The first three columns of Table 2 show the estimation results of the reduced form model presented in equation 4. In column (4) we report the average effect of digitalization on job characteristics, while in column (5) we multiply it with the estimated coefficients. Finally, in column (6) we show the Shapley values, which describe the contribution of each regressor in the goodness-of-fit of the estimation in column (3).

The estimations in the first three columns differ in terms of control variables, e.g., column (1) contains no control variables. Overall, the 10 characteristics explain about 34.5% of the total variance in the effect of digitalization on job satisfaction. Column (2) controls for individual characteristics, and column (3) further controls for the influence of digitalization on work in the preceding year. We find that these control variables have hardly any influence on the estimated coefficients. While the additional control variables increase the percentage of explained variance, they do so only slightly, to 37.9%.

[2] https://www.bfs.admin.ch/bfs/en/home/statistics/education-science/diploma/tertiary-advanced-professional-training.html

Table 2: Estimation results

	(1) $\widehat{\beta}_c$	(2) $\widehat{\beta}_c$	(3) $\widehat{\beta}_c$	(4) $\widetilde{\theta}_c$	(5) $\widehat{\beta}_c$*$\widetilde{\theta}_c$	(6) Percentage of Explained Variation
Dig. increases the time pressure at work	-0.0741***	-0.0683***	-0.0776***	3.23	-0.21	1.7
	(0.014)	(0.014)	(0.0139)			
Dig. puts my job at risk	-0.0312**	-0.0287**	-0.0343***	1.94	-0.067	0.52
	(-0.0147)	(-0.015)	(-0.0148)			
Dig. worsens the work-life balance	-0.102***	-0.0953***	-0.102***	2.72	-0.278	3.45
	(-0.0151)	(-0.015)	(-0.0148)			
Dig. leads to a smooth transition between working hours and leisure time	-0.0056	0.00145	0.00174	3.01	0.5	0.35
	(-0.0139)	(-0.0139)	(-0.0137)			
Dig. makes my work more interesting	0.165***	0.170***	0.155***	3.4	0.527	6.51
	(-0.0169)	(-0.0171)	(-0.0171)			
Dig. reduces the proportion of repetitive tasks	0.0138	0.0182	0.0193	3.24	0.063	1.22
	(-0.0137)	(-0.0137)	(-0.0136)			
Dig. increases my productivity	0.281***	0.271***	0.255***	3.65	0.928	11.01
	(-0.0177)	(-0.0177)	(-0.0179)			
Dig. increases my autonomy at work	0.0405**	0.0403**	0.0380**	3.15	0.119	1.94
	(-0.0167)	(-0.0167)	(-0.0164)			
Dig. enables more flexible forms of working time	0.0231**	0.0344***	0.0269**	3.25	0.087	1.48
	(-0.0119)	(-0.0122)	(-0.0122)			
Dig. simplifies interactions with colleagues and superiors	0.0595***	0.0541***	0.0548***	3.41	0.187	3.12
	(-0.0148)	(-0.0148)	(-0.0148)			
How strongly does Dig. affect the work over the last year?			0.112***		0.386	3.24
			(-0.0134)			
Worker characteristics		Yes	Yes			3.37
N	3089	3089	3089			
R^2 (%)	34.5	36.2	37.9			

Notes: Columns (1) to (3) reports the results of the OLS regression having as dependent variable the effect of digitalization on job satisfaction, which is measured on a five point Likert scale (1="less satisfied", 3="no change", 5="more satisfied"). Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. Worker characteristics is a vector of control variables as described in Table 1 plus industry dummies according to 1-digit NACE Rev. 2 classification. Column (4) shows $\widetilde{\theta}_c$, the average effect of digitalization on job characteristics as reported in Table 1. Column (5) multiplies the β_{OLS} from column (3) with the $\widetilde{\theta}_c$ from column (4). Column (6) reports the Shapley values, which describe the absolute contribution of each regressor in the goodness-of-fit of the estimation in column (3).

The coefficients of the OLS regression of column (3) test our hypotheses on the effect of each job characteristic on job satisfaction. The value for $\widehat{\beta}_c\widetilde{\theta}_c$ reported in column (5) and the Shapley values reported in column (6) allow us to quantify the importance of each channel.

We start by considering the channels of the dimension "time use". The OLS coefficient for time pressure at work is negative and statistically significant, suggesting that the increase in time pressure at work resulting from digitalization decreases job satisfaction. Column (4) reports the corresponding value of $\widetilde{\theta}_c$, the impact of digitalization on time pressure, which is average. Thus, as column (5) shows, $\widehat{\beta}_c$ $\widetilde{\theta}_c$ amounts to -0.25. Column (6) shows that the increase in time pressure due to digitalization accounts for about 1.7% of the total variance. This finding support hypothesis H1—that digitalization decreases job satisfaction through an increase in time pressure.

The second channel of the "time use" dimension is the fear of job loss. While OLS coefficients for the fear of losing one's job are also negative and statistically significant, they are lower than the coefficient for the increase in time pressure. Moreover, $\widetilde{\theta}_c$ is relatively low. Thus the resulting value of $\widehat{\beta}_c\widetilde{\theta}_c$ is particularly low. This channel explains about 0.5% of the overall variance. Nevertheless, we should not interpret this result as meaning that the fear of losing one's job has no effect on job satisfaction. Instead, in this case it means that digitalization has almost no effect on workers' job satisfaction in terms of that fear. Thus, while we confirm hypothesis H2—that digitalization decreases job satisfaction by increasing the fear of losing one's job—we find a relatively small effect magnitude for this channel in our sample. This finding, however, should be relativized given the relatively low unemployment probability of the sample consisting of workers with a degree from a PET college[3].

