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***Fairs in History*: the public database of the CoMOR project**

Throughout the high to late Middle Ages and up to the modern period, fairs played an important role in the development of the European economy and especially in the trans-regional exchange of goods. In order to understand the radical expansion of money markets and the transformation of exchange that occurred in the late Middle Ages and the first centuries of the early modern period that made the role of fairs so important in the economy, the CoMOR project focuses on the period between the decline of the classic fairs at Champagne beginning around 1350 and the emergence of fairs dedicated to finance and money exchange in the seventeenth century, with a particular emphasis on the fairs of France, Germany, and the north of Italy. Funded by the French *Agence nationale de la recherche* and its German equivalent, the *Deutsche Forschungsgemeinschaft*, the principal investigators Jean-Louis Gaulin and Susanne Rau made an online, collaborative database to record and support the research central to the project. This database needed to respond to the goals of the project and its various contributors, as well as providing a platform for future collaboration. This article presents the database—hosted at <http://fairs-in-history.huma-num.fr>—together with the decisions taken to respond to the project, the contributor requirements, and the opportunities that it offers to users.¹

The requirements of the CoMOR project

The multidisciplinary quality of the project team quickly led to the question of each team member's particular requirements for the database, with respect to both subject area and methods. Indeed, the long history of European fairs between 1350 and 1600 is one so rich that it can be approached in numerous ways, with numerous methods, as evidenced by the articles in the current volume.

¹ For a technical explanation of the workings of the database, including how the project assures the long-term viability of its data, see the Data Management Plan of the project in Jean-Paul Rehr, Jean-Louis Gaulin, Susanne Rau, Ulf Christian Ewert. *The CoMOR Data Management Plan*. 2019–2023. DOI: 10.34847/nkl.8ceekn2a. See also the forthcoming data paper by the same authors with Leif Scheuermann. The CoMOR project would also like to recognize and thank Marjorie Burghart for her early contributions to the digital conceptualization of the project.

To effectively study the itineraries of merchants or those places in which the fairs were conducted (spatial analysis), the database needed to capture the place names with their locations encoded according to modern geographic reference systems (these names often differing according to the period and to the language of documentation). Similarly, studying the relations and networks of merchants required that the database could act as an index of personal names, as well as groups and organisations which they frequently constituted (from consulates and chancelleries to banking institutions and families), as well as being able to link these “entities” in relations and networks. The latter, in particular, demanded that a given person represented across different sources would be referenced as a single entity in the database (with a normalisation of each name). A third interest of the project is the study of goods bought and sold at the markets as well as the related flow of money and credit, and as such obligated the database to manage the type, quantity, and value of merchandise traded at an international level.

The above elements are already challenging enough. However, this was compounded by another effect of the extensive spatial and temporal dimensions of the project—the diversity of historical documentation. Sources for research include merchant manuals, fair almanacs, contracts, wills and testaments, consular deliberations, fairs privileges, old maps, merchants accounts and registers, tolls and customs ledgers—to name just a handful of types. These diverse sources are held in archives and libraries across Europe. They may be original parchment or paper documents, printed materials, or sources already issued as a critical edition. Beyond the contents of the sources, the CoMOR database also needed the capacity to describe the sources and their metadata, even where these could radically change from one document to another.

One further challenge arises from the heterogeneous nature of the project sources: some are exceptionally lengthy, containing much detail that interests the project research goals (for example, account record and fairs privileges), while others are very short and terse (such as consular deliberations and credit notes). The CoMOR database needed to be structured in such a way as to accept this diversity of sources while being capable of bringing the relevant datapoints together—whether greater or lesser in quantity—in a way that provides useful analytical outcomes.

Other demands were made on the design of the database. Firstly, the database should not be a simple deliverable at the end of the project timeline, but rather a database operational as early as possible in the project so that it would be used by project members from the moment they began their research. This would assure data coherence with respect to all information about fairs found in the archival sources, thus permitting validation, improvement, and reuse from their very inception as data records. Moreover, the database was built to be col-

laborative: all members of the project team could contribute together and in dynamic fashion, as well as invite other collaborators and students to join the project. Finally, the database should not only serve as a repository of data, but as a point of distribution for the group's research. The data would need to be accessible to all and at all times. Consequently, the stored data needed to be easily accessible and interrogable by other users and machine-readable by internet search engines and other systems. The response to these requirements was an online database constructed with an app-like interface—the website *Fairs in History*. This website offers a single interface which allows both access to—and entry of—data from sources. As such, all researchers associated with the project are able to access it from anywhere and anytime, and—another important goal for the project—permits access for the general public.

