



To track or not to track?

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(May 2017)
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LASER Discussion Papers - Paper No. 101

(edited by A. Abele-Brehm, R.T. Riphahn, K. Moser and C. Schnabel)

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Abstract

In this exploratory study, we analyze under which circumstances employees are willing to accept tracking and tracing technologies at the workplace inside and outside the employer's premises. The results from our multi-factorial survey show that employees do not reject these technologies per se. However, they are sensitive, e.g., regarding the transparency and efficiency of the informational changes and the involvement of works councils, and they are rather skeptical if these technologies are to be used for monitoring health and performance. The results indicate that the new technologies at hand will probably be introduced, but the introduction may be subject to bargaining and conflicts between the actors involved.

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1. Motivation and scope of the paper

In today's increasingly digitized world of work, almost every activity – from the touch of a keyboard to the movement of a robot – generates information that can be used to permanently track workers and monitor their behavior. Modern sensor technology embedded in smart phones, combinations of body-worn sensors and artificial intelligence, and a multitude of novel applications appear in the market that have the potential to transform many aspects of work. Information generated by the individual in the workplace and the sensor-equipped artifacts in its work environment are getting more and more inseparable and are shared by a multitude of actors like supervisors, suppliers, or customers. In addition, regulations in many industries call for a strict process governance that focuses on the detailed tracking and tracing of organizational processes, implying the traceability of the personnel involved. Firms have increasingly implemented the continuous tracking of truck drivers in logistics and the recording of employees' behavior in call centers and at assembly lines. In the near future, sensorized clothing might allow for early warnings of risks in stressful and dangerous work environments. Applications will multiply as we move into networked working environments, not only in production settings, but even more so in service encounters and customer interaction spaces. Although tracking and tracing has the potential to improve the work process and productivity, for workers it brings both risks (e.g., reduced work autonomy, job loss, violated privacy and data protection) and benefits (e.g., safety protection, health monitoring) and it may invoke conflicts between workers and management. In this exploratory study, we analyze under which circumstances employees show positive or negative attitudes towards the new tracking and tracing technologies at the workplace inside and outside the employer's premises.

Electronic monitoring via tracking and tracing, which refers to the continuous gathering, examination and/or recording of employee work-related data with technological assistance in real time, can be used, *inter alia*, to monitor worker behavior, performance, safety and health. Since the early 1980s, starting with internet and telephone monitoring, there has been an increasing interest of firms in monitoring, recording, and tracking employee behaviors, work performance, and personal data at the workplace (Alge & Hansen, 2014; Ball, 2010; Stanton, 2000; US Congress, OTA, 1987). Various studies from different disciplines have analyzed the impact of information technology on organizations, work, labor demand and wages (e.g., Bresnahan et al., 2002; Zammuto et al., 2007; Schmitz, 2005) as well as workers' reactions to surveillance at the workplace and performance monitoring (see the reviews by Alge & Hansen, 2014 and Ball, 2010). One of the more robust findings in the electronic monitoring literature is that monitoring is positively related to biopsychological stress responses (e.g., Henderson et al., 1998), musculoskeletal disorders (Hales et al., 1994) and subjective stress reactions (e.g., Davidson & Henderson, 2000). With regard to motivation and performance, monitoring can have both positive and negative effects. Experiments have repeatedly confirmed the social facilitation theory (Zajonc, 1965) which predicts benefits of an electronic observer on the performance of simple, routinized tasks and detrimental effects on the performance of complex tasks or tasks requiring learning (Aiello & Svec, 1993; Becker & Marique, 2014). According to social information processing theory (Salancik & Pfeffer, 1978) performance increases because employees shift their attention from non-monitored tasks to monitored tasks (Grant et al., 1988). However, as a byproduct of prioritizing tasks employees can try to circumvent the rules or engage in deviant behavior (Duane & Finnegan, 2007). Another explanation for the impact of monitoring on employees' reactions stems from agency theory (Jensen & Meckling, 1976) which implies that electronic monitoring enhances the contingency between supervisors' goals and rewards of employee's performance. This results in better task performance and sometimes even in better

contextual performance (as shown by Bhave, 2014). Whether positive or negative effects dominate depends on the design of electronic monitoring, which includes its frequency (e.g., Bhave, 2014), its use and purpose (e.g., Douthitt & Aiello, 2001) and its target (e.g., Aiello & Kolb, 1995) as well as leadership characteristics (e.g., Zweig & Scott, 2007).