The third channel of the "time use" dimension is work-life balance. The large and negative OLS coefficient suggests that this channel has the strongest negative effect on job satisfaction of all 10 channels. However, as with the previous channel, the relatively low value of $\widetilde{\theta}_c$ reduces the value of $\widehat{\beta}_c\widetilde{\theta}_c$. Given that this channel explains about 3.4% of the total variance, we find that the relatively high value of $\widetilde{\theta}_c$ confirms hypothesis H3—that digitalization decreases job satisfaction by deteriorating the work-life balance.

The final channel in the "time use" dimension is the smoothness of transition between work and private life. The OLS coefficient for this channel is not statistically different from zero, and θ

[3]See the unemployment rate of workers with tertiary professional education `https://www.bfs.admin.ch/bfs/de/home/statistiken/bildung-wissenschaft/bildungsindikatoren/themen/wirkung/arbeitsmarktstatus.assetdetail.12527130.html`

remains relatively low. As the resulting $\widehat{\beta}_c\ \widetilde{\theta}_c$ is also close to zero, this channel explains less than 0.4% of the total variance. Thus, a smoother transition between working hours and leisure due to digitalization does not affect job satisfaction. Our findings therefore do not support hypothesis H4—that digitalization decreases job satisfaction by smoothing the transition between working hours and leisure time.

For the dimension "new activities", the OLS coefficient for the interestingness of work is positive and statistically significant. Given the high value of $\widetilde{\theta}_c$, the resulting $\widehat{\beta}_c\widetilde{\theta}_c$ is also high. This channel explains about 6.5% of the total variance. Our estimations thus support hypothesis H5—that the interestingness of work as a result of digitalization positively affects job satisfaction.

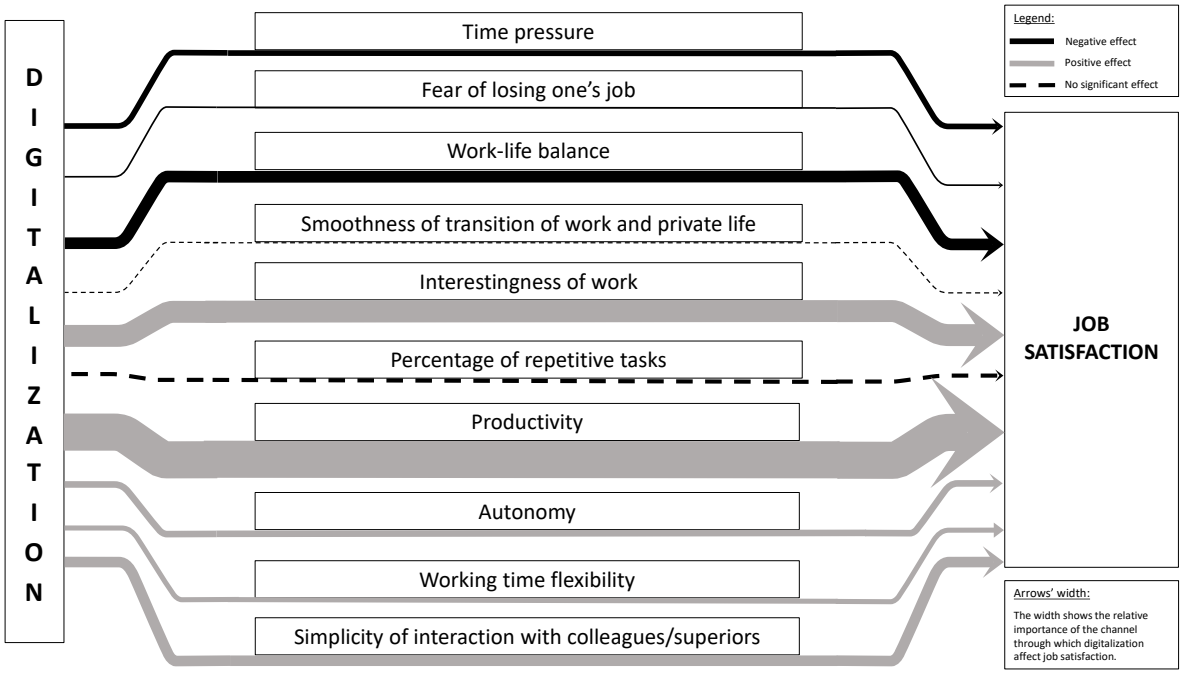
The second channel of the "new activities" dimension is percentage of repetitive tasks. The OLS coefficient for this channel is small and not statistically different from zero. Thus the resulting value of $\widehat{\beta}_c\widetilde{\theta}_c$ is low, even though $\widetilde{\theta}_c$ is relatively high. This channel explains about 1.2% of the total variance. Nevertheless, the low value of $\widehat{\beta}_c$ suggests that the reduction in the proportion of repetitive tasks as a result of digitalization does not markedly affect job satisfaction. Hypothesis H6—that digitalization increases job satisfaction by reducing the proportion of repetitive tasks—is thus not confirmed.

The third channel of the "new activities" dimension is productivity. The large and positive OLS coefficient suggests that this channel has the strongest effect on job satisfaction. Furthermore, this channel has the largest value of $\widetilde{\theta}_c$, meaning that digitalization affects workers' productivity particularly strongly. The combination of these two large values gives a very high value of $\widehat{\beta}_c\widetilde{\theta}_c$, showing the large contribution of this channel to explaining the effect of digitalization on job satisfaction. Indeed, this channel alone accounts for about 11% of the total variance. This result clearly supports hypothesis H7—that the increase in productivity caused by digitalization positively affects job satisfaction.

The fourth channel of the "new activities" dimension is autonomy. The OLS coefficient for the increase in autonomy is positive and statistically significant. However, the relatively low value of $\widehat{\beta}_c$ multiplied by an average value of $\widetilde{\theta}_c$ gives a relatively small value of $\widehat{\beta}_c\widetilde{\theta}_c$. This channel explains altogether about 1.9% of the total variance in the model, a finding suggesting that greater autonomy at work due to digitalization positively affects job satisfaction, and thus support hypothesis H8.

