Impact of different design choices when using metered data to understand how people search for jobs online

Workshop “Linking Digital Footprint and Survey Data for Open Research”

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Several of the images haven been created using ChatGPT.

Introduction

Metered data: definition

Metered data = 1 type of digital traces

Data obtained through a **tracking application** ("meter") installed by the participants on their devices to register at least the **URLs** of the webpages visited. Usually collected in online panels ("metered panels").

Data collected **passively**

Participants only need to accept to share such data and set up a tracking app

Metered data: potential benefits and growing use

Different potential **benefits**

- No recall errors
- Lower social desirability
- No effort/burden
- No satisficing
- Granularity
- Continuity
- Etc.

Growing interest in using them

- Exponential number of **papers** published using metered data
- Diversity of topics: media consumption, fake news, bipolar behaviors, etc.

Metered data: potential problems

- Many possible types of errors
  - **Total Error framework** for digital traces collected with **Meters** (Bosch & Revilla, 2022)
    - Overview of possible errors & their causes
    - Meter installed only on some of the devices used, shared devices, technology limitations, etc.

- In practice, these errors can be large
  - Bosch et al. (2024) found that only **26%** of participants are fully covered
    - Using data from the Netquest panels in Italy, Portugal and Spain

- **Size of these errors** depends on different aspects:
  - Concept to be measured, target population, etc.
  - Also depends on the **design choices**
    - Well-known for survey data that design choices impact results (Saris & Gallhofer, 2007)
    - But little information about these choices and their impact for metered data

Metered data: impact of design choices

- One study by Bosch (2023) supports the idea that **design choices impact the quality** of measures based on metered data
  - Using metered data from Italy, Portugal and Spain
  - Conducts a **multiverse** analysis to assess the validity & reliability of **+2,500 measures** of media exposure

Table 0.1: Design choices and options for measuring media exposure

Choices	Options
Metric	Visits, Seconds, Days, No Media
List of traces	
List of media	Tranco, Alexa, Cisco, Majestic
Top media	10, 20, 50, 100, 200, All
Information	All URLs, only those identified as "hard" news
Exposure	1-second, 30-seconds, 120-seconds threshold
App behaviour	Included, excluded
Tracking period	2, 5, 10, 15 days

Good point about metered data: low cost to create different measures

Metered data: impact of design choices

- One study by Bosch (2023) supports the idea that **design choices impact the quality** of measures based on metered data
  - Using metered data from Italy, Portugal and Spain
  - Conducts a **multiverse** analysis to assess the validity & reliability of **+2,500 measures** of media exposure

- Limitations
  - Only one concept considered (media exposure)
  - Only some design choices and values
  - Variables created by the fieldwork company (Netquest)

More research needed

Our study about online job search

Main goals

web data opp

1) Substantive goals

- Learn more about online job searches
- Study differences across gender, age, education groups, but also depending on the employment status

2) Methodological goals

- Illustrating the kind of new concepts that can be operationalized using metered data
- Investigating how design choices made during the operationalization of concepts into measures based on metered data affect the results

Our focus today

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Research questions

RQ1

To what extent does the device used to gather metered data influence the indicators obtained for different concepts?

- Some existing metered panels only collect data on one type of device
- Crucial to investigate how this can affect the results

RQ2

To what extent do a) the extension of the time period and b) the specific time frame covered by the metered data influence the indicators obtained for different concepts?

- Extension of time period affects largely the costs
- Time frame can play a role if seasonality in the concepts studied

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Data: metered + profiling

netquest

Metered data

Online job search activity:
URLs + app use + search terms

9 months (March to November 2023)

Survey data

Profiling information

53 variables measured through surveys and stored by Netquest

600 panellists

Sent metered data during the entire period

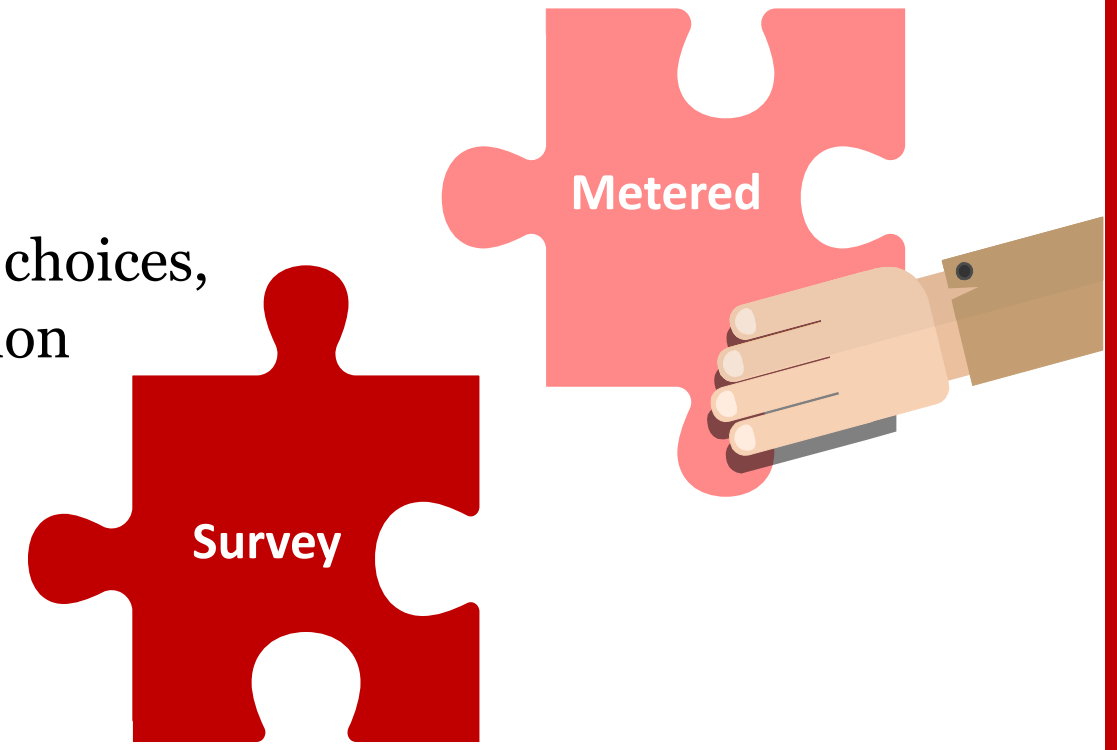
Visited any of the job search platforms on at least 5 days

Random within those

Profiling information about gender, age, region, & social class

Why did we need to link metered and survey data?