The online database, with its app-like interface, requires no particular technical skill in order to create well-ordered, reusable data, permitting researchers to work completely independently without need for recourse to a programmer or technical specialist. Further to the goal of ease of use, the site interface is available in French, English, German, and Italian, facilitating use by a multilingual, international research community. The ease of use, however, does not mean that there is no quality control of the data. It was important that the work product of researchers, even those of students, be protected and assured of their value. The response to this was the creation of a publishing process within the database that depends on roles and privileges assigned to users. The first level of privilege is a “contributor” who may enter their own new records, but who may not modify the records of other users. These new records, which are not yet visible to the public, are validated by an “editor” who evaluates the quality and integrity of the data and authorises their publication to the public. At times, a researcher may wish to enter data with the goal of using the database tools to analyse it, but they do not yet want to make the data available to the public (perhaps to protect forthcoming work)—this is considered an ‘embargo’ of data, and to facilitate this, a date of future publication can be applied to records in the database.

From a broader perspective, the CoMOR project obligated itself to principles and practices of Open Science and FAIR data (Findable, Accessible, Interoperable, and Reusable).² Among the chief concerns of these principles are that the data should be made available to the public in open formats with the least restrictive license possible, supported by proper documentation. Data should be deposited in

² FAIR data (as well as the acronym) was first defined in Mark D. Wilkinson et al. The FAIR Guiding Principles for Scientific Data Management and Stewardship. *Scientific Data* 3:1 (2016): 160018, <https://doi.org/10.1038/sdata.2016.18> (14 January 2024). the present-day iteration of FAIR principles can be found at <https://www.go-fair.org/fair-principles/> (07 October 2024).

repositories that can assure their persistence and access over time, while providing a normalised perennial identifier. The team made a number of technical decisions to facilitate this, the most important among them storing the data in TEI-XML files,³ constructing the database using Open Source technology,⁴ and hosting it on the Huma-Num infrastructure.⁵

The database *Fairs in History*

The requirements of the project and of the team members having been defined, the *Fairs in History* database was developed and put into service within the first year of the project. The following describes in greater detail the type of data being gathered, how they are put into relation with each other, and the tools offered to researchers by the web application.

The CoMOR project does not have in its mandate the publication of philological or diplomatic editions of sources subject to research, but rather the extraction of data identified by the project scope from those sources. At the highest level, the database indexes instances of fairs in the sources and the terminology used to describe them (*nundinae*, *forum*, *foire*, *fiera*, *messe*, etc.), the dates and places related to them (the fairs themselves, the commercial agreements implicated in them, the itineraries of merchants who journey to them), the names of those people and groups associated with them (merchants, political entities, banks), the interactions between them, and finally, the merchandise, monies, and quantities transacted. As mentioned above, the database also captures the metadata of sources: the date and place a document was created, the name of the person or entity who created it, the typology of document, and archival references.

To establish links between various data points, the latter have been normalised and organised in a cascading set of structures created especially for the project, based on a custom-controlled vocabulary specific (see Fig. 1). The database is composed of “collections” which act as containers for a series of “sources” judged by its editor to be somehow coherent. The “sources” themselves are singular documents—perhaps privileges, letters, or sequences of entries from ledgers—adapted to the form required by the database. That form is an “event,” which is a method of describing a single conjunction of people, places, dates, and objects

³ TEI-C is the acronym for the Text Encoding Initiative Consortium (<https://tei-c.org/>), a body responsible for maintaining a long-standing schema for encoding texts and their metadata.

⁴ eXist-db, an XML database (<https://exist-db.org/>).

⁵ Huma-Num. <https://www.huma-num.fr/> (07 October 2024).

found in those archival records which pertain somehow to the study of fairs and merchants from the late medieval to the early modern period.

This flexible structure can thus be adapted to any of the diverse types of documentary sources that make up the corpus of the CoMOR project. Metadata is also flexible, with minimal requirements. Certain components of them—such as the date and place of production of the source, the entity responsible for it, the archival reference, and at least a single date reference for an “event”—are required, and even then, it is possible to indicate a degree of certainty about the data.