Although the issue of closely monitoring employees' performance at the workplace is not new (think of clocking in/out, payment by piece-rate) and has been investigated in numerous studies, there is a huge gap in the literature concerning more recent tracking and tracing technologies. At an early stage of these technologies, Clarke (2001) already pointed out several important features and risks of tracking, but there are hardly any empirical studies on the new devices which have evolved during the past decade. Sophisticated applications like wearable computing systems and big data technologies now even allow organizations and their managers to track and analyze the employee's multiple dimensions of work behaviors, performance, and personal and biopsychological data, continually and in real time. Recently, firms' policies on monitoring have extended into private lives of their employees. In particular, tracking of biodata (e.g., subjective well-being and biopsychological data) generates concerns about violations of employee privacy and rights, and it challenges employees to "invoke private aspects of the self into management processes" (Ball, 2010, p. 92). Even if firms perceive many economic advantages in using the new tracking technologies, it will not be easy and probably also not productivity-enhancing to implement them without the consent of the affected employees. In Germany, the Works Constitution Act even gives works councils as the representatives of workers in co-determined establishments a veto right concerning the introduction of any technology that might be used to control workers.

Since it is an open question under which circumstances employees are willing to accept the new tracking and tracing technologies at the workplace, our study is a first attempt to shed light on this issue by conducting a factorial survey among 800 workers in Germany. We will show that employees do not reject these technologies *per se*. However, they are sensitive, e.g., regarding the transparency and efficiency of the informational changes and the involvement of works councils, and they are rather skeptical if these technologies are to be used for monitoring health and performance. Our paper is structured as follows: After some theoretical considerations in section 2, section 3 describes the method and data used. Our empirical results are presented in section 4, and section 5 provides some conclusions.

2. Theoretical considerations

The underlying assumption of our analysis is that the self-interest of employees is not restricted to wages, but also encompasses employment security, work autonomy, and privacy concerns. Tracking technology affects broadly defined self-interest of employees through its effects on working and living conditions in various ways, either positively or negatively. Evaluating these technologies, we expect most employees to trade off pros and cons. Only a small subset of employees will not condition their assessment of tracking technology on terms and conditions as well as direction and magnitude of its effects. Our purpose is to isolate the most relevant conditions and to determine the direction of the effects on the degree to which employees are willing to accept the use of tracking technologies. To this end, we will link conditions and effects to the broadly defined self-interest of employees.

Our first hypothesis is related to the positive effect of more detailed information on labor productivity and, therefore, on wages and employment security. If tracking technology increases efficiency, employers and employees are likely to benefit in the short and the long run. Hence, we hypothesize:

H₁: Employees' acceptance level is higher, ceteris paribus, if tracking and tracing increases labor productivity.

Detailed information on employees' effort and their individual output enables the firm to exercise tighter control and to punish shirking more effectively. As a consequence, work autonomy declines and the pressure to perform increases. Moreover, in-depth information helps firms to select the workforce more properly and, eventually, to identify and fire unproductive employees. In this regard, the acceptance level of tracking and tracing is probably negatively affected:

H₂: Employees' acceptance level is lower if tracking and tracing enables the firm to exercise tight control.

However, not all employees will be equally strongly affected by more accurate performance measurement. Accurate tracking may give highly productive workers the opportunity to reveal their higher performance reliably. Hence, we expect a negative cross-level effect:

H_{2a}: The negative effect of potentially tight control on the acceptance level is smaller if the employee is highly productive.