As for dimension "access to information", we observe that the OLS coefficient for the flexibility of working time is positive and statistically significant but relatively small. Given the

Figure 3: Summary of the results



Notes: This figure shows the relative importance of the 10 channels in explaining the impact of digitalization on workers' job satisfaction. The width of the arrows represents the relative importance of the channel. Black stands for channels with negative effects on job satisfaction. Grey represents a positive effect. A dashed arrow indicates that digitalization via this channel has no statistically significant effect on job satisfaction.

average value of $\widetilde{\theta_c}$, the resulting value of $\widehat{\beta_c}\widetilde{\theta_c}$ is relatively low. This indicator explains about 1.5% of the total variance. Therefore we find support for hypothesis H9, suggesting that more flexible forms of work stemming from digitalization increase job satisfaction.

For the coefficient of the dimension "communication tools", the OLS coefficient for the simplicity of interaction with colleagues and superiors is positive and statistically significant. Given the relatively high value of $\widetilde{\theta_c}$, the resulting $\widehat{\beta_c}\widetilde{\theta_c}$ is also relatively high. This channel explains about 3.1% of the overall variance, meaning that digitalization positively affects job satisfaction by simplifying interactions with colleagues and supervisors, and thus supports hypothesis H10. Figure 3 summarizes the main findings discussed thus far.

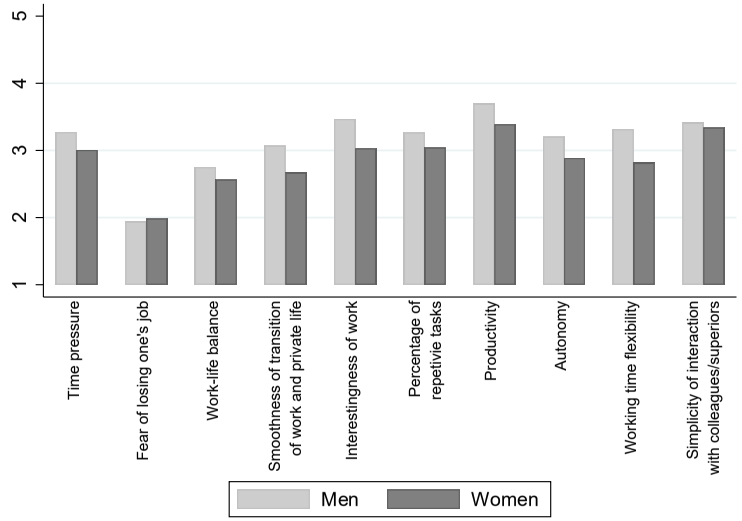
5.2 Heterogeneity Across Workers

By formulating the hypothesis in Section 2, we refer on the entire sample and refrain from refining them according to workers' individual characteristics. Nevertheless, the data offers information on workers' characteristics, which can be used to explore the heterogeneity of the results.

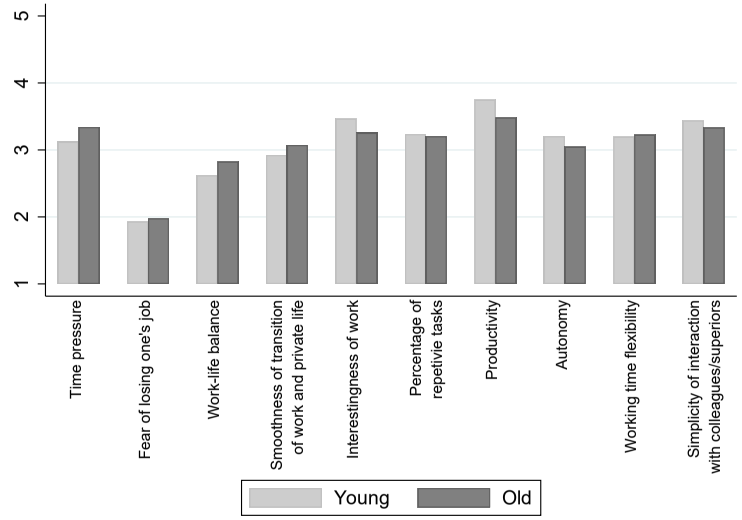
Figure 4 shows the effect of digitalization on the ten channels by subgroups of workers. In Sub-figure 4a we report the mean of women compared to men. This figure suggests that

Figure 4: Differences in the effect of digitalization on the channels across subgroups

