

An Introduction to Factorial Survey Experiments (FSE)

Part II: Setting Up the Experiment and the Survey

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Outline

Part I: Introduction

Part II: Setting Up the Experiment and the Survey

Part III: Data Analysis: Practical examples

Literature

General Source:

Auspurg, K. and Hinz, T. (2015) *Factorial Survey Experiments*. Los Angeles: Sage.

→ A further reading list is included in the supplementary material of this course

Part II

Setting Up the Experiment and the Survey

Dimensions, Levels, and the Vignette Universe

- **Vignettes:** hypothetical descriptions of persons, objects, or situations
- **Dimensions:** characteristics that comprise the vignettes
- **Levels:** values of dimensions varying across the vignettes
- **Vignette universe** (or full factorial): all possible combinations of levels
- **Number of vignettes in the universe:** Cartesian product of all levels and dimensions
- Example: **3 dimensions** with **2 levels** $\rightarrow 2^3 = 2 * 2 * 2 = 8$ vignettes

Example: Vignette Universe

- Three dimensions with two levels:
 $2^3 = 8$ vignettes
 - Dimension 1: Male/Female
 - Dimension 2: Unemployed/ Employed
 - Dimension 3: Married/Not Married

→ **Orthogonality (i.e., independence of dimensions)**

→ **Level balance (i.e., equal frequency of levels)**

Vignette	Dimension 1	Dimension 2	Dimension 3
1	Male	Employed	Married
2	Male	Employed	Not Married
3	Male	Unemployed	Married
4	Male	Unemployed	Not Married
5	Female	Employed	Married
6	Female	Employed	Not Married
7	Female	Unemployed	Married
8	Female	Unemployed	Not Married

Example of More Complex Designs

Seven dimensions with three levels, and one dimension with five levels → More than 10,000 vignettes! ($3^7 * 5^1 = 10,935$)

Dimensions		Levels		
		1	2	3
1	Increase in net income of household ^b	5 levels, from plus 0 % to plus 80 %		
2	Weekly working hours	20 hours	30 hours	40 hours
3	Over-qualification for offered job	None	Slight	Considerable
4	Prospects of internal promotion	None	Few	Many
5	Contract duration	Permanent	Limited to 1 year	Limited to 3 years
6	Distance from home (one-way commuting time)	1 hour	4 hours	6 hours
7	Local employment opportunities compared with actual residence	Worse	Similar	Better
8	Difficulty of finding adequate housing	Very easy	Some effort	Considerable effort

^a Not displayed here is an additional dimension concerned with employment opportunities for the partner of the respondent at the new place of residence. This dimension was presented to 50 % of the respondents in partnerships. Because the internal partnership dynamics involved with mobility decisions are not the focus of this paper, we determined to forgo the consideration of this dimension in the analyses described here.

^b The increase in income was presented to the respondents as the resulting absolute Euro amount of household income after acceptance of the job offer. The amount represented the (experimentally varied) percentage increase in the actual household income, which respondents had indicated earlier in the interview. Absolute amounts rather than percentages were used to present more tangible job offers. In the experiment design, gains in income were weighted using the working hours to create realistic offers. High percentage increases were overrepresented to present attractive offers.

Source: Abraham et al., 2013, p. 289, Table 1.

Factorial Surveys: Methodological Choices

- How many dimensions and levels?
- Which characteristics have to be held constant?
- How many vignettes should be sampled from the universe?
- How many vignette sets?
- How many vignettes per respondent?
- Which method should be used for composing the vignette sample/set (e.g., random sampling or quota designs)
- Size of the respondent sample (what is realisable?)

Five or Twelve Dimensions?

Vignette with five dimensions

A 60-year-old woman with vocational training works as a social worker.
Her monthly gross earnings total 2,500 Euros (before tax and extra charges).

Are the monthly gross earnings of this person fair or are they, from your point of view, unfairly high or low?

Unfairly low					Fair					Unfairly high
-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Vignette with 12 dimensions

A 40-year-old woman with no vocational training has one child and works as an engine-driver. She has gained a lot of experience. She has had health problems for a long time.
She joined the (economically stable) large enterprise a long time ago and her performance is above average.

Her monthly gross earnings total 1,500 Euros (before tax and extra charges).

Are the monthly gross earnings of this person fair or are they from your point of view unfairly high or low?

Unfairly low					Fair						Unfairly high
-5	-4	-3	-2	-1	0	+1	+2	+3	+4	+5	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

Source: Sauer et al., 2011, p. 101, Appendix.

Number of Dimensions (and Vignettes per Respondent) I

Too many

- Cognitive burden
- Satisficing behaviour
- Fatigue effects
- Learning effects
- Order effects

Too few

- Information too limited to make judgement
- Omitted variable bias
- Fatigue effects

→ Differences based on type of sample (e.g. lower-educated vs. higher-educated) (Sauer et al. 2011)

Number of Levels

- Range effects
- Number-of-levels effects
- Implausible and/or illogical combinations (→ should already be avoided in the choice of dimensions and levels)

Methodological Guidelines: Dimensions and Levels

For example: Auspurg and Hinz, 2015; Auspurg and Jäckle, 2017; Sauer et al. 2011.

