

The effect of the introduction of telework on job performance and satisfaction in the US: a systematic literature review

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ABSTRACT:

Technological enhancements have inevitably accelerated the adoption of telework as opposed to the traditional office-work arrangements. When it comes to remote working, the main concern is performance. Indeed, employees cannot be controlled and lack of ergonomics in the work environment may reduce the workers' productivity level. We performed a systematic review of 2 databases aiming to conduct an exhaustive analysis of the impact of the introduction of telework on both productivity and job satisfaction across the United States. In particular, this analysis includes 21 studies. Results indicate a positive association between telework implementation and both performance and job satisfaction. Since most of the literature does not do causal inference, future research should focus on the investigation of causal links between telework and performance (or satisfaction).

Keywords: telework – job performance – job satisfaction

1. INTRODUCTION

Over the last 15 years, technological progress has determined an exponential increase in the number of teleworkers in the US. Regular telecommuting grew by 216% between 2005 and 2019 (Global Workplace Analytics¹). Moreover, the COVID-19 pandemic and in particular social distancing have strongly supported this trend, highlighting the importance of telework, which has become the only way to preserve jobs and production. By the end of 2021, Global Workplace Analytics forecasts that 25-30% of the workforce will be working from home.

This literature review examines the viability of telecommuting as an alternative to the traditional office-work arrangement. In particular, the analysis focuses on various factors that influence productivity among teleworkers. The review limits its enquiry to the US. A large extent of the literature in this field focuses on behavioral and social aspects, i.e. on the impact of telework on dimensions such as work-life balance or anxiety, still, to our knowledge, no literature review focusing on the US and investigating our research question has been published up to now.

2. METHODS

2.1 *Search strategy*

To carry out our research, we used Scopus and Web of Science employing advanced research tools to guarantee research replicability. The formula that we used to look for results on Scopus is:

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TITLE-ABS-KEY("remote work*" OR telework* OR "work* from home" OR "distance work*") AND (productivity OR performance) AND (efficiency OR absenteeism OR satisfaction)
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Similarly, the formula used on Web of Science is:

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ALL=(("remote work*" OR telework* OR "work* from home" OR "distance work*") AND (productivity OR performance) AND (efficiency OR absenteeism OR satisfaction))
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Overall, this yielded 854 results from Scopus and 189 from Web of Science

We exclusively considered research papers written in English and belonging to the fields of economics, management and social sciences. We further restricted our results to studies focusing on the US.

These restrictions led to 168 publications (see PRISMA diagram).

2.2 *Screening process and eligibility assessment*

From this moment, we downloaded the results and we used Zotero as reference manager. We spotted 18 duplicates, which we then excluded. Since our team was composed of 4 researchers, we divided

¹ <https://globalworkplaceanalytics.com/telecommuting-statistics>

the remaining 150 papers to review titles and abstracts so that each of us was assigned 75 articles, in such a way to have each abstract checked at least twice.

We excluded 96 results as neither the abstract nor the title appeared to be relevant for the topic under study. In particular, we included any article drawing conclusions on the link between performance and remote working. We limited our search to two main concepts, i.e. *i*) job performance (or productivity) and *ii*) job satisfaction.

We paid special attention to the definition of teleworking the authors were referring to. Indeed, we included only those papers which made reference to the modern concept of remote working, i.e. working from home (or simply, remotely) using an electronic device such as a computer or a tablet. We excluded all papers resorting to the broader concept of flexible work arrangements, which might mean flexible working hours, etc. We excluded any article studying phenomena similar to telework, such as distance learning and the like.

The remaining 54 studies underwent full-text analysis and 37 of them were excluded. 4 were excluded because they were found to be reviews, 1 was excluded because it focused on a Canadian sample and the remaining ones were out of scope.

2.3 Additional sources

In addition to the 17 studies which resulted from the first avenue of screening, we decided to carry out some forward reference searching. We ended up with 5 studies resulting from this additional research process. Each of them underwent full-text analysis, just like the other 17. We totalised 21 studies overall.

2.4 Data extraction

When doing the final full-text analysis we focused on *i*) the aforementioned outcome variables (i.e. job performance and job satisfaction) and on their association with remote working, *ii*) study design, *iii*) the type of data and *iv*) the different factors the authors have controlled for.

3. RESULTS

3.1 Job performance

The literature investigating the relationship between telework and productivity tends to conclude a positive correlation between telework and productivity, even though this is not always the case. An explanation for this phenomenon is that different analyses require different proxies for measuring productivity and teleworking, which leads to discordant results.

Starting by considering quantitative papers, Gallardo and Whitacre (2018) assume median household income as an indicator of productivity and find a positive relationship between telework and income (i.e. telework and productivity). Specifically, considering a sample of 71,599 units and differentiating self-employers from employees, the authors find respective coefficients of 0.052 and 0.037 ($p < 0.01$).