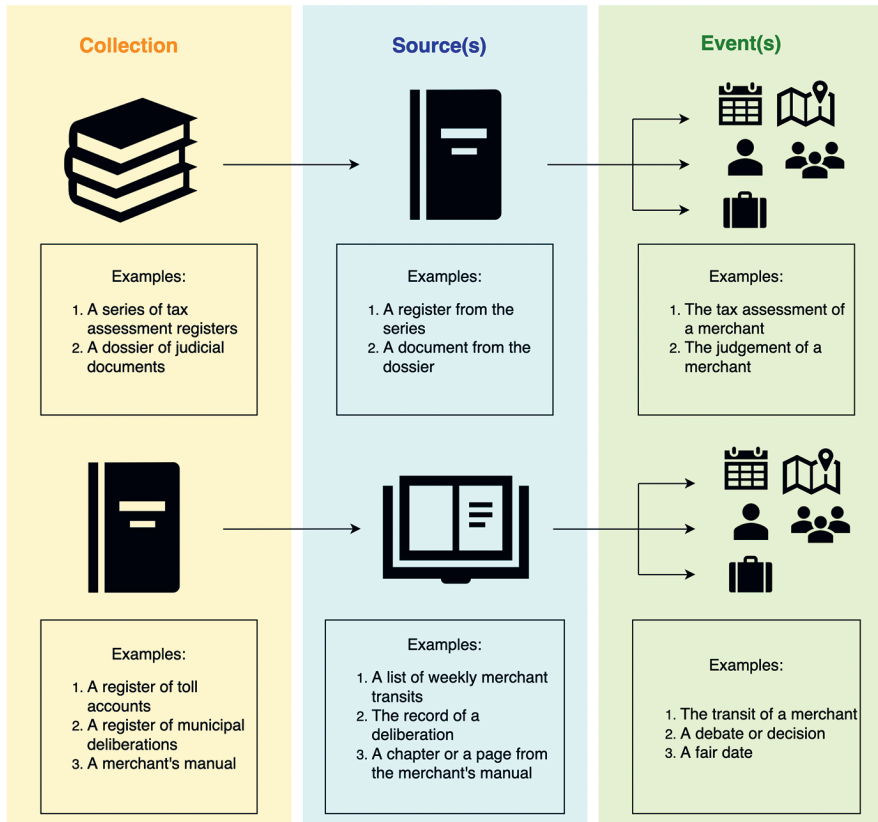


Fig. 1: Examples of the relationships of *Collection*, *Source*, and *Event* in the CoMOR database. Graphic by Noémie Lacroix.

The structure of the data model also facilitates the various queries that respond to the research questions of the CoMOR project and the individual researchers. The

analysis of networks of merchants may be interrogated through the passive links between people (for example, certain people found together in a single source) or through the links of actions that connect them in a form of a “predicate.” The “predicate” is the label of an action of or between actors in an “event.” In this fashion, the links between merchants may be explicitly described, even in complex transactions. To take an example, one can record the fact that in April 1423, Petrus de Aquiano and Aymonetus Regis transported, on behalf of magistro Symundo, certain merchandise which originated at the Geneva fair and for which the transporters paid a toll at Villeneuve to a certain Jaquemet Medici, the toll collector.⁶

Such flexibility, minimally constrained but providing a controlled vocabulary, can welcome almost any document, whatever their gaps may be. So long as a minimum of data exists, it can be entered. Virtually all fields directly related to the project research questions (dates, places, persons, objects, fairs) have auxiliary fields where contributors may add additional data, extracts of the sources, and commentary. This dual-level structure ensures the integrity of normalised data for comparative analysis while still allowing researchers to retain the original forms found in the historical documents with further description as necessary.

The database permits the numerous researchers who work with digitised documents to add those images to the “collections” with annotations (assuming, of course, that the project has the right to reuse and display the images). The core research data of the project can also be linked to exterior references, whether individuals, institutions, documentary metadata, particularly to a standardised bibliography,⁷ with commentary. Finally, each “source” can be labelled with Themes—that is, keywords which may describe aspects of the content of the “source” and allow users to browse the database thematically.