- Between five and nine dimensions
- Number of levels per dimension should be multiples of each other
- No more than 10 vignettes per respondent
- Order of vignettes should be randomized across respondents
- If possible, randomize order of information provided within vignettes, between respondents

Design Choice

Within-subject designs:

- Each respondent judges the same set of vignettes

Mixed designs:

- Different groups of respondents are assigned different vignettes sets, but within one group respondents evaluate the same set of vignettes

Between-subject designs:

- One vignette per respondent

Drawing the Vignette Sample and Creating Vignette Sets

Random sampling

- Easier to implement
- Less efficient (asymptotically efficient in large samples)
- Spurious correlations

Fractional factorial

- Main effects remain uncorrelated
- Only correlations with higher order interactions
- May be balanced or unbalanced
- Less suited for complex designs

D-efficient sampling/ blocking

- Relax orthogonality
- Optimise both orthogonality and level balance
- Control over correlations

For details, see, for example: Atzmüller and Steiner, 2010; Dülmer, 2007 & 2016.

Methodological Guidelines: Vignette Sample/Sets

- Efficient sampling techniques are recommended, particularly D-efficient techniques (for sampling AND constructing vignette sets) (e.g., Auspurg and Hinz, 2015; Dülmer 2007)
- Vignette sample:
 - D-efficiency score [0, 100]; 100 = perfect orthogonality and level balance
 - Vignette sample: D-efficiency score over 90 recommended (Auspurg and Hinz, 2015)
- Vignette sets/decks:
 - D-efficient blocking technique recommend (although no D-efficiency score can be computed)
- Software: SAS %Mktex macro (Kuhfeld, 2010) or R (e.g., AlgDesign)

Response Scales

- Responses to the vignettes comprise the dependent variable
- Rating scales (e.g., importance or fairness); 11-point scale are recommended (Auspurg and Hinz, 2015)
- Ranking
- Unordered categories (e.g., types of neighbourhoods to choose from)
- Amount (e.g., monetary value of inheritance to be allocated)

See, for example: Jasso, 2006; Auspurg and Hinz, 2015.

Setting Up the Survey

- Once created, the vignettes can be integrated into a survey (e.g., online survey or paper-pencil questionnaire)
- Each respondent must be randomly assigned one questionnaire version (i.e., one vignette set)
- Randomisation can be done manually before data collection (e.g., in case of paper questionnaires)
- Or randomisation can be programmed into the online survey (e.g., LimeSurvey or Qualtrics)
- For details and practical examples, see Auspurg and Hinz (2015)
- **You need to be able to identify which respondent has received which vignettes in which order!**

Data Preparation

- Two relevant data sets: the experimental set-up data and the respondent data
- Set-up data: contains the vignette sample (i.e., the experimental conditions)
- Respondent data: contains the vignette evaluations and other survey data
- Both data sets need to be combined for the analysis

Data Preparation: Set-Up Data

Dimensions (i.e., independent variables)

Vignette identifier

Vignette set identifier
(important for merging)

	A	B	C	D	E
1	Vignette_ID	Vignette_Set	Vig_Gender	Vig_Employment	Vig_Nationality
2	32	6	2	2	6
3	33	6	2	1	1
4	36	6	1	2	3
5	31	6	1	3	4
6	34	6	1	3	5
7	35	6	2	1	2
8	16	3	1	2	2
9	15	3	2	1	6
10	18	3	2	3	5
11	14	3	2	2	4
12	13	3	1	1	3
13	17	3	1	3	1
14	6	1	2	3	2
15	3	1	2	1	4
16	1	1	1	1	5

Data Preparation: Respondent Data

From wide format

Resp_ID	VigSet_ID	Vig_1	Vig_2	Vig_3	Vig_4	Resp_gender	Resp_Sector
1	6	7	5	10	6	female	Finance
2	3	9	3	8	4	male	Catering

To long format

Resp_ID	VigSet_ID	Vig_position	Vig_Rating	Resp_gender	Res_Sector
1	6	1	7	female	Finance
1	6	2	5	female	Finance
1	6	3	10	female	Finance
1	6	4	6	female	Finance
2	3	1	9	male	Catering

E.g., in stata:
reshape

Example: Set-Up Data, personalised

Random assignment of vignette sets to respondents before data collection

	A	B	C	D	E	F	G
1	Resp_ID	Vignette_ID	Vignette_Set	Vignette_positior	Vig_Gender	Vig_Employment	Vig_Nationality
2	1	32	6	1	2	2	6
3	1	33	6	2	2	1	1
4	1	36	6	3	1	2	3
5	1	31	6	4	1	3	4
6	1	34	6	5	1	3	5
7	1	35	6	6	2	1	2
8	2	16	3	1	1	2	2
9	2	15	3	2	2	1	6
10	2	18	3	3	2	3	5
11	2	14	3	4	2	2	4
12	2	13	3	5	1	1	3

Data Analysis

- Hierarchical data structure (except between-subjects designs)
 - Vignette evaluations (Level 1) nested within respondents (Level 2)
- Observations within respondents are not independent from each other
- Requires application of statistical models that account for clustering
 - Ordinary least squares regression with robust clustered standard errors at the respondent level
 - Multilevel models (Hox, 2010)

Steps of Setting Up a Factorial Survey Experiment

- **Step 1:** Deciding on the number of dimensions and levels to be included in the experiment and which dimensions should be held constant.
- **Step 2:** Deciding on whether the vignette universe can be used or whether a sample of vignettes needs to be drawn from the universe. Are there illogical or implausible cases that need to be excluded?
- **Step 3:** Deciding on the number of vignettes to be sampled from the universe and the method to be used to sample vignettes.
- **Step 4:** Deciding on the number of vignette sets/vignettes per respondent and on the method to be used to allocate vignettes to sets.
- **Step 5:** Deciding on the display format of the vignettes (e.g., text or table), and the response scale.

Outlook: Part III

Practical examples:

- Checking data quality of vignette sample
- Data analysis and interpreting results

References

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