- For the substantive analyses
  - Crucial part of the research is to compare different groups
  - While some groups could be defined using metered data (e.g., low versus high internet use), for most groups, survey data was needed (e.g., to obtain information about their age or education level)
- For the methodological analyses
  - To control when studying the effect of design choices, also important to have background information



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Concepts operationalized using metered data

Categorical		Numerical
Proportion	Distribution	
• Online platforms used for job search • Device used for job search • Device used for job application • Search terms used for job search	• Days of the week preferred for job search • Time of the day preferred for job search	• Job search duration • Job search effort • Job search intensity • Job search effectiveness • Average time per job offer • Average time per job application
Proportion of panelists for whom each level of the variable applies. Do not sum to 100.	How the activity of panelists is distributed across the levels of these variables. Sum to 100.	Compute mean for each variable

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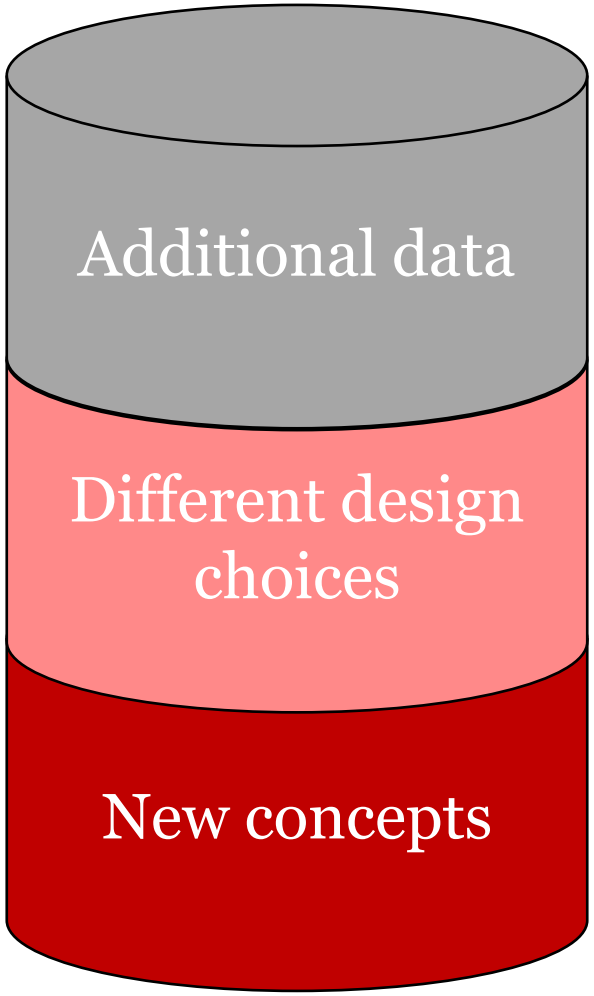
Contributions



- List of all individual relevant URLs/app visits
- All **search terms** used before visiting a URL/app of interest

- Device used to gather metered data
- Extension of the tracking period*
- Time frame
- More (in progress)

- **12** different concepts (already studied and new ones)
- Different types (categorical and numeric)

Analyses: to answer RQ1

- All operationalizations of concepts were implemented using observed activity from
  1. Only PCs
  2. Only mobile devices
  3. Both PCs and mobile devices

- "Device used for job search" and "Device used for job application" excluded
  - Cannot be studied when we have metered data from only one type of devices

- Groups compared using Yates' chi-squared tests (proportions) or t-tests (means)

- Regressions were also implemented to control for gender, age and education
  - Logistic or linear, with and without random effects

Analyses: to answer RQ2

- Extension of the tracking period
  - We compare 1 month (1m), 3 months (3m), and 9 months (9m)

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Analyses: to answer RQ2

- Extension of the tracking period
  - We compare 1 month (1m), 3 months (3m), and 9 months (9m)

- Time frame
  - We compare 3 equal-length periods of time

- "Job search duration" and "job search effort" excluded
  - The average search duration is 162 days → 3 months or less clearly insufficient

- Similar tests and regressions
  - Present results from the tests, regressions in Appendix

Results: Impact of device (RQ1)

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- **Proportion**

	PC		Mobile		Both	
Online platforms (top 5)						
Infojobs	76.2	ab	91.2	a	89.2	b
indeed.com	49.0	a	38.2	ac	49.0	c
linkedin.com/jobs	65.4	ab	10.1	ac	42.5	bc
Jooble	21.8		17.5	c	22.8	c
Randstad	17.8		21.8		22.5	
Search terms used						
Specific search	64.2		59.6		66.6	
Platform name	53.8	a	37.7	ac	51.0	c
Job related topics	46.2		35.6	c	46.6	c
Generic search	12.1		15.1		14.9	

a, b and c indicate a significant effect (5% level) between the 2 groups sharing the same letter

Results for online platforms used significantly different in most cases

← Some substantial differences

Results for search terms vary less

Significant differences for job search platform could be linked to use of apps in mobile

Results: Impact of device (RQ1)

- **Distribution**

	PC	Mobile	Both
Day of the week			
Monday	17.1	16.2	17.3
Tuesday	18.9	16.6	16.9
Wednesday	18.6	17.8	18.4
Thursday	17.2	17.2	17.1
Friday	13.0	13.3	13.3
Saturday	7.1 [a]	9.5 [a]	8.4
Sunday	8.1	9.5	8.7
Time of the day			
Night (0:00-5:59)	4.5 [a]	6.3 [a]	5.5
Morning (6:00-11:59)	24.1 [ab]	28.9 [a]	27.8 [b]
Afternoon (12:00-17:59)	40.5	39.0	40.2
Evening (18:00-23:59)	30.9 [ab]	25.8 [a]	26.5 [b]

Limited variations for day of the week

But significant differences for time of the day

Results: Impact of device (RQ1)

- **Numeric**

	PC	Mobile	Both
Job search duration (days)	133.3 [b]	139.4 [c]	164.0 [bc]
Job search effort (days)	2.1	2.7	3.2
Job search intensity (min./day)	0.8	1.2	1.1
Job search effectiveness (%)	9.4	7.0	8.6
Avg. time per job offer (sec.)	53.1	41.7	48.2
Avg. time per job application (sec.)	111.1	78.5	101.9

Significant differences for job search duration

But not for the others

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Results: Impact different extensions & time frames (RQ2)

- **Proportion**

Shortening the tracking period affects indicators based on proportions that depend on detecting specific events for each panelist

- The longer the period, the more likely such events are detected.

Time frame only affects significantly the device used for applying.