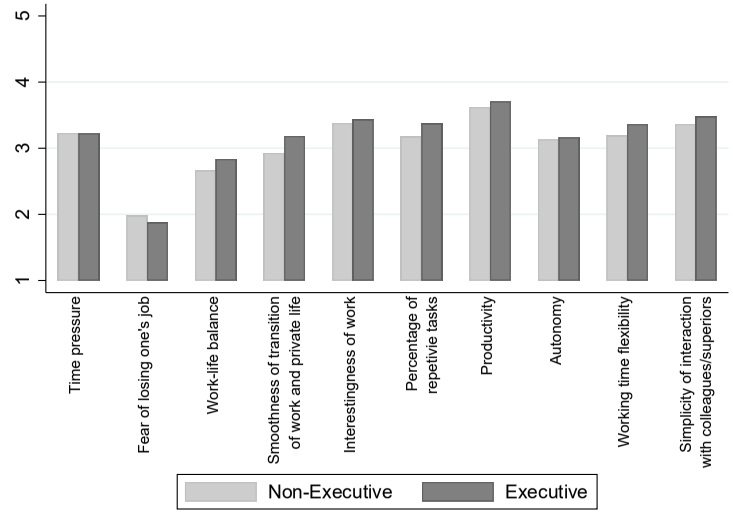
(a) Gender



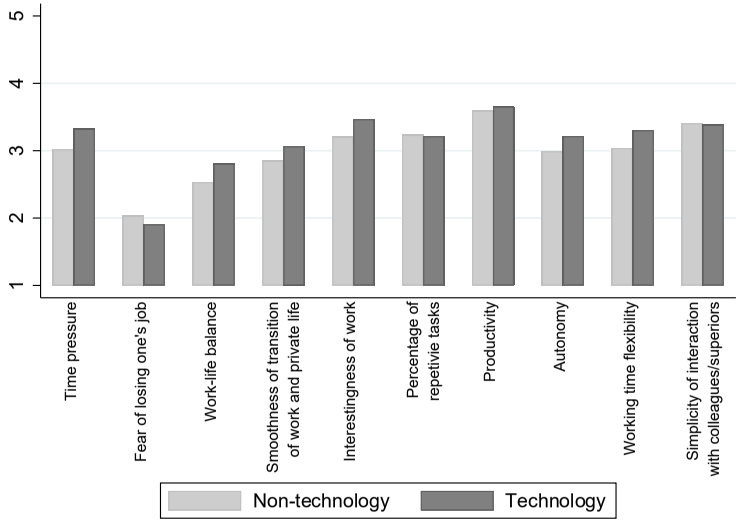
(b) Age



(c) Executive position



(d) Field of study



Notes: This figure shows θ_c, the effect of digitalization on the ten channels, across subgoups of workers. These variables reppresent on a five-point Likert scale to what extent respondents agree with statements about the impact of digitalization on each channel. (1="I don't agree at all"; 5="I fully agree")

digitalization affects job characteristics relatively less strongly for women. The only exceptions are the effects of digitalization on increasing the fear of job loss and the simplified interaction with colleagues or superiors. These two channels are equally affected across gender. This figure suggests thus an overall weaker impact of digitalization on women compared to men.

The situation is less clear-cut when subdividing the sample by age. Sub-figure 4b illustrates that digitalization has a relatively less strong effect on time pressure, work-life balance, and transition between work and private life for workers younger than 35 years. In contrast, digitalization increases the interestingness of work, productivity, and autonomy relatively stronger for young workers than for older ones.

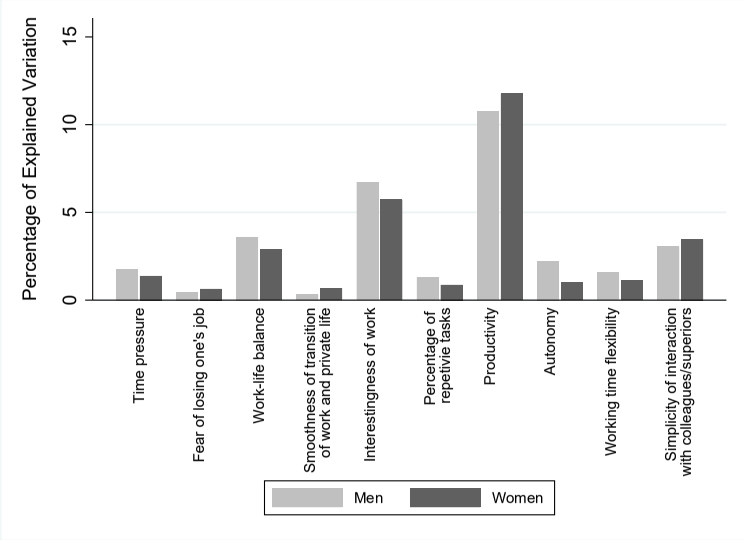
Sub-figure 4c presents the comparison of workers having a managerial position compared to workers without managerial position. Digitalization increases the fear of job loss less strongly by management workers. There is no statistical difference regarding time pressure, interestingness of work, and autonomy. In contrast, digitalization has a stronger effect on workers with managerial position with regard to the worsening of the work-life balance, the smoothing of the transition between work and private life, as well as in term of reducing repetitive tasks and making work more flexible.

Finally, Sub-figure 4d compares the means of workers that graduated in a technology-related field—the one by far most diffused in our sample—compared to other workers. In this case, we observe that digitalization increases the fear of job loss relatively less strong for workers who studied in a technology-related field. In contrast, the effect of digitalization with regard to the increase in time pressure, the worsening of the work-life balance, smoothing transition between work and private life, the increase in the interestingness of work, the increase in autonomy as well as the increase in working time flexibility are relatively stronger affected compared to workers who have not studied in technology-related fields.

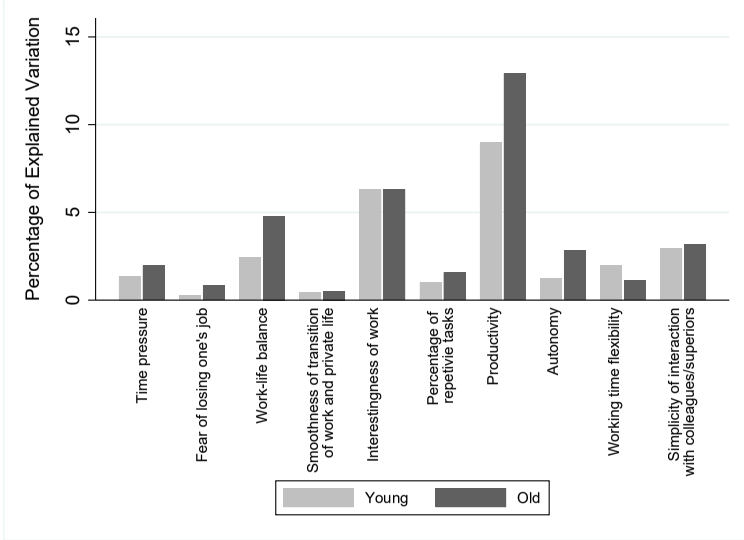
Similarly as in the previous subsection, we run the reduced form model described in equation 4 for sub samples of workers according to their individual characteristics. To ease the comparisons across subgroups we report in Figure 5 the Shapley values which allow us to quantify the relative importance of each channel. Sub-figure 5a reports the results according to respondents' gender; Sub-figure 5b according to their age; Sub-figure 5c according to their management position; and Sub-figure 5d according to their field of study. Tables A1–A4 in the Appendix reports the OLS estimates by workers' characteristics, which underpin the regressors' contribution to R^2.