Even if workers tend to avoid tight control, they may appreciate technology that allows for a better coordination and planning of work tasks and procedures, in such a way also making their own life easier. A case in point would be coordination across mobile and dispersed workplaces. We thus hypothesize:

H₃: Employees acceptance level is higher if tracking is used primarily to enhance coordination and planning (and less to control workers).

In case the new monitoring techniques are opposed by employees, employers may have to promise not to use tracking data for controlling workers. However, the credibility of such an agreement is doubtful as long as there is no control of the employer in this respect. In general, the higher transparency concerning tracking data and its use is, the higher should be the acceptance of such a technology. An important institution that can hinder firms to use information about workers' performance against their interest is a works council, which is not mandatory in Germany but can be elected by the workforce in plants with five or more employees. Hence, we expect the existence of a works council to have a positive effect on tracking acceptance. Therefore, we hypothesize:

H₄: The higher employees' control about the content and use of tracking data is, the higher their level of acceptance will be.

3. Method and Data

General Method

In order to test these hypotheses, we use a survey experiment – known as factorial survey method – that consists of several descriptions of situations with systematically varying dimensions (for an overview, see Auspurg & Hinz, 2015). These dimensions represent the variables of interest which are considered to influence the dependent variable. Each respondent of the survey is asked to evaluate these descriptions (so called vignettes) and answer several accompanying questions.

In sociology, factorial surveys are used to judge attitudes, norms and values (e.g. Jasso & Opp, 1997, Abraham et al., 2016) as well as to assess hypothetical behavior (e.g. Abraham et al., 2013, Buschmann et al., 2016). The method allows a causal interpretation of the effect of the varying dimensions on the respondent's judgement due to its experimental design. The hypothetical situations are assigned randomly to respondents who usually evaluate more than one vignette. Thus, inter- as well as intra-personal variance can be used to analyze the effects as well as the relative importance of the dimensions of interest.

We implement a factorial survey experiment to analyze the perceived adequacy of tracking at the workplace. Compared to a survey using item-based questions the factorial survey has several advantages:

- The vignettes allow the use of context and the combination of several interesting aspects in one question. A trade-off between several aspects can be created and results in a context-based evaluation considering all relevant aspects at once.
- The use of several aspects at once reduces bias due to social desirability.
- The experimental design allows for causal interpretations.

Compared to laboratory experiments factorial surveys can score with a better cost-data ratio as well as a more heterogeneous sample (most lab experiments use students). However, instead of real behavior factorial surveys can only measure intended behavior. The respondents' answer to how they would react in a described situation is not necessarily how they would behave in this situation. However, there exist some studies which show that the results of vignette studies and actual behavior correlate (e.g. Nisic & Auspurg, 2009; for an overview see Auspurg & Hinz, 2015: 113ff). A prerequisite is a realistic description of the situation which seems to be the case in our study if we accept the low percentage of uncompleted questionnaires as an indicator.

A Factorial Survey to Measure Acceptability of Employee Tracking

The factorial survey we designed to test the judgement on workplace tracking technology and the behavioral reactions to it takes eight dimensions into account which are shown in Table 1.

Table 1: Dimensions Experimentally Varied in our Vignette Study

Dimension	Level	#
Level of task	simple demanding	2
Mobility of worker	fixed workplace mobility on company premises regional mobility	3
Accuracy of tracking workers' position (grid)	one meter a hundred meters	2
Efficiency effects of tracking	some gains big gains in efficiency	2
Access to collected data	only employer employee on request employee anytime	3
Performance tracking	yes, results used for wage determination no	2
Health tracking	no yes	2
Works council exists	no yes	2

The combination of all levels (Cartesian product) creates the vignette universe which contains all possible combinations. In our case the universe includes 576 (3*3*2*2*2*2*2) vignettes. To allow the use of all vignettes we created decks consisting of 6 vignettes. The vignettes were randomly assigned to the decks resulting in 96 decks. Those decks were randomly presented to the respondents, i.e. each respondent was asked to evaluate six situations. Each deck is rated by several respondents, in our study about 8 persons at average. Figure 1 shows an example for a situation produced by our vignette design:

Figure 1: Example of a Vignette. The Varying Dimensions are Underlined.