	Extension			Time frame		
	1m	3m	9m	p1	p2	p3
Online platforms (top 5)						
Infojobs	73.7 b	77.1 c	89.2 bc	78.0	77.1	79.8
indeed.com	23.1 ab	31.8 ac	49.0 bc	31.3	31.8	29.7
linkedin.com/jobs	25.3 ab	32.0 ac	42.5 bc	32.2	32.0	35.4
Jooble	6.4 ab	11.2 ac	22.8 bc	11.6	11.2	13.4
Randstad	9.8 b	14.0 c	22.5 bc	13.5	14.0	13.7
Device for visits						
PC	78.9	81.0	81.1	76.1	81.0	82.6
Mobile	26.3 b	32.3 c	43.0 bc	38.1	32.3	37.0
Device for applications						
PC	89.4	87.8	84.2	73.6 a	87.8 a	84.7
Mobile	12.8 b	17.1	29.5 b	34.7 a	17.1 a	23.5
Search terms used						
Specific search	43.8 b	55.2 c	66.6 bc	62.5	55.2	54.1
Platform name	31.2 b	37.3 c	51.0 bc	39.7	37.3	40.5
Job related topics	22.3 ab	34.8 ac	46.6 bc	33.7	34.8	41.5
Generic search	10,7	9.0	14.9	12.0	9.0	9.3

Results: Impact different extensions & time frames (RQ2)

web data opp

- **Distribution**

	Extension			Time frame		
	1m	**3m**	**9m**	**p1**	**p2**	**p3**
Day of the week						
Monday	20.8 [b]	18.5	17.3 [b]	17.3	18.5	19.1
Tuesday	15.7	16.2	16.9	17.6	16.2	16.2
Wednesday	16.0	16.7	18.4	18.8	16.7	18.4
Thursday	16.7	19.3 [c]	17.1 [c]	15.9 [a]	19.3 [a]	16.9
Friday	11.4	13.3	13.3	12.7	13.3	12.1
Saturday	9.5	8.2	8.4	8.9	8.2	9.1
Sunday	9.9	7.9	8.7	8.9	7.9	8.3
Time of the day						
Night (0:00-5:59)	5.5	5.9	5.5	5.8	5.9	5.2
Morning (6:00-11:59)	28.4	27.1	27.8	29.6	27.1	27.9
Afternoon (12:00-17:59)	39.4	41.1	40.2	37.2 [a]	41.1 [a]	40.5
Evening (18:00-23:59)	26.7	25.9	26.5	27.4	25.9	26.5

Few significant differences for both extension and time frame

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Impact different extensions & time frames (RQ2)

- **Numeric**

	Extension			Time frame		
	1m	**3m**	**9m**	**p1**	**p2**	**p3**
Job search intensity (min./day)	1.3 [a]	0.9 [a]	1.1	1.2	0.9	1.4
Job search effectiveness (%)	9.7	8.9	8.6	8.2	8.9	8.9
Avg. time per job offer (sec.)	49.3	47.5	48.2	38.7	47.2	48.3
Avg. time per job application (sec.)	84.2	109.6	101.9	80.0	109.6	96.5

Almost no significant differences for numeric variables

Conclusions

Summary

- We measure 12 concepts of interest related to online job search using metered data

- We study whether different design decisions affect the proportions, distributions or means obtained
  - Type of device used to collect the metered data
  - Extension of the tracking period
  - Time frame

- Main results:
  - Restricting data collection to a single type of **device can significantly influence** research outcomes, though the effect varies by concept
    - Some show substantial differences, while others remain unaffected
  - **Reducing the tracking period significantly impacts the results** for most proportion-based indicators but has little effect on those based on distributions or numeric values
  - The **time frame** has **limited** impact on the outcomes studied

CONCLUSIONS

Practical recommendations

1

Collect data from both mobile and PC

If this is not possible, interpret your results carefully

2

Use the longest tracking period that you can afford

At least for a topic like online job search, reducing the tracking period from 9 to 3 months can lead to different results

3

Consider potential issues with the time frame

Even if the impact of the time frame seems limited, carefully consider if some seasonality can be expected in the variables of interest

Results could be different in other countries, panels, for other concepts of interest, etc.

Further research

- With these data
  - Look at more decisions in the operationalization
    - How does it affect the results if the times per visit longer than X minutes are discarded, or replaced by the median visit time?
    - Or if visits shorter than X seconds are not considered?
  - Study further selection bias, etc.

- Beyond these data
  - More research needed about design choices
    - Need to learn more about how they impact the results to make informed decisions (as in surveys)
  - More research needed on how to combine metered data with surveys
    - Ochoa (forthcoming) implemented an in-the-moment survey triggered by metered data
    - Can complement the kind of analyses that can be done with the current study data

Thanks!

Questions?

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https://www.upf.edu/web/webdataopp

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Appendices

APPENDIX 1

Concepts operationalized using metered data

Concept	Meter-based indicator	Group
Online platforms used for job search	Proportion of panelists visiting at least once each platform in the listed job search websites and apps	Proportion
Job search duration	Days between the first and the last job offer visited of "valid job search periods", defined as those that do not include searches within the first and the last week of observed data, since this may indicate that the search process is not fully observed (i.e., the process could have started before the observation period or could still be in progress after it).	Numerical
Job search effort	Total time spent on job search platforms. For websites, this time is the sum of the time spent on each webpage (i.e., the time from when the page is visited until the next one is visited). For apps, it is the time from when the app is opened until it is closed.	Numerical
Job search intensity	Time spent in job search websites per day, considering all the time period that spans from the first to the last job offer visit. In this case, searched are not limited to valid job search periods.	Numerical
Device used for job search	Proportion of visited job offers from PCs vs. mobile devices among panelists sharing metered data from both types of devices.	Proportion
Device used for job application	Proportion of job applications from PCs vs. mobile devices among panelists sharing metered data from both types of devices.	Proportion
Search terms used for job search	Proportion of terms used in (1) search engines (e.g., Google) before accessing job search platforms and (2) internal search engines inside job search platforms (information not recordable by the used meter for all the sites).	Proportion
Days of the week preferred for job search	Proportion of job search sessions per day of the week.	Distribution
Time of the day preferred for job search	Proportion of visited job offers per time of the day.	Distribution
Job search effectiveness	Ratio of application over the number of visited job offers (without considering repeated visits).	Numerical
Average time per job offer	Total time spent on job offer visits over the number of different visited job offers (without repetitions).	Numerical
Average time per job application	Total time spent on job offer applications over the number of different job applications.	Numerical

APPENDIX 2

Sample characteristics

Sample

Average age: 41 years

53% women

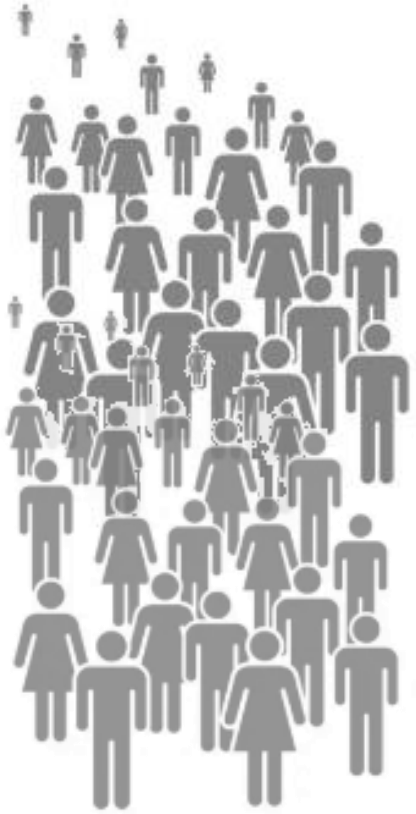
47% highly educated

73% shared metered data from PC & mobile

22.0% from mobile only

5% from PCs only

Entire metered panel



Average age: 42 years

53% women

42% highly educated

32% shared metered data from PC & mobile

56.0% from mobile only

12% from PCs only

APPENDIX 3: Regression analyses

APPENDIX 3

Results using regressions controlling for age, gender, and education

APPENDIX 3: Regressions

Results: Impact of device (RQ1)