Figure 5: Contribution to R^2 across sub-samples

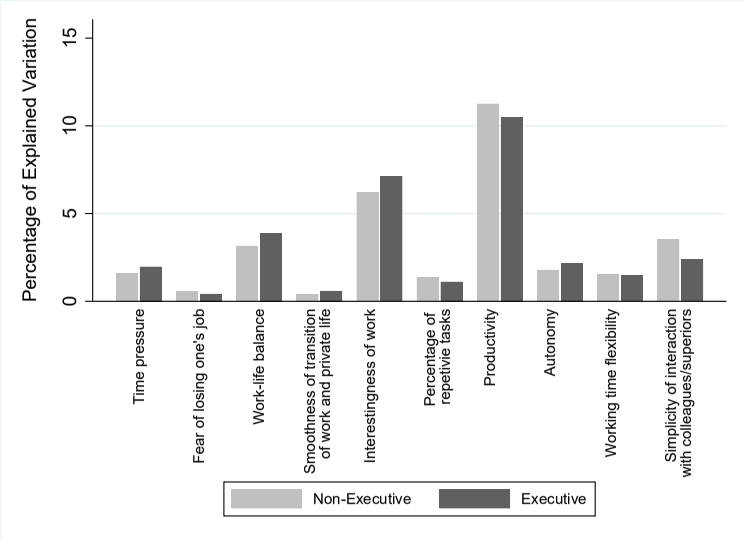
(a) Gender



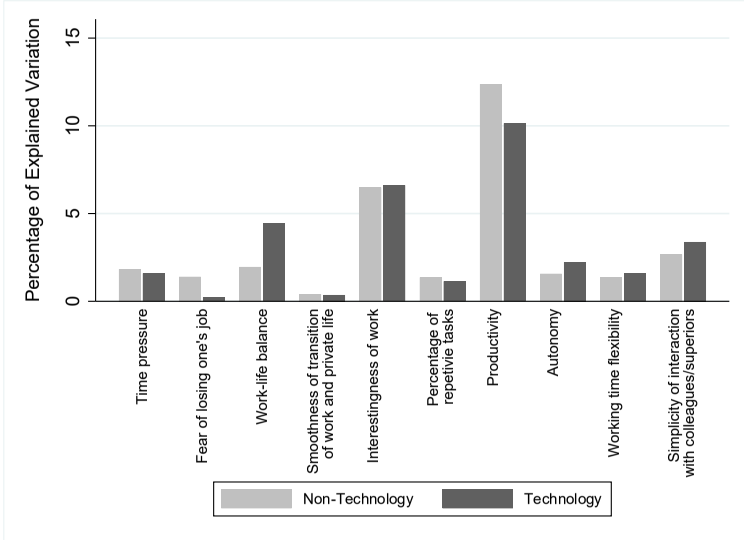
(b) Age



(c) Executive position



(d) Field of study



Notes: This figure shows the percentage of vasriation explained by each channel across subgoups of workers. Tables A1–A4 in the Appendix reports the OLS estimates by workers' characteristics, which underpin the regressors' contribution to R^2

Starting by looking at the heterogeneity across gender, Sub-figure 5a, shows that the channels of time pressure and particularly work-life balance are more harmful for women. In contrast, women profit more through the increase in interestingness of work and more autonomy. Finally, the productivity channel, which is the most relevant channel, is slightly less beneficial for women.

For the heterogeneity across age groups, Sub-figure 5b shows that the channel of losing one's job is slightly more detrimental for older workers. Furthermore, the deterioration of the work-life-balance is clearly more critical for older workers. In contrast, older workers profit more through the increase of productivity and autonomy. However, older workers benefit less from more interesting work. Similarly, the channel of working time flexibility is slightly less beneficial for older workers.

As for the heterogeneity across executive position, Sub-figure 5c shows that non-executive workers suffer slightly less from an increase in time pressure and the worsening of the work-life-balance. Additionally, non-executive workers benefit more from the increase in productivity and from an easier interaction with colleagues and superiors. However, they profit less from more interesting work.

Finally, for the heterogeneity across field of study, Sub-figure 5d shows that the channel of losing one's job is clearly more harmful for workers outside technology-related fields. However, they suffer less for the worsening of the work-life balance. Furthermore, workers outside technology-related fields profit more through the increase in productivity. Nevertheless, workers outside technology-related fields benefit less from more autonomy and easier interaction with colleagues and superiors.

5.3 Robustness Check

Our main estimation controls for how strongly digitalization affected respondents' work over the last year, thereby accounting for unobserved characteristics related to both digitalization and satisfaction. Furthermore, this information can be used to address potential heterogeneity in the relevance and perception of different job characteristics. Concretely, we conduct a robustness check that interacts the overall effect of digitalization on work with the effect of digitalization on each job characteristic. To ease interpretation, we standardize the resulting interaction terms by assigning the same mean and variance of the original effect of digitalization on each job characteristic.