Data entry is done directly through the website interfaces, each of which is made of masks or forms with mandatory fields clearly marked, dropdown or select lists with options curated by the project team, and free-text fields. These simple interfaces, which effectively guide contributors in their data entry, assure

6 Noémie Lacroix. Archivio di Stato di Torino Sezioni Riunite, Inventario 69, folio 31, mazzo 9, compte du petit péage de Villeneuve (1423–1424) (COL0095). In *Configurations of European Fairs: Merchants, Objects, Routes (ca. 1350–1600)*. Jean-Louis Gaulin, Susanne Rau (eds.). <https://fairs-in-history.huma-num.fr/collection/COL0095> (31 December 2023). See also Franco Morenzoni. *Marchands et marchandises au péage de Villeneuve de Chillon: (première moitié du XV^e siècle)*. Lausanne: Université de Lausanne, 2016, 166–167.

7 The project bibliography is open and public, managed at <https://www.zotero.org/groups/2476769/comor/> (07 October 2024).

data normalisation for comparative analysis between different sources while still permitting the researcher to describe their sources as fully as they need.

Beyond acting as a database for recording data, *Fairs in History* is a platform for accessing the records. The entirety of the data published is accessible directly on the website as well as made available in a number of formats for download (PDF or the TEI-XML source files). All data is made available under the Creative Commons Attribution-NonCommercial-ShareAlike License (CC BY-NC-SA 4.0),⁸ a license facilitated by the project's use of stable identifiers and structured citation reference.⁹

The site offers numerous methods for exploring the data: dynamic indexes and browsable lists, a variety of search engines, and numerous options for filtering data. The indexes facilitate quick access to names, places, objects, and merchandise found in the sources, or exploration by keywords. Certain content is enriched with external references, such as the place index which provides maps for locating a place and sub-lists of historic names.¹⁰

Three search engines offer different methods for accessing site data. The full-text search engine provides a way to search data in the free text fields (commentary and source extracts).¹¹ An advanced search tool permits a multi-faceted search of all data from “collections” down to the components of “events.”¹² This engine, in particular, gives users maximum control over the parameters of their search to obtain completely refined results. Finally, a third search engine is narrowly focused on exploring the fairs themselves, presented in something of the fashion of a calendar.¹³

Example use cases of *Fairs in History*

The *Fairs in History* database has been in production for the greater part of the formal life of the CoMOR project and by the end of the project funding phase,

8 That is, users may reuse the data so long as they cite the source, use the data for non-commercial purposes, and in turn impose the same license conditions on their redistribution of the data. See license details at <https://creativecommons.org/licenses/by-nc-sa/4.0> (07 October 2024).

9 Each “collection” has a unique, permanent project identifier as well as a DOI.

10 This enrichment has, in particular, been affected through reference to old maps indexed and geolocated by Leif Scheuermann, allowing a dual historic and modern view of CoMOR project data.

11 Simple Search, CoMOR. <https://fairs-in-history.huma-num.fr/simplesearch> (07 October 2024).

12 Search, CoMOR. <https://fairs-in-history.huma-num.fr/search> (07 October 2024).

13 Fair Explorer, CoMOR. https://fairs-in-history.huma-num.fr/fair_explorer (07 October 2024).

over 100 collections were created. The site is ready and able to take in new data from the current team and new contributors interested in fairs and merchants, and provides a standardised set of tools for analysis and visualisations. Among the latter are five different, ready-built data exports which gather datasets automatically according to specific criteria.¹⁴ Four datasets are structured around the *Events* ('fair calendar,' 'fair references,' and 'trade data,' with or without merchandise) with the fifth dataset assembling relational data for various applications of network analysis.¹⁵ All of the data exports are formatted to comply with specific open protocols used by most open source software. The 'fair calendar' and 'fair references' take advantage of the underlying geo-encoding to output as geoJSON for easy import to GIS systems.¹⁶ The datasets aimed at network analysis are exported as CSV files containing nodes and edges accepted by most network analysis packages. The 'trade data' is output in both CSV and geoJSON formats, providing multiple possibilities for interrogating the data. The datasets are exportable by 'collection'; however, due to the fact that they all follow the same data models, datasets can be easily combined, allowing one to effectively map the geo-encoded elements of the entire CoMOR project data or analyse the networks contained in it. What follows below are two examples, from two different collections, demonstrating the possibilities with CoMOR data.