- **Proportion**

	Coef. Both->PC	*p.value*		Coef. Both->Mobile	*p.value*		Coef. PC->Mobile	*p.value*	
Online platforms (top 5)									
InfoJobs	-0.91	*0.000*	*	0.17	*0.421*		1.08	*0.000*	*
indeed.com	0.00	*0.989*		-0.44	*0.001*	*	-0.44	*0.002*	*
linkedin.com/jobs	0.92	*0.000*	*	-1.90	*0.000*	*	-2.82	*0.000*	*
Jooble	-0.04	*0.813*		-0.35	*0.029*	*	-0.31	*0.090*	
Randstad	-0.26	*0.132*		-0.08	*0.618*		0.18	*0.319*	
Search terms									
Specific search	-0.15	*0.396*		-0.23	*0.262*		-0.08	*0.715*	
Job search platform name	0.11	*0.518*		-0.55	*0.007*	*	-0.66	*0.002*	*
Job related searches (salarys, conditions, contracts)	-0.01	*0.934*		-0.46	*0.026*	*	-0.44	*0.042*	*
Generic employment query	-0.22	*0.387*		-0.03	*0.910*		0.19	*0.545*	

Effect of the observed devices on indicators (proportions and distributions), with regressions controlling for age, gender and education.
Regressions are run first using “Both” as reference level (groups of columns 1 and 2) and then using “PC” (groups of columns 3).

APPENDIX 3: Regressions

Results: Impact of device (RQ1)

- **Distribution**

	Coef. Both->PC	*p.value*	Coef. Both->Mobile	*p.value*	Coef. PC->Mobile	*p.value*
Day of the week						
Monday	-0.31	*0.751*	-0.93	*0.306*	-0.62	*0.552*
Tuesday	2.09	*0.028**	-0.27	*0.758*	-2.36	*0.02**
Wednesday	0.04	*0.961*	-0.42	*0.615*	-0.47	*0.628*
Thursday	0.22	*0.814*	0.02	*0.982*	-0.2	*0.841*
Friday	-0.17	*0.839*	-0.21	*0.784*	-0.04	*0.962*
Saturday	-1.31	*0.069*	1.09	*0.105*	2.4	*0.002**
Sunday	-0.56	*0.443*	0.73	*0.285*	1.29	*0.099*
Time of the day						
Night (0:00-5:59)	-0.91	*0.243*	0.76	*0.291*	1.67	*0.044**
Morning (6:00-11:59)	-3.98	*0.005**	1.32	*0.320*	5.30	*0.001**
Afternoon (12:00-17:59)	0.32	*0.818*	-1.22	*0.346*	-1.54	*0.300*
Evening (18:00-23:59)	4.57	*0.001**	-0.87	*0.514*	-5.44	*0.000**

Effect of the observed devices on indicators (proportions and distributions), with regressions controlling for age, gender and education.
Regressions are run first using “Both” as reference level (groups of columns 1 and 2) and then using “PC” (groups of columns 3).

APPENDIX 3: Regressions

Results: Impact of device (RQ1)

- **Numeric**

	Coef. Both->PC	*p.value*	Coef. Both->Mobile	*p.value*	Coef. PC->Mobile	*p.value*
Job search duration (days)	-30.87	0.000	-24.54	0.000	6.34	0.342
Job search effort (days)	-1.15	0.103	-0.53	0.425	0.63	0.407
Job search intensity (min./day)	-0.33	0.474	0.01	0.980	0.34	0.489
Job search effectiveness (%)	0.9	0.446	-1.61	0.225	-2.50	0.077
Avg. time per job offer (sec.)	4.28	0.450	-5.55	0.386	-9.83	0.151
Avg. time per job application (sec.)	10.15	0.496	-27.87	0.160	-38.02	0.065

APPENDIX 3: Regressions

Results: Impact of tracking period extension (RQ2a)

- **Proportion**

	Coef. 1m->3m	*p.value*	Coef. 1m->9m	*p.value*	Coef. 3m->9m	*p.value*
Online platforms (top 5)						
InfoJobs	0.18	0.247	1.10	0.000*	0.92	0.000*
indeed.com	0.44	0.003*	1.18	0.000*	0.74	0.000*
linkedin.com/Jobs	0.36	0.020*	0.86	0.000*	0.50	0.000*
Jooble	0.62	0.013*	1.49	0.000*	0.88	0.000*
Randstad	0.41	0.049*	1.00	0.000*	0.59	0.000*
Device for visits						
PC	0.13	0.656	0.18	0.510	0.05	0.835
Mobile	0.30	0.262	0.75	0.002*	0.46	0.022*
Device for applications						
PC	-0.15	0.791	-0.42	0.424	-0.27	0.515
Mobile	0.34	0.515	1.07	0.025*	0.72	0.037*
Search terms						
Specific search	0.49	0.041*	1.02	0.000*	0.53	0.005*
Job search platform name	0.28	0.258	0.85	0.000*	0.56	0.002*
Job related searches (salarys, conditions, contracts)	0.61	0.024*	1.10	0.000*	0.49	0.009*
Generic employment query	-0.19	0.627	0.36	0.301	0.55	0.061

Effect of the observed devices on indicators (proportions and distributions), with regressions controlling for age, gender and education.
Regressions are run first using “Both” as reference level (groups of columns 1 and 2) and then using “PC” (groups of columns 3).

APPENDIX 3: Regressions

Results: Impact of tracking period extension (RQ2a)

- **Distribution**

	Coef. 1m->3m	*p.value*	Coef. 1m->9m	*p.value*	Coef. 3m->9m	*p.value*
Day of the week						
Monday	-2.39	0.075	-3.57	0.006*	-1.19	0.329
Tuesday	0.52	0.664	1.15	0.322	0.63	0.557
Wednesday	0.64	0.575	2.31	0.039*	1.67	0.108
Thursday	2.54	0.042*	0.39	0.747	-2.15	0.057
Friday	1.91	0.055	1.93	0.046*	0.03	0.975
Saturday	-1.27	0.174	-1.06	0.243	0.21	0.805
Sunday	-1.94	0.037*	-1.14	0.205	0.79	0.344
Time of the day						
Night (0:00-5:59)	0.43	0.635	0.03	0.973	-0.40	0.625
Morning (6:00-11:59)	-1.25	0.463	-0.54	0.743	0.71	0.646
Afternoon (12:00-17:59)	1.64	0.333	0.73	0.657	-0.91	0.554
Evening (18:00-23:59)	-0.82	0.616	-0.22	0.892	0.60	0.684

Effect of the observed devices on indicators (proportions and distributions), with regressions controlling for age, gender and education.
Regressions are run first using “Both” as reference level (groups of columns 1 and 2) and then using “PC” (groups of columns 3).