<p>The employee has a <u>demanding task</u> and is often <u>mobile on company premises</u>. His position is tracked <u>exactly down to one meter</u> and tracking results in <u>some efficiency gains</u>. The collected data is <u>accessible for the employee on request</u>. The technology is <u>also used to track performance in order to determine wages</u>.</p> <p>The technology is <u>not used to track the employee's health</u>. There is <u>no works council</u> in the establishment.</p> <p>How adequate do you think is the application of the technology considering the described conditions?</p>											
Completely inadequate											Completely adequate
1	2	3	4	5	6	7	8	9	10	11	

The vignettes were accompanied by a survey including questions on sociodemographic information (gender, age, zip code, schooling and vocational training), questions on respondents' work situation and workplace (employment status and job description, tasks, existence of works council and membership in an union), and questions on their use of technology (private and professional use, acceptability of different technologies).

To test our hypotheses we used the following variables: First the positive productivity effect of the tracking technology was reflected directly by the vignette dimension "the tracking results in some/big efficiency gains". Second, the control exercised by the employer was measured by three different dimensions: the accuracy of the tracking technology, the use of the data for wage determination, and its use for health monitoring. Our third hypothesis, which focused on control vs coordination, is implemented by the mobility of the employee in the vignette. We assume that employees who are very mobile profit from a better coordination, whereas tracking at a fixed workplace purely reflects control. For our fourth hypothesis we used two dimensions to measure the employee's control of the data usage: who has access to the data (only employer or also employee?) and the existence of a works council in the establishment.

Data Collection and Sample

The vignettes were programmed using Stata, the survey was programmed with Unipark (questback EFS fall 2016). The survey was conducted in cooperation with Norstat in January 2017. Respondents are part of the Norstat Convenience Panel. Recruiting for the panel takes place actively via different channels (phone and online) and a double-opt-in procedure. Panelists are remunerated for completing surveys with bonus points which can be transferred to money or items. The panel consists of approximately 78,000 participants with around 60 percent women and a high share of younger participants (Norstat, 2016). Our sample was restricted to people ranging from age 18 to 64 because of our focus on tracking in the workplace. However, we did not exclude unemployed people as they usually have made work experience during their life. We dropped 45 respondents from the analysis as they started the survey but did not complete the vignette part. This leaves us with 800 respondents and 4800 observations for the following analysis. Persons who finished all vignette evaluations but dropped out afterwards are included in the analysis using the vignette dimensions but might be dropped when including respondent characteristics.

Table 2 describes our sample, which is quite heterogeneous, e.g. with respect to professional qualification. The average age of our respondents is 42.8 years (median: 42), 46 percent of respondents are women and 14 percent are members of a union. Respondents have some experience in the private use of tracking technology and in tracking at the workplace (reflected in our respective indices which combine various items). We constructed three indices from multi-time questions. The index "private use of tracking" is based on seven items about the private use of smartphones and the internet. On a five-point scale the respondents were supposed to rate the frequency of using e.g. the smartphone's tracking function, the navigation function or platforms like Facebook. The index is the standardized sum of all seven answers, 0 indicating no use and 1

maximum use of this possibilities. Similarly, the index “tracking at workplace” is the standardized sum of five items indicating the use of technologies which provide information about the employee (working at a highly-automatized workplace, camera surveillance in the firm, working at a computer, use of electronic entrance cards, use of social media for work). Finally, we tried to measure general attitudes about the use of personal use by commercial actors (personal behavior leads to custom-tailored ads, higher process in online purchases, personalized insurances fees for automobile and health insurance). The resulting index “acceptance personalization internet/insurance” is again running between 0 and 1.

Neither the panel nor our sample can be considered representative of the German population. However, with the experimental design and the random assignment of vignettes on respondents the missing representativeness does not undermine the main methodological focus of our study, the causal interpretation of the effects of the dimensions on respondents’ judgement. We concede, however, that caution is advisable on the interpretation of other effects and generalization of results for the German population.