Acs, Gerlowski and Zhang (2021) considered the decrease in operating income of small businesses that during COVID-19 implemented teleworking and found a negative coefficient of -1.328 ($p < 0.01$) between a decrease in operating revenues (proxy of (un)productivity) and telework implementation. Besides, this study differentiates for business sectors, highlighting the differences in the impact of the introduction of telework. Results range from -2.278 ($p < 0.01$) for the category “wholesale trade sector” to a maximum of + 3.500 (statistically insignificant) for the educational services sector.

Dubrin (1991) compared 34 in-house-employers and 34 office-based ones and found that the productivity, measured by “transactions per hour”, increased by 29.9% when shifting to work-at-home status.

Choudhury, Foroughi and Larson (2021) investigated the phenomenon of WFA (working from anywhere) in the United States Patent and Trademark Office. The concept of WFA is such that employees are not just working from home, but they work from a region or a country different from the place of residence. They found a positive relation between WFA and an increase in productivity (coefficient: 0.574, $p < 0.001$).

Glass and Noonan (2016) focused on the relationship between earnings and telework on a final sample size of 3,621 employees. Specifically, the regression found a positive association between them, but these coefficients hold only for the first 40 hours of work – when employees work overtime, coefficients plunge.

Another important segment of the literature is mostly composed of within-person field studies that deploy survey data and focus on single firms. The findings suggest that employees have a more positive experience while teleworking and self-report higher levels of productivity, longer working hours, higher morale, etc.

In a study conducted on IBM, Colihan et al. (1998) explored the influences of the virtual office on aspects concerning work and work-life balance. Employees reported greater productivity and performance of teleworkers than office-based employees (Pearson’s correlation: 0.17, $p < 0.01$). Veiga, Anderson and Kaplan (2015) conducted a similar study on a large U.S. government organization and found similar results with a correlation factor of 0.21 ($p < 0.05$) and a coefficient equal to 0.03 ($p < 0.01$). Conversely, Mahler (2012) used large-sample federal government surveys in conjunction with a Microsoft survey to verify whether remote working positively influences job satisfaction and performance. Specifically, 83% of routine teleworkers self-reported better personal productivity and performance. Jackson (2006) found similar results collecting data from AT&T. However, this study is exposed to biases that originate from the fact that only 10% of AT&T’s employees were office-based then. Also, Golden and Gajendran (2019) regress job performance against the amount of time spent telecommuting and found a positive association between them (coeff.: 0.17, $p < 0.01$). Similarly, Bélanger, Watson-Manheim and Swan (2013) serves as a further confirmation of the fact that telecommunication has a positive impact on productivity and in particular lowers both office costs and absenteeism.

Olson (1989) used a sample of 1,615 employers and highlighted that, on average, the 469 people who have worked only remotely also claimed to be more productive. However, managers did not note any difference in the performance of teleworkers, leading to the conclusion that they should work in the

office. Also, telecommunications was perceived as an inefficient tool, but in the 80s technologies were not as developed as nowadays.

Some researchers have focused on the quality of communication when telecommuting. Indeed, the exchange of information between co-workers has proved to be a significant predictor of performance. Golden and Veiga (2008) examined the impact of leader-member quality exchange (LMX) to show that teleworkers enjoying high-quality communication with their leaders demonstrated a higher level of commitment, job satisfaction and performance. In particular, they designed a framework and the coefficient between performance (outcome variable) and LMX is approximately equal to 0.26 ($p < 0.001$). Similarly, Golden et al. (2021) showed that high-quality virtual communication is strongly related to task and job performance, with a Person's correlation of 0.4 ($p < 0.05$) and a coefficient of 0.197 ($p < 0.1$). Jain et al. (2011), tried to disentangle the factors that lead to successful telecommunication concluding that the richness of media communication was positively correlated to job performance. The authors considered separately performance and productivity and found a positive relationship with telework for both of them (0.24 and 0.4 respectively, $p < 0.01$). Results from Mullins, Kim, Yoon (2021) are in line with the aforementioned studies. In particular, they controlled for several variables, but the most important one is social integration (i.e. supervisor's communication quality). They observed the differences between remote workers and office-based ones. Social integration is positively associated with individual performance, but it lowers when the time teleworking per week is reduced. Even higher is the associations with non-teleworkers, suggesting that good communication is important to improve performance for both teleworkers and non-teleworkers.

It is worth mentioning the studies that controlled for factors that may be disruptive to productivity when working remotely.

Kocarev and Prodanova (2021) studied the effect of anxiety for ICT, smartphone addiction and interruptions while working remotely and concluded that these factors inhibit work progress. Likewise, Dino, Golden and Veiga (2008) explored the concept of professional isolation due to home-working and highlighted negative association with performance (coeff.: - 0.13, $p < 0.05$). A study by Britton et al. (2020) conducted on 331 salespeople demonstrated that factors such as health stress, financial stress, role conflict, role overload, emotional exhaustion, etc. all play a negative role in predicting productivity.