APPENDIX 3: Regressions

Results: Impact of tracking period extension (RQ2a)

- **Numeric**

	Coef. 1m->3m	*p.value*	Coef. 1m->9m	*p.value*	Coef. 3m->9m	*p.value*
Job search duration (days)	-0.36	0.262	-0.13	0.668	0.22	0.437
Job search effort (days)	-0.92	0.601	-1.33	0.419	-0.41	0.770
Job search intensity (min./day)	-1.97	0.781	-0.68	0.919	1.29	0.817
Job search effectiveness (%)	23.97	0.313	18.42	0.398	-5.55	0.754
Avg. time per job offer (sec.)	-0.36	0.262	-0.13	0.668	0.22	0.437
Avg. time per job application (sec.)	-0.92	0.601	-1.33	0.419	-0.41	0.77

APPENDIX 3: Regressions

Results: Impact of time frame (RQ2b)

- **Proportion**

	Coef. p1->p2	*p.Value*	Coef. p1->p3	*p.value*	Coef. p2->p3	*p.value*
Online platforms (top 5)						
InfoJobs	-0.05	0.752	0.1	0.492	0.15	0.313
indeed.com	0.02	0.894	-0.08	0.559	-0.10	0.470
linkedin.com/Jobs	-0.01	0.920	0.15	0.270	0.16	0.226
Jooble	-0.05	0.800	0.16	0.382	0.21	0.257
Randstad	0.05	0.784	0.02	0.902	-0.03	0.878
Device for visits						
PC	0.27	0.302	0.41	0.123	0.14	0.600
Mobile	-0.24	0.275	-0.04	0.851	0.20	0.362
Device for applications						
PC	0.92	0.034*	0.68	0.094	-0.24	0.600
Mobile	-0.96	0.013*	-0.54	0.131	0.42	0.285
Search terms						
Specific search	-0.31	0.143	-0.34	0.104	-0.03	0.872
Job search platform name	-0.10	0.645	0.04	0.863	0.13	0.515
Job related searches (salarys, conditions, contracts)	0.05	0.833	0.33	0.120	0.28	0.168
Generic employment query	-0.30	0.368	-0.29	0.382	0.01	0.971

Effect of the observed devices on indicators (proportions and distributions), with regressions controlling for age, gender and education.
Regressions are run first using “Both” as reference level (groups of columns 1 and 2) and then using “PC” (groups of columns 3).

APPENDIX 3: Regressions

Results: Impact of time frame (RQ2b)

- **Distribution**

	Coef. p1->p2	*p.Value*	Coef. p1->p3	*p.value*	Coef. p2->p3	*p.value*
Day of the week						
Monday	1.20	0.363	1.82	0.167	0.62	0.638
Tuesday	-1.37	0.244	-1.41	0.229	-0.04	0.974
Wednesday	-2.14	0.074	-0.48	0.684	1.66	0.162
Thursday	3.39	0.005*	1.02	0.398	-2.37	0.048*
Friday	0.64	0.518	-0.60	0.545	-1.24	0.208
Saturday	-0.78	0.420	0.14	0.885	0.91	0.337
Sunday	-0.94	0.281	-0.48	0.581	0.46	0.593
Time of the day						
Night (0:00-5:59)	0.10	0.909	-0.64	0.452	-0.74	0.384
Morning (6:00-11:59)	-2.54	0.129	-1.74	0.297	0.80	0.627
Afternoon (12:00-17:59)	3.92	0.020*	3.21	0.055	-0.71	0.669
Evening (18:00-23:59)	-1.48	0.360	-0.83	0.606	0.65	0.685

Effect of the observed devices on indicators (proportions and distributions), with regressions controlling for age, gender and education.
Regressions are run first using “Both” as reference level (groups of columns 1 and 2) and then using “PC” (groups of columns 3).

APPENDIX 3: Regressions

Results: Impact of time frame (RQ2b)

- **Numeric**

	Coef. p1->p2	*p.Value*	Coef. p1->p3	*p.value*	Coef. p2->p3	*p.value*
Job search duration (days)	-0.23	0.445	0.28	0.351	0.51	0.088
Job search effort (days)	0.69	0.659	0.69	0.664	0.00	0.998
Job search intensity (min./day)	8.43	0.124	9.66	0.081	1.23	0.822
Job search effectiveness (%)	28.99	0.104	17.23	0.327	-11.76	0.498
Avg. time per job offer (sec.)	-0.23	0.445	0.28	0.351	0.51	0.088
Avg. time per job application (sec.)	0.69	0.659	0.69	0.664	0.00	0.998

APPENDIX 3

Results using regressions controlling for age, gender, and education, with random effects

APPENDIX 3: Regressions with random effects

Results: Impact of device (RQ1)

- **Proportion**

	Coef. Both->PC	*p.value*	Coef. Both->Mobile	*p.value*	Coef. PC->Mobile	*p.value*
Online platforms (top 5)						
InfoJobs	-3.38	0.000*	-1.80	0.003*	1.58	0.003*
indeed.com	-0.47	0.037*	-1.28	0.000*	-0.75	0.000*
linkedin.com/jobs	-0.09	0.000*	-10.71	0.000*	-11.01	0.000*
Jooble	-1.46	0.007*	-3.29	0.000*	-1.83	0.003*
Randstad	-2.24	0.000*	-2.13	0.000*	0.10	0.855
Search terms						
Specific search	-1.50	0.015*	-1.73	0.008*	-0.23	0.710
Job search platform name	-0.47	0.348	-4.79	0.000*	-2.31	0.000*
Job related searches (salarys, conditions, contracts)	-0.89	0.085	-3.10	0.000*	-1.47	0.001*
Generic employment query	-2.27	0.029*	-1.86	0.071	0.25	0.749

Effect of the observed devices on indicators (proportions and distributions), with regressions controlling for age, gender and education.
Regressions are run first using “Both” as reference level (groups of columns 1 and 2) and then using “PC” (groups of columns 3).