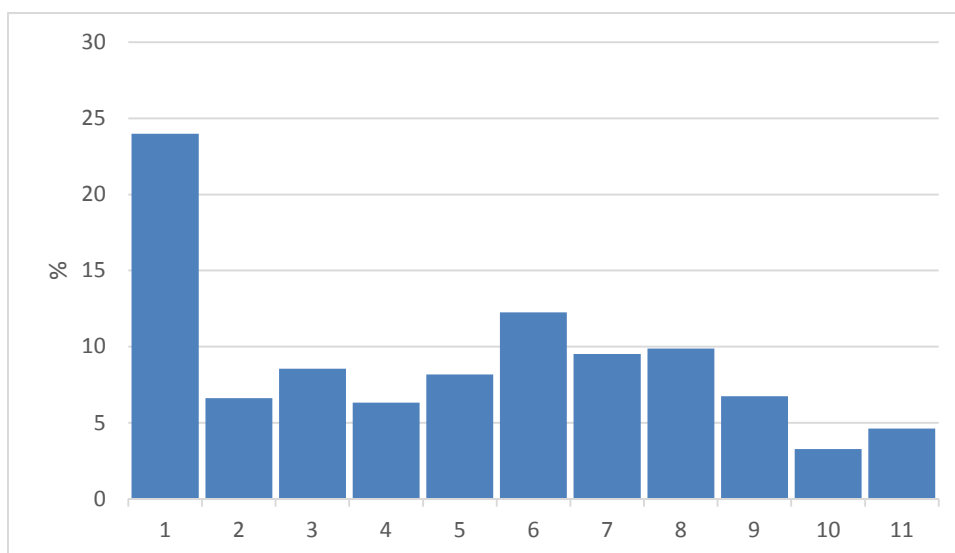
Table 2: Sample Description

	N	Mean/Percent	Variance	Minimum	Maximum
Variables on respondent level					
Age	800	42.785	124.53	18	64
Gender (1 = female)	800	0.461	0.25	0	1
Union membership (1 = yes)	798	0.139	0.12	0	1
Superior to employees (1 = yes)	798	0.194	0.16	0	1
Use of online banking (1 = yes)	800	0.409	0.24	0	1
Index: private use of tracking	761	0.410	0.05	0	1
Index: tracking at workplace	764	0.305	0.06	0	1
Index: acceptance personalization internet/insurance	786	0.337	0.05	0	1
Professional qualification	799				
Still in training	21	2.628			
No certificate	52	6.508			
Apprenticeship / semi-skilled training	212	26.533			
Vocational training	196	24.531			
Master / technician	57	7.134			
University of cooperative education	45	5.632			
University degree	208	26.033			
Other	8	1.001			
Variables on vignette level					
DV: Adequacy of technology use	4,800	4,929	9.80	1	11

4. Results

As can be seen in Figure 2, concerning the acceptance of tracking the respondents made use of the scale's total range which runs from 1 (completely unacceptable) to 11 (completely acceptable). The mean evaluation over all vignettes and respondents is 4.9. 76 percent of all vignettes showed at least a 2, 54.5 percent of all vignettes at least a 5 on the answering scale. In about 24 percent of the situations described by the vignettes the respondents judged the tracking as completely unacceptable (1 on the answering scale). Obviously, the majority of respondents does not reject the new technological possibilities *per se*. However, there is a minority of 9 percent of respondents who showed no acceptance at all (that is 1 in our answering scale) for all six vignettes. This group can be seen as fundamental opponents of tracking technologies. On the other side 14 respondents (1.75 percent) judge all vignettes as completely adequate.

Figure 2: Distribution of the Acceptance of Tracking at the Workplace, Vignette Level



When testing our hypothesis concerning the acceptance of tracking technologies, we treat the dependent variable as continuous; alternative statistical models for non-continuous variables (e.g., ordinal regressions) did not yield different results. As our data is hierarchically nested, we apply a multilevel linear mixed effects model, which enables us to make use of the variance at the individual level as well as the level of vignette judgements (Hox, 2010; Snijders & Bosker, 2012). Table 3 shows the results: in the first model only the vignette dimensions are included, in the second model we added the control variables at the individual level, and the third model includes additional interaction effects. As can be seen across the three models, our results are the same regardless of the model specification.

