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10:10–10:30 SHORT PAPER

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Women in Business on the Rhine in the 18th Century: Comparison of Business Patterns and Quality Control of Identification after AI-Supported Named Entity Recognition (NER)

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Keywords: *Named entity recognition (NER), customs register, semi-structured data, business history, early modern period, female entrepreneurship, female work, 18th century, river trade, inland trade, Rhine trade, tariffs, Germany, Netherlands*

This short paper of 13 pages for the DHNB 2026 conference studies how female shipmasters and other professionals can be identified in the customs registers of Schenkenschans customs station (1630-1810) in the 18th century at the border between the Netherlands and Germany through Named Entity Recognition (NER). The paper uses a study of widows to review methodologies of NER on an early modern dataset, the customs registers of Schenkenschans (1630-1810), a historical fortress and customs station on the Rhine on the border between Netherlands and what today is Germany.

I conduct Named Entity Recognition (NER) on these data through two different methods for comparison, Levenshtein Distance and Ratcliff/Obershelp string matching algorithm, to identify the female widows who are the female entrepreneurs in the data. These two methods are then applied to matching the widows with their deceased husbands. In this step, I compare the selection of products widows, and their deceased husbands transported through the Schenkenschans and by the locations from where their ships came from. This shows continuities and discontinuities in trade patterns between the widows and their deceased husbands.

The identification of the widows is based on the way they were registered in the dataset: widows in my Dutch-language material had the title *weedwe* (widow) or some of its spelling variants as their title followed by the name of their deceased husband. Thus, I apply the methods of Levenshtein Distance and Ratcliff/Obershelp string matching algorithm on the RoleName and PersName tags of the source XML files. Here is an example on the RoleName tag and the PersName tag and how they work in the example line 367 in the XML file for the customs register of 1737-1738:

```
<roleName>De Wed:
```

```
Verkerck</persName></roleName>
```

The string-matching algorithms use the corpus defined by the author to find the RoleName tags including the title *weedwe* or some of its spelling variations, in this case *Wed:*. After this, they match the title they find with the person's name in the PersName tag that follows as this is the last name or the full name of the deceased husband. In this case, the name of the widow would be identified by the algorithms as "Verkerck".

In the early modern period, women were allowed to run a business if their husband had run a business and passed the business on their widow after their death. See Erickson (2024) on the 18th century UK and Moring (2025) on the 19th century Finland. Earlier literature points out that there are clear research gaps in business history literature. Wilson et al. (2022) find major challenges to the field of business

history despite flourishing research that include, for example, a lack of overarching paradigms in the field, limited teaching compared to research and neglecting some research themes such as gender questions.

Other research like Gelderblom and Trivellato (2018) also find that literature has neglected women and their economic contribution especially in literature focusing on the early modern period. The temporal focus on only some periods of history comes up in other contributions as well. Banken and Ressel (2024) discuss the state of German business history as a research field and find that research into German business history has neglected the period of early industrialization between 1850 and 1870 and the whole period prior to 1815.

The empirical results of comparing the business patterns of the widows and their deceased husbands are as follows:

The analysis of the female, widowed entrepreneurs and their deceased husbands shows some main continuities and discontinuities between them. Firstly, the female widows seemed to have both continued and discontinued the businesses of their deceased husbands in the same geographical places in Germany and the Netherlands. This logical given that the source data used in this paper are the customs registers of a single customs station, meaning that a relatively low level of diversity and change in geographical locations of trade is to be expected.

There are, nevertheless, some geographical patterns. It seems that Cologne became more important for female shipmasters increased in the late 18th century and Amsterdam less important. Cologne was an important city for the widows both as a new, a continued and a discontinued location after the death of the husband.

An issue in the current research design of this paper is that the direction of ships going past the Schenkenschans customs station in 1737-1810 is now not included in the analysis of locations. While this data is available, the analysis here has been made simpler due to the limitations on the length of the paper.

When analyzing the continuities and discontinuities in the selection of products that the widows and their husbands, it seems there are more discontinuities than with the geographical locations. It seems that the trade in tobacco and associated products like the *pijpaarde soil* conducted by the female, widowed entrepreneurs started to increase on the Rhine from the 1750s onwards.

When widows started to trade new products that their deceased husbands had not traded, it seems wine was an important new product in their sortiment until the 1760s. However, from the 1770s onwards, widows started to conduct more trade with coffee on their own. Additionally, the widows started to conduct new trade in construction and raw materials like stone and iron after their husbands had died.

The discontinuities by the widows after their husband's death relate to two main categories of products. Firstly, widows tended to discontinue very capital-intensive trade like timber. Additionally, it was common for them to discontinue trade in very common products like pottery and dried goods. This reflects the extensive trade with these products in general, meaning there were many entrepreneurs both starting and quitting the business with such products.

It is worth noting, however, that the changes in products sold by the widows might not only reflect their own business decisions. They might reflect larger structural changes of the Rhine economy. The approach used here does not allow assessing the cause of the changes.

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