3.2 Job satisfaction

After analyzing the impact of remote work on performance, we now turn to its effect on employees' satisfaction.

Literature tends to conclude a positive relationship between the implementation of telework arrangements and job satisfaction, which might partially explain the results we have disclosed in the previous section on job performance.

Bae and Kim (2016) find strong evidence supporting a positive association between telework and job satisfaction. Specifically, 219,450 employees across 19 federal agencies of the United States

expressed their job satisfaction through a five-point Likert-type scale by the Office of Personnel Management survey. Results showed that employees who had taken part in telework programs reported higher satisfaction than those who did not (coefficient: 0.180, $p < 0.01$). Similarly, Vega, Anderson, Kaplan (2014), using the same methodology on a sample of 192 employees at a federal agency, concluded that teleworkers reported higher job satisfaction levels than non-teleworkers (coeff.: 0.08, $p < 0.05$). This study, however, does not represent a piece of reliable evidence since it is based on data collected over a single-week teleworking trial. Dubrin (1991) highlighted the resulting mean job satisfaction of home workers was just slightly higher than that of office-site workers, because people at home can enjoy higher flexibility. However, he also noted that some teleworkers showed dissatisfaction because working from home implied shorter working-hours and, consequently, lower salaries.

Roitz and Jackson (2006) conducted a longitudinal analysis using a survey forwarded to all AT&T workers. Two-thirds of the respondents declared to be more satisfied with their job since beginning the introduction of telework and 69 % of them reported to be more content with their personal and family lives. Similarly, Mahler (2012) highlighted that 86% of teleworkers and 13% of non-teleworkers participating in the survey perceived a positive impact of this work arrangement on job satisfaction.

Jain et al. (2011) collected data from an online survey filled in by 89 employees of 10 different companies and found that positive perception of self-reported job satisfaction was related to the richness of communication technologies (coefficient: 0.46, $p < 0.01$). The authors also highlighted that there is a positive correlation between employees' tenure (0.18, $p < 0.05$) and telework experience (0.19, $p < 0.05$) with satisfaction. They explained these correlations claiming that shorter-tenure/less-experienced employees' unfamiliarity with the organization and its expectations obliges them to face extra stress while discovering if they are handling their responsibilities appropriately.

Opposite evidence was found by Golden and Veiga (2008), who estimated a coefficient of “degree of telework” against job satisfaction equal to -0.18 ($p < 0.01$). They also noted a positive relationship between LMX and satisfaction, with coefficient equal to 0.45 ($p < 0.001$).

4. DISCUSSION

Our systematic review highlights the positive relationship between performance (or productivity) and the introduction of telework. It is worth noting that the majority of the studies use survey data to conduct cross-sectional analyses. This gives rise to a series of doubts regarding the soundness of the results. The cross-sectional analyses included suggest that there is a positive link between the two phenomena, though we cannot infer causation because most papers do not run causal inference, and we found no diff-in-diff studies. This point suggests the first gap of the literature – in order to demonstrate causality, more longitudinal analysis and causal inference is needed. On top of this, we collected very few randomised control trials.

Many studies use survey data (i.e. self-reported performance) to measure productivity. This gives rise to non-negligible knowledge concerns, as employees may not be able to know their productivity level. In the cases in which survey data were not used, the choice of a proxy is critical in that it should

faithfully depict the changes in performance and job satisfaction. Future research should definitely use such proxies (e.g. median income) to measure productivity, as results appear to be sounder.

We noted that most studies use samples of modest dimensions, usually in the order of hundreds of units (often < 400 units). This prevents us from claiming with an acceptable degree of certainty that the estimates are on average reliable.

Given these limitations, the majority of results have only internal validity and one should be careful in projecting the conclusions out of the research design and context in which those conclusions were drawn.