First, we see that higher efficiency gains resulting from tracking lead to a higher acceptance by employees. Obviously, the advantages of the technology are an important factor. This lends support to our first hypothesis that the acceptance level is higher if tracking and tracing increases labor productivity.

Our second hypothesis postulates that the acceptance level is lower if tracking and tracing enables the firm to exercise tight control. For this hypothesis we employed several indicators. First we assumed that the detail of precision which the tracking technology is able to exercise will be crucial. Our results show indeed that a higher precision of tracking – that is one meter compared to a hundred meters – leads to a lower acceptance of the technology. Second, if the tracking data is used to measure performance and to determine wages based on this measure, the respondents are less willing to accept the device at the workplace. Third, tracking devices can be used to gather health data about the employees. Clearly, the respondents reject this possibility and show a lower acceptance in this case. Taken together, these results support our second hypothesis about the negative effects of extended control by the employer.

However, there is mixed evidence for our hypothesis H_{2a} , stating that the negative effect of potentially tight control on the acceptance level is smaller if the employee is highly productive. As can be seen in model 3, a combination of simple tasks level and the use of tracking for implementing performance pay schemes leads to significantly negative assessment of the technology. In contrast, for the other two measures of control – that is accuracy and health surveillance – there are no such effects.

Concerning our third hypothesis, the respondents regard the assignment of the tracking technology at fixed workstations less adequate compared to a situation where they are mobile on company premises or regionally. As stated in H_3 we think that this is due to the fact that a better coordination of tasks and work processes across mobile workplaces should be beneficial for all actors, whereas tracking at fixed workplaces purely reflects the kind of tight control that was already rejected by the employees in our tests of hypothesis 2.

Since tracking technology can be used to exercise control, it should be important to control the employer when it comes to the actual use of the existing data. Here we see that our respondents are much more critical if only the employer has access to the information compared to a situation where the employee has access to the data, too. Moreover, if a works council exists (and agreed to the technology) the employees judge it more adequate to be confronted with tracking at the workplace. These results support our hypothesis H_4 about the positive effect of control exercised on the employer.

With respect to the characteristics of our respondents, we see hardly any level effects of the variables at the individual level. The only exception is the index measuring the general acceptance of personalization in internet and insurance services. It is hardly surprising that people who do not have a problem with such a personalization of services tend to accept tracking technologies, too. More interesting is the fact that respondents who are actually confronted with tracking at their workplace show a higher acceptance level than employees without such an experience. This may reflect a simple self-selection effect in that mainly those employees who regard tracking and tracing as acceptable are found at such workplaces. It could also be a reflection of their personal experience that existing tracking technologies have had little (negative) impact on their working life so far.

Finally, people may get used to this technology and its consequences over time, thus showing a status quo bias.

Table 3: Summary of Linear Regression Analysis for Variables Predicting the Acceptance of Tracking (Random Intercept Models)