Table 3: Robustness Check

	(1) OLS	(2) OLS
Dig. increases the time pressure at work	-0.0776***	
	(0.0128)	
* How strongly Dig. affect the work over the last year?		-0.107***
		(0.0175)
Dig. puts my job at risk	-0.0343***	
	(0.0133)	
* How strongly Dig. affect the work over the last year?		-0.0251
		(0.0154)
Dig. worsens the work-life balance	-0.102***	
	(0.0137)	
* How strongly Dig. affect the work over the last year?		-0.120***
		(0.0171)
Dig. leads to a smooth transition between working hours and leisure time	0.00174	
	(0.0131)	
* How strongly Dig. affect the work over the last year?		0.00758
		(0.0171)
Dig. makes my work more interesting	0.155***	
	(0.0154)	
* How strongly Dig. affect the work over the last year?		0.233***
		(0.0231)
Dig. reduces the proportion of repetitive tasks	0.0193	
	(0.0128)	
* How strongly Dig. affect the work over the last year?		0.0267
		(0.0178)
Dig. increases my productivity	0.255***	
	(0.0161)	
* How strongly Dig. affect the work over the last year?		0.416***
		(0.0259)
Dig. increases my autonomy at work	0.0380***	
	(0.0147)	
* How strongly Dig. affect the work over the last year?		0.0516**
		(0.0207)
Dig. enables more flexible forms of working time	0.0269**	
	(0.0116)	
* How strongly Dig. affect the work over the last year?		0.0365**
		(0.0153)
Dig. simplifies interaction with colleagues and superiors	0.0548***	
	(0.0136)	
* How strongly Dig. affect the work over the last year?		0.0772***
		(0.0196)
How strongly Dig. affect the work over the last year?	0.112***	-0.260***
	(0.0121)	(0.0281)
Worker characteristics	Yes	Yes
N	3089	3089
R^2	0.379	0.381

Notes: This table reports the results of the OLS regression having as dependent variable the effect of digitalization on job satisfaction, which is measured on a five point Likert scale (1="less satisfied", 3="no change", 5="more satisfied"). Robust standard errors in parentheses.* p<0.10, ** p<0.05, *** p<0.01. Worker characteristics is a vector of control variables as described in Table 1 plus industry dummies according to 1-digit NACE Rev. 2 classification. Column (1) reports the baseline estimation as in Table 2, while column (2) reports the estimation of the model in which we allow the channel to interact with the overall effect of digitalization on work.

Table 3 shows the results of this robustness test. Column (1) reports the baseline estimation as in Table 2, while column (2) reports the estimation of the model in which we allow the channel to interact with the overall effect of digitalization on work. The comparison of the coefficients of these two columns suggests that indeed digitalization might partially strengthen or weaken the effect of the channels. Nevertheless, the signs and the sizes of the coefficients are similar, supporting thus our baseline results.

6 Conclusion, limitations, and implications

Using graduates of PET colleges in Switzerland as a case study, this paper provides insights into the relative strength of 10 channels through which digitalization affects job satisfaction. We find that digitalization increases job satisfaction among PET graduates particularly by increasing work productivity, making work more interesting, and fostering interactions with coworkers and supervisors. Relatively less important is the positive effect of digitalization on job satisfaction through the increase in workers' autonomy and more flexible forms of work.

Our results further suggest a negative effect of digitalization on job satisfaction through the worsening of the work life balance and an increase in time pressure. While the widespread idea that the fear of losing one's job to digitalization negatively affects job satisfaction is confirmed, it remains small in magnitude in our sample. Finally, our estimates provide no evidence that (a) digitalization negatively affects job satisfaction by smoothing the transition between work and private life, or (b) digitalization positively affects job satisfaction by reducing the proportion of repetitive tasks.

We further investigate the heterogeneity of our results by decomposing the sample according to respondents' gender, age, management position, and field of study. By comparing the relative contribution of the channels, we find relatively similar patterns across sub-samples. Major differences occur only for the effect that digitalization has on job satisfaction through the worsening of the work-life balance, a finding more relevant for men, for workers aged more than 35 years (roughly the average age in our sample), for workers with an executive position, and for workers whose field of study technology-related. For the effect that digitalization has on job satisfaction through an increase in the interestingness of work, we find a larger effect for males and for workers younger than 35. In contrast, the effect that digitalization has on job satisfaction through an increase in autonomy is lower for young workers, for women, and for

workers who did not study in technology-related fields. n terms of productivity, we find that digitalization is more beneficial for women, for older workers, for workers without an executive position, and for workers who did not study in technology-related fields. Finally, the positive effect that digitalization has on job satisfaction by simplifying interactions with colleagues and superiors is larger for non-executive workers than for executives.

One limitation in our study is that even though controlling for gender, age, field of study, industry, management position, and a measure of how strongly respondents assess the impact of digitalization on their job, barely affects our estimates, we cannot rule out the possibility that other work characteristics (e.g., occupation) might affect our results. Therefore, future research should investigate other work characteristics that might prove to be channels for the effect of digitalization on job satisfaction.

Another limitation arises from the fact that the sample considered in this study is not perfectly representative, especially with regard to gender and field of study. Nevertheless, the fact that the results between sub-samples are particularly robust partially reassures the strength of the results.

Additionally, our results need cautious interpretation because they are specific to the particular sample investigated in this paper, which mainly consists of workers with management-level positions. The findings may differ substantially for workers with no tertiary vocational education. For example, a recent investigation conducted by Pfrombeck et al. (2020) on a representative sample of Swiss workers shows that, on average, a high degree of digitalization in the immediate work environment has a negative effect on job satisfaction. Future research should therefore evaluate the extent to which our results hold for different types of workers (e.g. workers with no tertiary vocational education).

Finally, a last limitation lies in this paper's reliance on respondent self-assessments of the influence of digitalization on job satisfaction and various work characteristics. Nonetheless, the estimates are robust to our controlling for various individual characteristics and for the self-assessed impact of digitalization on work. Furthermore, our estimates provide insights into the relative strength of various channels through which digitalization affects job satisfaction. However, due to the empirical strategy of a reduced form estimation, we are unable to interpret the results in absolute terms. Therefore, future research should use measures of digitalization, work characteristics, and job satisfaction that allow the estimating of structural models that capture these concepts directly and are less prone to potential measurement error.