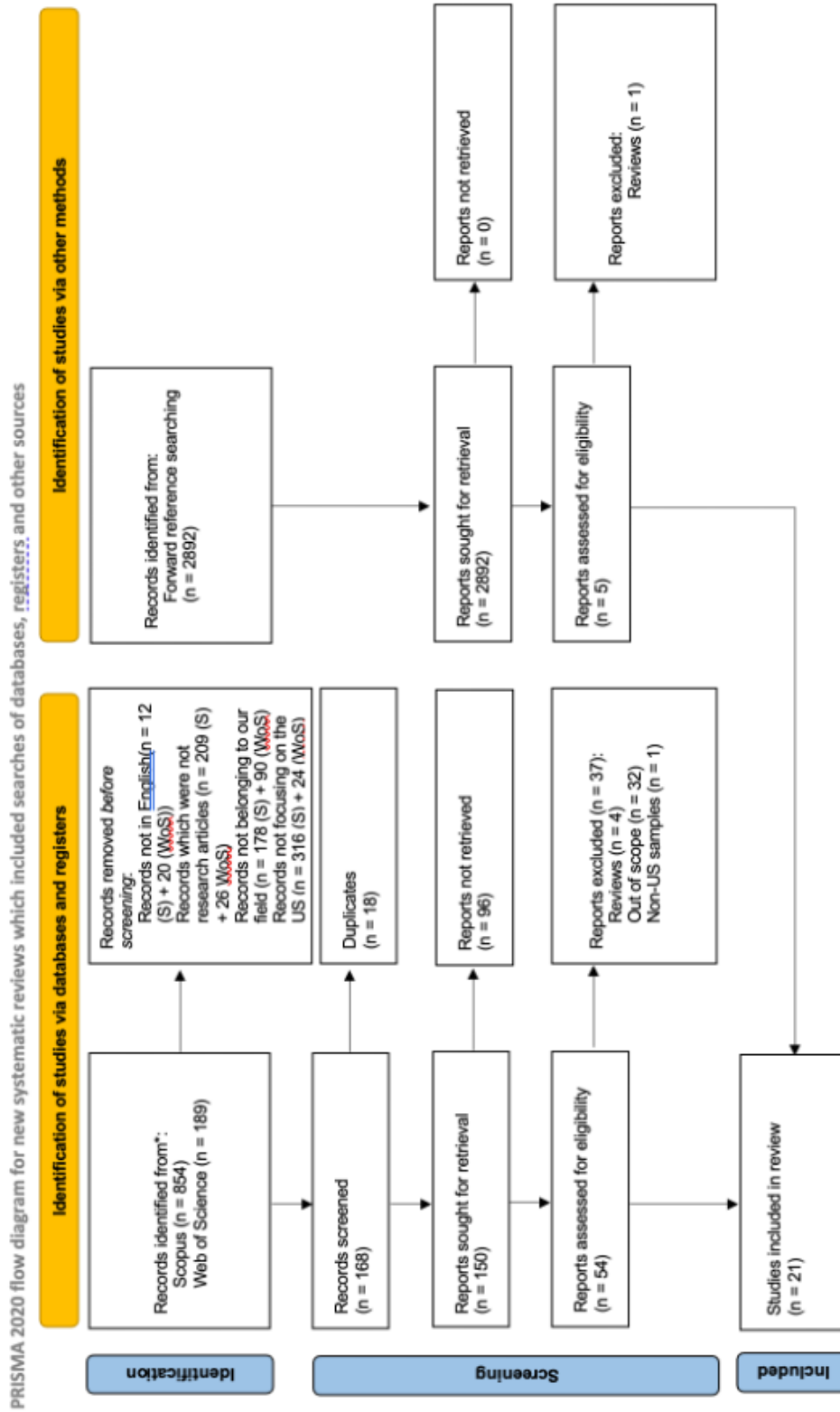
The main limit of our work is that we controlled for only two outcomes, i.e. *i*) job performance/productivity and *ii*) job satisfaction. We did not consider studies investigating different dimensions such as absenteeism or turnover. One further limitation is represented by the number of articles that we have been able to include. Moreover, our review is that we did not control for differences in the telework being compulsory (i.e. made mandatory by the governance) or voluntary. This might partially explain the variability in the coefficients present in our results.

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APPENDIX A



*Consider, if feasible to do so, reporting the number of records identified from each database or register searched (rather than the total number across all databases/register).

**If automation tools were used, indicate how many records were excluded by a human and how many were excluded by automation tools.

From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. *BMJ* 2021;[372:n71](https://doi.org/10.1136/bmj.n71). doi: 10.1136/bmj.n71. For more information, visit: <http://www.prisma-statement.org>

APPENDIX B

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	1
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	2
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	2
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	2
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	2
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	2-3
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	3
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	3
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	3

	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	3
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	-
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	-
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	-
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	-
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	-
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	-
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	-
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	-
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	3
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	-
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	10
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	-
Study characteristics	17	Cite each included study and present its characteristics.	3 – 6
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	3 – 6

Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	3 – 6
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	3 – 6
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	-
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	3 – 6
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	-
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	-
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	3 – 6
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	7
	23b	Discuss any limitations of the evidence included in the review.	7
	23c	Discuss any limitations of the review processes used.	7
	23d	Discuss implications of the results for practice, policy, and future research.	7
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	-
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	-
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	-
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	-
Competing interests	26	Declare any competing interests of review authors.	-

Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	-
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APPENDIX C

<https://docs.google.com/spreadsheets/d/1kFFVq7e8K34BquoMnLBAhCcCYimmvQJ7/edit?usp=sharing&oid=113656201824273779460&rtpof=true&sd=true>

*excel file with raw data