	H	Model 1 b/se	Model 2 b/se	Model 3 b/se
Vig: simple task level (vs demanding)		0.104	0.081	-0.118
		-0.056	-0.06	-0.123
Vig: mobility at workplace (ref.: on company premises)	H ₃			
1. fixed workplace		-0.268***	-0.268***	-0.264***
		-0.069	-0.074	-0.074
3. regional mobile		0.112	0.114	0.11
		-0.069	-0.074	-0.074
Vig: accuracy of tracking 1m	H ₂	-0.114*	-0.094	-0.136
		-0.056	-0.061	-0.087
Vig: efficiency gain big (vs some)	H ₁	0.166**	0.202***	0.197**
		-0.057	-0.061	-0.061
Vig: accessibility (ref.: employee always)	H ₃			
1. only employer		-0.303***	-0.303***	-0.302***
		-0.067	-0.072	-0.072
2. employee on request		-0.084	-0.1	-0.102
		-0.068	-0.073	-0.073
Vig: performance tracking (ref.: no)	H ₂	-0.561***	-0.583***	-0.419***
		-0.059	-0.063	-0.087
Vig: tracking health (ref.: no)	H ₂	-0.201***	-0.165**	-0.1
		-0.056	-0.061	-0.085
Vig: works council (ref.: no)	H ₄	0.658***	0.684***	0.682***
		-0.056	-0.06	-0.06
Gender (1 = female)			0.069	0.075
			-0.177	-0.177
Age			-0.017	-0.016
			-0.009	-0.009
Professional qualification (ref.: still in training)				
2. No certificate			0.395	0.395
			-0.619	-0.619
3. Apprenticeship / semi-skilled training			-0.038	-0.039
			-0.545	-0.545
4. Vocational training			0.198	0.199
			-0.551	-0.551
5. Master / technician			0.368	0.366
			-0.618	-0.618
6. University of cooperative education			0.148	0.151
			-0.64	-0.64

7. University degree		-0.223	-0.222
		-0.55	-0.55
8. Other		-0.51	-0.512
		-1.059	-1.059
Union membership (1 = yes)		-0.265	-0.262
		-0.246	-0.246
Superior to employees (1 = yes)		0.159	0.156
		-0.225	-0.225
Index: private use of tracking		0.965*	0.956
		-0.491	-0.491
Index: tracking at workplace		1.001*	1.012*
		-0.475	-0.475
Index: acceptance personalization internet/insurance		4.554***	4.562***
		-0.413	-0.414
Vig: simple task level * Vig: performance tracking yes	H _{2a}		-0.323**
			-0.121
Vig: simple task level * Vig: accuracy of tracking 1m	H _{2a}		0.075
			-0.122
Vig: simple task level * Vig: tracking health yes	H _{2a}		-0.136
			-0.121
Constant		5.081***	3.451***
		-0.127	-0.631
Ins1_1_1			
Constant		0.920***	0.744***
		-0.027	-0.03
Insig_e			
Constant		0.585***	0.604***
		-0.011	-0.012
N		4,800	4,284

* p<0.05, ** p<0.01, *** p<0.001

5. Conclusion

Tracking and tracing technologies are developing at a fast pace, and their assignment at the workplace will become a standard soon. Already today, a lot of employees are working with technologies that allow for tracking and tracing the employees' mobility patterns, their behavior or even health status. However, in many cases, employees are not aware of this fact or use them purely as self-tracking technologies without the awareness of the employer. Many employers also have not grasped the full potential of the new possibilities yet. Consequently, we do not know much about the assessment of employers and employees concerning the new technologies. However, for the resolution of future conflicts, policy makers dealing with regulation of tracking technologies at the workplace will need empirically-based expertise.

To make a start on solving this problem, we analyzed in a first exploratory study under which circumstances employees are willing to accept tracking and tracing technologies at the workplace. Based on an online access sample, we asked 800 workers in Germany about their opinion on this matter. Specifically, we employed an experimental factorial design which allows us to vary the conditions of the technologies assignment randomly. The results show that employees do not reject these technologies *per se*. However, they are sensitive, e.g. regarding the transparency and efficiency of the informational changes and the involvement of works councils, and they are rather skeptical if these technologies are to be used for monitoring health and performance. The results indicate that the new technologies at hand will probably be introduced in the end, but the introduction may be subject to bargaining and conflicts between the actors involved.

Our study is the first to examine employees' acceptance of the new technologies with an experimental vignette study. However, it has a few drawbacks: First, we do not employ a random sample of the population, our online sample may be biased towards employees who are more technically-minded. However, the causal effects measured with our factorial design are at least valid among this group and usually tend to be relatively stable when varying the sample. Second, we only had a look at the opinions of employees. For the technology's implementation, other actors - especially employers, managers, works councils or unions – will have an impact, too. The attitudes and decisions of these groups will be the subject of future research, hence a prediction about the technology's diffusion path is not possible at the moment.

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