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Appendix

Table A1: Sub-sample results: Estimation by gender

	Man				Women			
	(1) $\widehat{\beta}_c$	(2) $\widetilde{\theta}_c$	(3) $\widehat{\beta}_c * \widetilde{\theta}_c$	(4) Percentage of Explained Variation	(5) $\widehat{\beta}_c$	(6) β_{OLS}	(7) $\widehat{\beta}_c * \widetilde{\theta}_c$	(8) Percentage of Explained Variation
Dig. increases the time pressure at work	-0.0766***	3.27	-0.25	1.77	-0.0756**	3.05	-0.23	1.38
	(0.0159)				(0.0295)			
Dig. puts my job at risk	-0.026	1.93	-0.05	0.46	-0.0511	2.01	-0.1	0.64
	(0.0167)				(0.0322)			
Dig. worsens the work-life balance	-0.103***	2.75	-0.28	3.6	-0.100***	2.58	-0.26	2.9
	(0.0168)				(0.0314)			
Dig. leads to a smooth transition between working hours and leisure time	-0.000794	3.08	0	0.31	0.00563	2.73	0.02	0.68
	(0.0155)				(0.0294)			
Dig. makes my work more interesting	0.160***	3.47	0.56	6.72	0.134***	3.09	0.41	5.72
	(0.0192)				(0.039)			
Dig. reduces the proportion of repetitive tasks	0.0212	3.28	0.07	1.29	0.00635	3.07	0.02	0.87
	(0.0153)				(0.0317)			
Dig. increases my productivity	0.251***	3.69	0.93	10.76	0.262***	3.45	0.9	11.76
	(0.02)				(0.0395)			
Dig. increases my autonomy at work	0.0468**	3.2	0.15	2.23	-0.0015	2.94	0	0.99
	(0.0186)				(0.0344)			
Dig. enables more flexible forms of working time	0.0313**	3.32	0.1	1.58	0.0117	2.94	0.03	1.13
	(0.0135)				(0.0277)			
Dig. simplifies interactions with colleagues and superiors	0.0546***	3.42	0.19	3.04	0.0670**	3.38	0.23	3.48
	(0.0168)				(0.0317)			
How strongly does Dig. affect the work over the last year?	0.108***			3.07	0.113***			3.59
	(-0.015)				(0.0302)			
Worker characteristics	Yes			3.16	Yes			7.61
N	1042				2047			
R^2 (%)	37.99				40.73			

Notes: Columns (1) and (5) report the results of the OLS regression having as dependent variable the effect of digitalization on job satisfaction, which is measured on a Likert scale (1="less satisfied", 3="no change", 5="more satisfied"). Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. Worker characteristics is a vector of control variables as described in Table 1 plus industry dummies according to NACE 1-digit classification. Columns (2) and (6) report the sub-sample average values of the job characteristics. Columns (3) and (7) reports the multiplication of the betas from columns (1) and (4) with the sub-sample average values of the characteristics. Columns (4) and (8) report the percentage of explained variance by each regressor in the estimation in column (1).

Table A2: Sub-sample results: Estimation by age

	Young (<= 35 years)				Old (> 35 years)			
	(1) $\widehat{\beta}_c$	(2) $\widetilde{\theta}_c$	(3) $\widehat{\beta}_c * \widetilde{\theta}_c$	(4) Percentage of Explained Variation	(5) $\widehat{\beta}_c$	(6) β_{OLS}	(7) $\widehat{\beta}_c * \widetilde{\theta}_c$	(8) Percentage of Explained Variation
Dig. increases the time pressure at work	-0.0768***	3.14	-0.25	1.37	-0.0790***	3.35	-0.26	1.97
	(0.0224)				(0.018)			
Dig. puts my job at risk	-0.0411*	1.92	-0.05	0.28	-0.0239	1.98	-0.08	0.83
	(0.0218)				(0.0203)			
Dig. worsens the work-life balance	-0.126***	2.62	-0.23	2.44	-0.0869***	2.84	-0.36	4.79
	(0.0242)				(0.0189)			
Dig. leads to a smooth transition between working hours and leisure time	-0.00697	2.95	0.04	0.43	0.0125	3.09	-0.02	0.52
	(0.0209)				(0.0183)			
Dig. makes my work more interesting	0.145***	3.5	0.57	6.31	0.162***	3.27	0.47	6.31
	(0.0257)				(0.0235)			
Dig. reduces the proportion of repetitive tasks	0.0177	3.25	0.06	1.01	0.0181	3.22	0.06	1.58
	(0.0213)				(0.0179)			
Dig. increases my productivity	0.281***	3.77	0.87	9.0	0.230***	3.48	0.98	12.93
	(0.0269)				(0.0239)			
Dig. increases my autonomy at work	0.0569**	3.22	0.08	1.22	0.0243	3.06	0.17	2.83
	(0.0258)				(0.0215)			
Dig. enables more flexible forms of working time	0.00806	3.24	0.14	2.0	0.0420***	3.26	0.03	1.14
	(0.0194)				(0.0156)			
Dig. simplifies interactions with colleagues and superiors	0.0431**	3.47	0.22	2.95	0.0641***	3.33	0.14	3.16
	(0.0212)				(0.0206)			
How strongly does Dig. affect the work over the last year?	0.0846***			4.44	0.136***			2.37
	(0.0201)				(0.0182)			
Worker characteristics	Yes			2.11	Yes			2.55
N	1331				1758			
R^2 (%)	33.56				40.98			

Notes: Columns (1) and (5) report the results of the OLS regression having as dependent variable the effect of digitalization on job satisfaction, which is measured on a Likert scale (1="less satisfied", 3="no change", 5="more satisfied"). Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. Worker characteristics is a vector of control variables as described in Table 1 plus industry dummies according to NACE 1-digit classification. Columns (2) and (6) report the sub-sample average values of the job characteristics. Columns (3) and (7) reports the multiplication of the betas from columns (1) and (4) with the sub-sample average values of the characteristics. Columns (4) and (8) report the percentage of explained variance by each regressor in the estimation in column (1).