APPENDIX 3: Regressions with random effects

Results: Impact of device (RQ1)

- **Distribution**

	Coef. Both->PC	*p.value*	Coef. Both->Mobile	*p.value*	Coef. PC->Mobile	*p.value*
Day of the week						
Monday	-0.69	-1.020*	-0.30	-0.478*	0.40	0.522
Tuesday	1.76	2.396	0.03	0.038*	-1.74	-2.126*
Wednesday	-0.62	-0.967*	0.06	0.110	0.69	0.956
Thursday	0.47	0.662	-0.31	-0.474*	-0.79	-0.988*
Friday	0.18	0.309	-0.47	-0.869*	-0.66	-0.989*
Saturday	-0.72	-1.362*	0.57	1.162	1.29	2.175
Sunday	-0.45	-0.848*	0.50	1.039	0.95	1.611
Time of the day						
Night (0:00-5:59)	-0.63	-1.271*	0.34	0.764	0.97	1.752
Morning (6:00-11:59)	-3.40	-3.879*	1.49	1.871	4.89	4.962
Afternoon (12:00-17:59)	0.25	0.289	-0.65	-0.817*	-0.90	-0.920*
Evening (18:00-23:59)	3.81	4.050	-1.18	-1.371*	-4.98	-4.727*

Effect of the observed devices on indicators (proportions and distributions), with regressions controlling for age, gender and education.
Regressions are run first using “Both” as reference level (groups of columns 1 and 2) and then using “PC” (groups of columns 3).

APPENDIX 3: Regressions with random effects

Results: Impact of device (RQ1)

- **Numeric**

	Coef. Both->PC	*p.value*	Coef. Both->Mobile	*p.value*	Coef. PC->Mobile	*p.value*
Job search duration (days)	-27.84	-5.829*	-21.97	-4.919*	5.87	1.105
Job search effort (days)	-1.51	-2.936*	-0.60	-1.269*	0.91	1.594
Job search intensity (min./day)	-0.49	-1.464*	-0.04	-0.127*	0.45	1.210
Job search effectiveness (%)	0.48	0.996	-0.81	-1.412*	-1.29	-1.939*
Avg. time per job offer (sec.)	3.89	1.086	-8.59	-2.045*	-12.47	-2.595*
Avg. time per job application (sec.)	2.41	0.692	-7.06	-1.368*	-9.47	-1.632*

APPENDIX 3: Regressions with random effects

Results: Impact of tracking period extension (RQ2a)

- **Proportion**

	Coef. 1m->3m	*p.value*	Coef. 1m->9m	*p.value*	Coef. 3m->9m	*p.value*
Online platforms (top 5)						
InfoJobs	0.77	0.000*	3.77	0.000*	9.98	0.000*
indeed.com	11.11	0.000*	23.63	0.000*	2.80	0.000*
linkedin.com/Jobs	9.86	0.000*	21.32	0.000*	11.60	0.001*
Jooble	4.26	0.000*	11.28	0.000*	13.44	0.038*
Randstad	13.01	0.000*	27.47	0.000*	8.46	0.000*
Device for visits						
PC	1.43	0.000*	5.47	0.000*	7.16	0.000*
Mobile	1.06	0.061	2.60	0.000*	12.87	0.087
Device for applications						
PC	0.92	0.000*	2.12	0.000*	2.26	0.000*
Mobile	11.19	0.000*	24.33	0.000*	11.71	0.209
Search terms						
Specific search	18.54	0.000*	31.37	0.000*	2.33	0.000*
Job search platform name	2.08	0.000*	3.99	0.000*	1.91	0.000*
Job related searches (salarys, conditions, contracts)	12.54	0.000*	25.72	0.000*	1.80	0.000*
Generic employment query	7.79	0.170	19.26	0.022*	11.25	0.000*

Effect of the observed devices on indicators (proportions and distributions), with regressions controlling for age, gender and education.
Regressions are run first using “Both” as reference level (groups of columns 1 and 2) and then using “PC” (groups of columns 3).

APPENDIX 3: Regressions with random effects

Results: Impact of tracking period extension (RQ2a)

web data opp

• Distribution

	Coef. 1m->3m	*p.value*	Coef. 1m->9m	*p.value*	Coef. 3m->9m	*p.value*
Day of the week						
Monday	-2.39	-2.359*	-3.53	-3.533*	-1.14	-1.251*
Tuesday	0.20	0.208	0.82	0.866	0.62	0.715
Wednesday	0.70	0.754	2.43	2.657	1.73	2.068
Thursday	2.45	2.555	0.50	0.532	-1.95	-2.258*
Friday	1.96	2.612	1.93	2.608	-0.03	-0.044*
Saturday	-1.33	-1.831*	-1.21	-1.693*	0.12	0.181
Sunday	-1.54	-2.215*	-0.91	-1.334*	0.63	1.000
Time of the day						
Night (0:00-5:59)	0.26	0.471	-0.08	-0.146*	-0.34	-0.683*
Morning (6:00-11:59)	-1.01	-0.952*	-0.21	-0.205*	0.79	0.832
Afternoon (12:00-17:59)	1.35	1.166	0.76	0.665	-0.59	-0.565*
Evening (18:00-23:59)	-0.58	-0.562*	-0.48	-0.473*	0.10	0.104

Effect of the observed devices on indicators (proportions and distributions), with regressions controlling for age, gender and education.
Regressions are run first using “Both” as reference level (groups of columns 1 and 2) and then using “PC” (groups of columns 3).

APPENDIX 3: Regressions with random effects

Results: Impact of tracking period extension (RQ2a)

- **Numeric**

	Coef. 1m->3m	*p.value*	Coef. 1m->9m	*p.value*	Coef. 3m->9m	*p.value*
Job search intensity (min./day)	-0.24	-4.130*	-0.36	-6.291*	-0.13	-2.388*
Job search effectiveness (%)	-0.90	-0.902*	-0.94	-0.955*	-0.04	-0.045*
Avg. time per job offer (sec.)	0.79	0.287	2.15	0.791	1.36	0.611
Avg. time per job application (sec.)	15.3	1.391	11.04	1.017	-4.26	-0.494*

APPENDIX 3: Regressions with random effects

Results: Impact of time frame (RQ2b)

- **Proportion**

	Coef. p1->p2	*p.Value*	Coef. p1->p3	*p.value*	Coef. p2->p3	*p.value*
Online platforms (top 5)						
InfoJobs	-0.15	0.000*	0.29	0.000*	0.40	0.078
indeed.com	0.09	0.581	-0.12	0.469	-0.22	0.2
linkedin.com/Jobs	-0.08	0.722	0.31	0.147	0.47	0.075
Jooble	0.01	0.000*	0.34	0.000*	0.25	0.000*
Randstad	0.21	0.51	0.06	0.854	-0.15	0.631
Device for visits						
PC	0.53	0.434	0.44	0.49	-0.08	0.91
Mobile	-0.60	0.000*	0.07	0.000*	0.61	0.000*
Device for applications						
PC	1.09	0.412	0.13	0.906	-0.95	0.458
Mobile	-1.41	0.000*	-0.68	0.000*	0.66	0.000*
Search terms						
Specific search	-0.32	0.158	-0.36	0.111	-0.04	0.862
Job search platform name	-0.09	0.715	0.05	0.82	0.14	0.543
Job related searches (salarys, conditions, contracts)	0.05	0.855	0.41	0.094	0.34	0.055
Generic employment query	0.01	0.983	-0.31	0.613	-0.33	0.603

Effect of the observed devices on indicators (proportions and distributions), with regressions controlling for age, gender and education.
Regressions are run first using “Both” as reference level (groups of columns 1 and 2) and then using “PC” (groups of columns 3).

