

A Public Transport Ticket that Moved a Country: Assessing the Value of the German 9-Euro-Ticket as a Socio-Technical Experiment

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Supplemental Information I

Note: This document includes the review protocol. Data extraction tables of included studies as well as a full list of screened documents are provided in supplemental information II.

Review Protocol

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I. Background

The German 9-Euro-Ticket represents an unprecedented transport policy experiment that received much interest from researchers and the public. Table S 1 provides additional details on the conceptualization of the 9-Euro-Ticket as a socio-technical experiment, namely as a sustainability experiment (Sengers et al., 2019).

Table S 1. Conceptualizing the 9-Euro-Ticket as a sustainability experiment

| Sustainability experiment characteristics | Attributes of the 9-Euro-Ticket |
|---|---|
| Highly novel (radically different from known and prevailing solutions) | Highly different mode of providing public transport compared to previous tariffs |
| Planned (conscious choices) | Deliberately implemented by government |
| Socio-technical (not taking place in lab but in social context) | Broadly rolled-out in real world setting |
| Goal oriented (towards sustainability gains) | Social (costs for citizens) and environmental (sustainable mobility) sustainability goals |
| Result from activities at various societal levels (top-down or bottom-up) | Top-down governmental action by federal government |

Note: Characteristics on the left based on Sengers et al. (2019)

II. Question

Building on the conceptualization of the 9-Euro-Ticket as a socio-technical experiment, this literature review addresses the research question “*What learning effects have resulted from the 9-Euro-Ticket experiment in a socio-technical sense?*”.

In view of the definition of socio-technical experiments (Sengers et al., 2019), the study particularly investigates technological, social and institutional learnings. For the purpose of this study, technological learning refers to public transport provision in a broad sense. Social learning is understood as learning processes by the general public with a focus on fairness of the transport sector. Lastly, institutional learning is defined as learning processes that affect individual institutions with regard to own processes and priorities.

III. Methods

a. Searches

Three platforms are used to search for relevant literature. Namely, these are Google Scholar, Scopus and Web of Science. Google Scholar is considered particularly relevant for the topic of this review as it represents an important source to identify grey literature (Haddaway et al., 2015). Since the 9-Euro-Ticket is a relatively new topic that also raised awareness outside academia, a general exclusion of grey literature would result in insufficient coverage and an inadequate picture. For instance, a test search with the largest and most prominent research project (VDV et al., 2022) indicates that the respective report is only listed in Google Scholar. For all platforms different spellings of “9-Euro-Ticket” are combined in one search string (see Table S 2). In addition, spellings without hyphens were tested. This, however, did not affect the results. No entries were found with the search in Web of Science. For Google Scholar and Scopus, results are filtered to publications in 2022 or later as the 9-Euro-Ticket was introduced in 2022. Table S 2 provides a detailed overview of the search process.

Table S 2: Details regarding search process and search strings

| Platform | Search string | Filters | Date | Results |
|----------------|--|------------|---|---------|
| Google Scholar | “9-Euro-Ticket” OR “Neun-Euro-Ticket” OR “9-€-Ticket” OR “9€-Ticket” | Since 2022 | 22.05.2023; updated on 13.07.2023 | 343 |
| Scopus | ALL(“9-Euro-Ticket” OR “Neun-Euro-Ticket” OR “9-€-Ticket” OR “9€-Ticket”) AND PUBYEAR > 2021 | / | 13.07.2023 | 7 |
| Web of Science | ALL=(“9-Euro-Ticket” OR “Neun-Euro-Ticket” OR “9-€-Ticket” OR “9€-Ticket”) | / | 13.07.2023 | 0 |
| <i>Total</i> | | | | 350 |

b. Study inclusion criteria

To ensure a transparent screening process, inclusion and exclusion criteria were defined a priori (see Table S 3 for details). As the screening process follows the steps outlined in the ROSES reporting standards (Haddaway et al., 2018), the exclusion criteria ‘Format’ and ‘Focus’ are applied at title / abstract as well as at full text level. The criterion ‘Method’ is assessed at full text level only to avoid false exclusions. In general, a conservative approach is chosen for screening at title / abstract level and uncertain cases are retrieved as full text.

Table S 3: Overview of inclusion and exclusion criteria

| Criteria | Inclusion | Exclusion | Reasoning |
|-----------------|--|---|--|
| Duplicates | Unique documents; main documents per research project | Duplicates between databases; duplicates within databases; documents of same project reporting the same study | Screening for duplicates as standard procedure to avoid double-counting of data. Inclusion of grey literature occasionally results in multiple entries per project (e.g., talks on different dates; multiple documents reporting same study / data). |
| Language | English; German | All other languages | English as standard for literature reviews. German relevant in view of local context. |
| Format | Peer reviewed articles; scientific reports; working papers; scientific presentation documents; theses; preprints | Non-scientific formats (e.g., newspaper articles, interviews, comments, editorials) | Inclusion of output formats beyond peer reviewed articles to cover broad picture. Restriction to rather scientific output formats to ensure quality of included documents. |
| Focus | 9-Euro-Ticket as central topic of document | 9-Euro-Ticket only mentioned | Searching in all fields or full texts retrieves documents that are not focusing on the 9-Euro-Ticket and are thus not relevant for analysis. |
| Method | Established empirical research methods (quantitative or qualitative) are used | Studies not based on empirical evidence | Limiting the review to studies with any form of own empirical analysis of data gathered in the context of the 9-Euro-Ticket supports the review’s focus on learning effects. |

c. Study quality assessment

All studies that are included after full text screening undergo a critical appraisal with regard to, inter alia, internal validity as well as external validity (Collaboration for Environmental Evidence, 2022; Popay et al., 2006). For instance, methods described in the studies are assessed with a focus on samples (primary research) and datasets (secondary research). Generally, different empirical research methods (see Table S 3) as well as samples and datasets are deemed acceptable as long as their use is reasonably justified.

d. Data extraction strategy

Relevant data for each included study is summarized in an data extraction form (see supplemental information II). This form includes bibliographic information, study characteristics as well as relevant results. The columns are defined as follows:

- *Reference*: Author(s) and year of publication
- *Location*: Regional setting of the study
- *Study type*: Research method(s)
- *Study design*: Sample size, participants, time of data collection, etc.
- *Objectives*: Research objectives as stated by the authors
- *Results*: Relevant reported results

e. Synthesis

To analyze findings of included studies, a narrative synthesis of extracted data is conducted. The following definition of narrative synthesis by Popay et al. (2006, p. 5) is used:

“‘Narrative’ synthesis’ refers to an approach to the systematic review and synthesis of findings from multiple studies that relies primarily on the use of words and text to summarise and explain the findings of the synthesis. Whilst narrative synthesis can involve the manipulation of statistical data, the defining characteristic is that it adopts a textual approach to the process of synthesis to ‘tell the story’ of the findings from the included studies. As used here ‘narrative synthesis’ refers to a process of synthesis that can be used in systematic reviews focusing on a wide range of questions, not only those relating to the effectiveness of a particular intervention.”

This type of synthesis is chosen in view of the different methods and objectives of included studies to be integrated in the synthesis. Data tabulation, performed as part of data extraction, is the first step of synthesis (Collaboration for Environmental Evidence, 2022). On this basis, a thematic analysis is conducted to identify recurrent themes within the included studies (Popay et al., 2006). The thematic analysis is guided theory driven by the learning categories included in the definition of socio-technical experiments (Sengers et al., 2019).

References

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