Table A3: Sub-sample results: Estimation by executive position

	Non-Executive				Executive			
	(1) $\widehat{\beta}_c$	(2) $\widetilde{\theta}_c$	(3) $\widehat{\beta}_c$*$\widetilde{\theta}_c$	(4) Percentage of Explained Variation	(5) $\widehat{\beta}_c$	(6) β_{OLS}	(7) $\widehat{\beta}_c$*$\widetilde{\theta}_c$	(8) Percentage of Explained Variation
Dig. increases the time pressure at work	-0.0846***	3.24	-0.27	1.6	-0.0567**	3.21	-0.18	1.97
	(0.0164)				(0.0271)			
Dig. puts my job at risk	-0.0398**	1.97	-0.08	0.57	-0.0277	1.88	-0.05	0.42
	(0.0175)				(0.028)			
Dig. worsens the work-life balance	-0.101***	2.67	-0.27	3.16	-0.0956***	2.83	-0.27	3.89
	(0.0177)				(0.0285)			
Dig. leads to a smooth transition between working hours and leisure time	0.0161	2.94	0.05	0.41	-0.0423	3.19	-0.13	0.59
	(0.016)				(0.0276)			
Dig. makes my work more interesting	0.142***	3.39	0.48	6.2	0.192***	3.44	0.66	7.12
	(0.0198)				(0.0345)			
Dig. reduces the proportion of repetitive tasks	0.0330**	3.19	0.11	1.36	-0.0106	3.36	-0.04	1.11
	(0.0158)				(0.0273)			
Dig. increases my productivity	0.258***	3.63	0.94	11.26	0.253***	3.69	0.93	10.49
	(0.0206)				(0.0358)			
Dig. increases my autonomy at work	0.0316	3.14	0.1	1.79	0.0431	3.16	0.14	2.18
	(0.0197)				(0.0294)			
Dig. enables more flexible forms of working time	0.0206	3.2	0.07	1.56	0.0529**	3.35	0.18	1.48
	(0.0142)				(0.0249)			
Dig. simplifies interactions with colleagues and superiors	0.0592***	3.38	0.2	3.52	0.0453	3.48	0.16	2.39
	(0.0175)				(0.0282)			
How strongly does Dig. affect the work over the last year?	0.123***			3.92	0.0855***			1.99
	(0.0154)				(0.028)			
Worker characteristics	Yes			3.23	Yes			5.07
N	2193				896			
R^2 (%)	38.58				38.71			

Notes: Columns (1) and (5) report the results of the OLS regression having as dependent variable the effect of digitalization on job satisfaction, which is measured on a Likert scale (1="less satisfied", 3="no change", 5="more satisfied"). Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. Worker characteristics is a vector of control variables as described in Table 1 plus industry dummies according to NACE 1-digit classification. Columns (2) and (6) report the sub-sample average values of the job characteristics. Columns (3) and (7) reports the multiplication of the betas from columns (1) and (4) with the sub-sample average values of the characteristics. Columns (4) and (8) report the percentage of explained variance by each regressor in the estimation in column (1).

Table A4: Sub-sample results: Estimation by field of study

	Non-Technology				Technology			
	(1) $\widehat{\beta}_c$	(2) $\widetilde{\theta}_c$	(3) $\widehat{\beta}_c$*$\widetilde{\theta}_c$	(4) Percentage of Explained Variation	(5) $\widehat{\beta}_c$	(6) β_{OLS}	(7) $\widehat{\beta}_c$*$\widetilde{\theta}_c$	(8) Percentage of Explained Variation
Dig. increases the time pressure at work	-0.0904***	3.05	-0.28	1.83	-0.0685***	3.32	-0.23	1.59
	(0.0231)				(0.0172)			
Dig. puts my job at risk	-0.0772***	2.04	-0.16	1.4	-0.00704	1.89	-0.01	0.22
	(0.0249)				(0.0181)			
Dig. worsens the work-life balance	-0.0615**	2.55	-0.16	1.96	-0.127***	2.8	-0.36	4.44
	(0.0252)				(0.0183)			
Dig. leads to a smooth transition between working hours and leisure time	-0.00343	2.9	-0.01	0.41	0.00411	3.07	0.01	0.36
	(0.0243)				(0.0168)			
Dig. makes my work more interesting	0.151***	3.25	0.49	6.49	0.154***	3.48	0.54	6.61
	(0.0305)				(0.0209)			
Dig. reduces the proportion of repetitive tasks	0.0321	3.26	0.1	1.36	0.0147	3.23	0.05	1.14
	(0.0257)				(0.0161)			
Dig. increases my productivity	0.278***	3.63	1.01	12.38	0.237***	3.65	0.87	10.14
	(0.0313)				(0.0214)			
Dig. increases my autonomy at work	0.0237	3.02	0.07	1.57	0.0476**	3.21	0.15	2.23
	(0.0285)				(0.0199)			
Dig. enables more flexible forms of working time	0.0113	3.13	0.04	1.38	0.0321**	3.31	0.11	1.58
	(0.0214)				(0.0145)			
Dig. simplifies interactions with colleagues and superiors	0.0327	3.44	0.11	2.68	0.0687***	3.4	0.23	3.38
	(0.0265)				(0.0174)			
How strongly does Dig. affect the work over the last year?	0.110***			3.2	0.113***			3.25
	(0.0237)				-0.016			
Worker characteristics	Yes			0.0442	Yes			3.3
N	1042				2047			
R^2 (%)	39.06				38.25			

Notes: Columns (1) and (5) report the results of the OLS regression having as dependent variable the effect of digitalization on job satisfaction, which is measured on a Likert scale (1="less satisfied", 3="no change", 5="more satisfied"). Robust standard errors in parentheses. * p<0.10, ** p<0.05, *** p<0.01. Worker characteristics is a vector of control variables as described in Table 1 plus industry dummies according to NACE 1-digit classification. Columns (2) and (6) report the sub-sample average values of the job characteristics. Columns (3) and (7) reports the multiplication of the betas from columns (1) and (4) with the sub-sample average values of the characteristics. Columns (4) and (8) report the percentage of explained variance by each regressor in the estimation in column (1).

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