APPENDIX 3: Regressions with random effects

Results: Impact of time frame (RQ2b)

- **Distribution**

	Coef. p1->p2	*p.Value*	Coef. p1->p3	*p.value*	Coef. p2->p3	*p.value*
Day of the week						
Monday	1.14	0.910	1.78	1.422	0.64	0.510
Tuesday	-1.37	-1.165*	-1.41	-1.203*	-0.04	-0.032*
Wednesday	-2.14	-1.790*	-0.48	-0.407*	1.66	1.399
Thursday	3.36	2.856	1.05	0.896	-2.31	-1.984*
Friday	0.65	0.665	-0.59	-0.608*	-1.25	-1.283*
Saturday	-0.76	-0.840*	0.09	0.101	0.85	0.949
Sunday	-0.90	-1.067*	-0.47	-0.560*	0.43	0.515
Time of the day						
Night (0:00-5:59)	0.08	0.117	-0.65	-0.964*	-0.73	-1.088*
Morning (6:00-11:59)	-2.63	-1.922*	-1.94	-1.420*	0.69	0.510
Afternoon (12:00-17:59)	3.82	2.534	3.36	2.241	-0.45	-0.303*
Evening (18:00-23:59)	-1.25	-0.907*	-0.85	-0.619*	0.40	0.293

Effect of the observed devices on indicators (proportions and distributions), with regressions controlling for age, gender and education.
Regressions are run first using “Both” as reference level (groups of columns 1 and 2) and then using “PC” (groups of columns 3).

APPENDIX 3: Regressions with random effects

Results: Impact of time frame (RQ2b)

- **Numeric**

	Coef. p1->p2	*p.Value*	Coef. p1->p3	*p.value*	Coef. p2->p3	*p.value*
Job search intensity (min./day)	-0.16	-1.448*	-0.06	-0.542*	0.10	0.911
Job search effectiveness (%)	0.77	0.550	0.92	0.649	0.15	0.109
Avg. time per job offer (sec.)	2.74	0.725	4.15	1.069	1.41	0.373
Avg. time per job application (sec.)	26.69	1.919	14.64	1.023	-12.04	-0.891*

APPENDIX 3

Results: Summary of significant effects across analyses

APPENDIX 3: Summary

Results: Impact of device (RQ1)

- **Proportion**

	Both-PC			Both-Mobile			PC-Mobile		
	Tests groups	**Regressions**	**Reg. with RE**	**Tests groups**	**Regressions**	**Reg. with RE**	**Tests groups**	**Regressions**	**Reg. with RE**
Online platforms (top 5)									
Infojobs	*	*	*	ns	ns	*	*	*	*
indeed.com	ns	ns	*	*	*	*	*	*	*
linkedin.com/jobs	*	*	*	*	*	*	*	*	*
Jooble	ns	ns	*	*	*	*	ns	ns	*
Randstad	ns	ns	*	ns	ns	*	ns	ns	ns
Search terms used									
Specific search	ns	ns	*	ns	ns	*	ns	ns	ns
Platform name	ns	ns	ns	*	*	*	*	*	*
Job related topics	ns	ns	ns	*	*	*	ns	*	*
Generic search	ns	ns	*	ns	ns	ns	ns	ns	ns

Comparing where significant differences were found using tests across groups (“Tests groups), regressions (“Regressions”) and regressions with random effects (Reg. with RE). ns: non-significant / *: significant at the 5% level.

APPENDIX 3: Summary

Results: Impact of device (RQ1)

- **Distributions**

	Both-PC			Both-Mobile			PC-Mobile		
	Tests groups	**Regressions**	**Reg. with RE**	**Tests groups**	**Regressions**	**Reg. with RE**	**Tests groups**	**Regressions**	**Reg. with RE**
Day of the week									
Monday	ns	ns	*	ns	ns	*	ns	ns	ns
Tuesday	ns	*	ns	ns	ns	*	ns	*	*
Wednesday	ns	ns	*	ns	ns	ns	ns	ns	ns
Thursday	ns	ns	ns	ns	ns	*	ns	ns	*
Friday	ns	ns	ns	ns	ns	*	ns	ns	*
Saturday	ns	ns	*	ns	ns	ns	ns	*	ns
Sunday	ns	ns	*	ns	ns	ns	ns	ns	ns
Time of the day									
Night (0:00-5:59)	ns	ns	*	ns	ns	ns	*	*	ns
Morning (6:00-11:59)	*	*	*	ns	ns	ns	*	*	ns
Afternoon (12:00-17:59)	ns	ns	ns	ns	ns	*	ns	ns	*
Evening (18:00-23:59)	*	*	ns	ns	ns	*	*	*	*

Comparing where significant differences were found using tests across groups (“Tests groups), regressions (“Regressions”) and regressions with random effects (Reg. with RE). ns: non-significant / *: significant at the 5% level.

APPENDIX 3: Summary

Results: Impact of device (RQ1)

- **Numeric**

	Both-PC			Both-Mobile			PC-Mobile		
	Tests groups	**Regressions**	**Reg. with RE**	**Tests groups**	**Regressions**	**Reg. with RE**	**Tests groups**	**Regressions**	**Reg. with RE**
Job search duration (days)	*	*	*	*	*	*	ns	ns	ns
Job search effort (days)	ns	ns	*	ns	ns	*	ns	ns	ns
Job search intensity (min./day)	ns	ns	*	ns	ns	*	ns	ns	ns
Job search effectiveness (%)	ns	ns	ns	ns	ns	*	ns	ns	*
Avg. time per job offer (sec.)	ns	ns	ns	ns	ns	*	ns	ns	*
Avg. time per job application (sec.)	ns	ns	ns	ns	ns	*	ns	ns	*

Comparing where significant differences were found using tests across groups (“Tests groups), regressions (“Regressions”) and regressions with random effects (Reg. with RE). ns: non-significant / *: significant at the 5% level.

APPENDIX 3: Summary

Results: Impact of tracking period extension (RQ2a)

- **Proportion**

	1m-3m			1m-9m			3m-9m		
	Tests groups	**Regressions**	**Reg. with RE**	**Tests groups**	**Regressions**	**Reg. with RE**	**Tests groups**	**Regressions**	**Reg. with RE**
Online platforms (top 5)									
Infojobs	ns	ns	*	*	*	*	*	*	*
indeed.com	*	*	*	*	*	*	*	*	*
linkedin.com/jobs	*	*	*	*	*	*	*	*	*
Jooble	*	*	*	*	*	*	*	*	*
Randstad		*	*	*	*	*	*	*	*
Devices for visits									
PC	ns	ns	*	ns	ns	*	ns	ns	*
Mobile	ns	ns	ns	*	*	*	*	*	ns
Devices for applications									
PC	ns	ns	*	ns	ns	*	ns	ns	*
Mobile	ns	ns	*	*	*	*	ns	*	ns
Search terms used									
Specific search	ns	*	*	*	*	*	*	*	*
Platform name	ns	ns	*	*	*	*	*	*	*
Job related topics	*	*	*	*	*	*	*	*	*
Generic search	ns	ns	ns	ns	ns	*	ns	ns	*

Comparing where significant differences were found using tests across groups (“Tests groups), regressions (“Regressions”) and regressions with random effects (Reg. with RE). ns: non-significant / *: significant at the 5% level.

APPENDIX 3: Summary

Results: Impact of tracking period extension (RQ2a)

- **Distributions**

	1m-3m			1m-9m			3m-9m		
	Tests groups	**Regressions**	**Reg. with RE**	**Tests groups**	**Regressions**	**Reg. with RE**	**Tests groups**	**Regressions**	**Reg. with RE**
Day of the week									
Monday	ns	ns	*	*	*	*	ns	ns	*
Tuesday	ns	ns	ns	ns	ns	ns	ns	ns	ns
Wednesday	ns	ns	ns	ns	*	ns	ns	ns	ns
Thursday	ns	*	ns	ns	ns	ns	*	ns	*
Friday	ns	ns	ns	ns	*	ns	ns	ns	*
Saturday	ns	ns	*	ns	ns	*	ns	ns	ns
Sunday	ns	*	*	ns	ns	*	ns	ns	ns
Time of the day									
Night (0:00-5:59)	ns	ns	ns	ns	ns	*	ns	ns	*
Morning (6:00-11:59)	ns	ns	*	ns	ns	*	ns	ns	ns
Afternoon (12:00-17:59)	ns	ns	ns	ns	ns	ns	ns	ns	*
Evening (18:00-23:59)	ns	ns	*	ns	ns	*	ns	ns	ns

Comparing where significant differences were found using tests across groups (“Tests groups), regressions (“Regressions”) and regressions with random effects (Reg. with RE). ns: non-significant / *: significant at the 5% level.

APPENDIX 3: Summary

Results: Impact of tracking period extension (RQ2a)

- **Numeric**

	1m-3m			1m-9m			3m-9m		
	Tests groups	**Regressions**	**Reg. with RE**	**Tests groups**	**Regressions**	**Reg. with RE**	**Tests groups**	**Regressions**	**Reg. with RE**
Job search intensity (min./day)	*	ns	*	ns	ns	*	ns	ns	*
Job search effectiveness (%)	ns	ns	*	ns	ns	*	ns	ns	*
Avg. time per job offer (sec.)	ns	ns	ns	ns	ns	ns	ns	ns	ns
Avg. time per job application (sec.)	ns	ns	ns	ns	ns	ns	ns	ns	*

Comparing where significant differences were found using tests across groups (“Tests groups), regressions (“Regressions”) and regressions with random effects (Reg. with RE). ns: non-significant / *: significant at the 5% level.

APPENDIX 3: Summary

Results: Impact of time frame (RQ2b)

- **Proportion**

	p1-p2			p1-p3			p2-p3		
	Tests groups	**Regressions**	**Reg. with RE**	**Tests groups**	**Regressions**	**Reg. with RE**	**Tests groups**	**Regressions**	**Reg. with RE**
Online platforms (top 5)									
Infojobs	ns	ns	*	ns	ns	*	ns	ns	ns
indeed.com	ns	ns	ns	ns	ns	ns	ns	ns	ns
linkedin.com/jobs	ns	ns	ns	ns	ns	ns	ns	ns	ns
Jooble	ns	ns	*	ns	ns	*	ns	ns	*
Randstad	ns	ns	ns	ns	ns	ns	ns	ns	ns
Devices for visits									
PC	ns	ns	ns	ns	ns	ns	ns	ns	ns
Mobile	ns	ns	*	ns	ns	*	ns	ns	*
Devices for applications									
PC	*	*	ns	ns	ns	ns	ns	ns	ns
Mobile	*	*	*	ns	ns	*	ns	ns	*
Search terms used									
Specific search	ns	ns	ns	ns	ns	ns	ns	ns	ns
Platform name	ns	ns	ns	ns	ns	ns	ns	ns	ns
Job related topics	ns	ns	ns	ns	ns	ns	ns	ns	ns
Generic search	ns	ns	ns	ns	ns	ns	ns	ns	ns

Comparing where significant differences were found using tests across groups (“Tests groups), regressions (“Regressions”) and regressions with random effects (Reg. with RE). ns: non-significant / *: significant at the 5% level.

APPENDIX 3: Summary

Results: Impact of time frame (RQ2b)

- **Distributions**

	1m-3m			1m-9m			3m-9m		
	Tests groups	**Regressions**	**Reg. with RE**	**Tests groups**	**Regressions**	**Reg. with RE**	**Tests groups**	**Regressions**	**Reg. with RE**
Day of the week									
Monday	ns	ns	ns	ns	ns	ns	ns	ns	ns
Tuesday	ns	ns	*	ns	ns	*	ns	ns	*
Wednesday	ns	ns	*	ns	ns	*	ns	ns	ns
Thursday	*	*	ns	ns	ns	ns	ns	*	*
Friday	ns	ns	ns	ns	ns	*	ns	ns	*
Saturday	ns	ns	*	ns	ns	ns	ns	ns	ns
Sunday	ns	ns	*	ns	ns	*	ns	ns	ns
Time of the day									
Night (0:00-5:59)	ns	ns	ns	ns	ns	*	ns	ns	*
Morning (6:00-11:59)	ns	ns	*	ns	ns	*	ns	ns	ns
Afternoon (12:00-17:59)	*	*	ns	ns	ns	ns	ns	ns	*
Evening (18:00-23:59)	ns	ns	*	ns	ns	*	ns	ns	ns

Comparing where significant differences were found using tests across groups (“Tests groups), regressions (“Regressions”) and regressions with random effects (Reg. with RE). ns: non-significant / *: significant at the 5% level.

APPENDIX 3: Summary

Results: Impact of time frame (RQ2b)

- **Numeric**

	1m-3m			1m-9m			3m-9m		
	Tests groups	**Regressions**	**Reg. with RE**	**Tests groups**	**Regressions**	**Reg. with RE**	**Tests groups**	**Regressions**	**Reg. with RE**
Job search intensity (min./day)	ns	ns	*	ns	ns	*	ns	ns	ns
Job search effectiveness (%)	ns	ns	ns	ns	ns	ns	ns	ns	ns
Avg. time per job offer (sec.)	ns	ns	ns	ns	ns	ns	ns	ns	ns
Avg. time per job application (sec.)	ns	ns	ns	ns	ns	ns	ns	ns	*

Comparing where significant differences were found using tests across groups ("Tests groups), regressions ("Regressions") and regressions with random effects (Reg. with RE). ns: non-significant / *: significant at the 5% level.

Overall, very similar results between "tests groups" and "regressions"
More significant effects when using random effects