14 Downloads, CoMOR. <https://fairs-in-history.huma-num.fr/downloads> (07 October 2024).

15 The variety of applications of network analysis to historical studies has exploded in the last 15 years, extending far beyond sociological origins of social network analysis. The literature has grown with it, although a key starting point for historians would now be Claire Lemerrier. *Formal Network Methods in History: Why and How?* In *Social Networks, Political Institutions, and Rural Societies*, Georg Fertig (ed.). Turnhout: Brepols, 2015, 281–310. <https://doi.org/10.1484/M.RURHE-EB.4.00198>. For another comprehensive overview, see K. Patrick Fazioli. *Modeling the Middle Ages: A Review of Historical Network Research on Medieval Europe and the Mediterranean World*. In *Social and Intellectual Networking in the Early Middle Ages*, Michael Kelly, K. Patrick Fazioli (eds.). Binghamton, NY: Gracchi Books/Punctum Books, 2023.

16 In the last twenty years, geographic information systems have been used in numerous projects of spatially oriented historical scholarship, although a comprehensive introduction is still a research desideratum. For this reason, only two fundamental—albeit somewhat older—edited volumes by Anne Kelly Knowles shall be mentioned here: Anne Kelly Knowles. *Placing History: How Maps, Spatial Data, and GIS Are Changing Historical Scholarship*. Redlands, CA: ESRI Press, 2008; Anne Kelly Knowles. *Past Time, Past Place: GIS for History*. Redlands, CA: ESRI Press, 2002. For spatio-temporal analysis of the CoMOR data, see Ulf Christian Ewert, Susanne Rau, Leif Scheuermann. *Räumliche Konfigurationen des Messehandels im frühneuzeitlichen Europa*. *GEDRUCKTE MESSEKALENDER DES 16. UND 17. JAHRHUNDERTS UND IHRE COMPUTERGESTÜTZTE ANALYSE*. *Vierteljahrschrift für Sozial- und Wirtschaftsgeschichte* 110:4 (2023): 494–541.

The first example comes from the *Collection* “Biblioteca Riccardiana di Firenze, Pegolotti, La pratica della mercatura (COL0018).”¹⁷ In the middle of the fourteenth century, the Florentine merchant Francesco Balducci Pegolotti composed *La pratica della mercatura*,¹⁸ a treatise providing rare, precious insights into merchants, commerce, and trade of the late Middle Ages. Marta Gravela, researcher with the CoMOR project, studied the manual and from it entered the fair and exchange data into *Fairs in History*. Using *Fairs in History*’s automated network analysis datasets imported into Gephi (a popular open-source software for analysing and visualising network graphs),¹⁹ one can quickly visualise the mercantile links which existed between the towns cited by Pegolotti in the fourteenth century, and in so doing understand quickly the depth of the networks he described and his vast worldview. Fig. 2 represents a general overview of the trade networks described by Pegolotti. In this typical network graph, the towns are represented by circles (‘nodes’) with their size reflecting their ‘importance’ in Pegolotti’s tables of trade: the more the town is cited, the more the trade recorded for them by Pegolotti and the larger the node. At a glance, we can see that Pegolotti focused on Venice, Florence, Famagusta (Ammóchostos), Genoa, and Bruges as centres of trade (whether in reality they were such centres or not is another matter for analysis).²⁰ The four node colours in this graph indicate another tendency in the data—the effect of sub-networks emanating from hubs. In network analysis terms, this is ‘community’ or ‘modularity’ analysis and uses an algorithm to attempt to segregate the graph into smaller, local networks according to the intensity of connections between groups of nodes. For this high-level view, we have set the algorithm to a fairly low ‘resolution’ to distinguish the broadest tendencies. As mentioned previously, all locations in the *Fairs in History* database have been geo-encoded with latitude and longitude. This allows network analysis applications such as Gephi to ‘read’ the coordinates and place them in relative geographic position. The result in Fig. 3 shows how the ‘hubs’ or ‘local networks’ from Fig. 2 follow a certain geographic logic—albeit not exclusively! In this representation, we see that the four sub-networks are roughly demarcated by zones of interaction (again expressed in modern geographic terms): the Adriatic Sea, the

¹⁷ Marta Gravela. Biblioteca Riccardiana di Firenze, Pegolotti, *La pratica della mercatura* (COL0018). In *Configurations of European Fairs*, Gaulin, Rau (eds.). <https://fairs-in-history.humanum.fr/collection/COL0018> (01 January 2024).

¹⁸ Francesco Balducci Pegolotti. *La pratica della mercatura*. Allan Evans (ed.). Cambridge: Medieval Academy of America, 1936.

¹⁹ Gephi. The Open Graph Viz Platform. <https://gephi.org/> (07 October 2024).

²⁰ The names of the towns in the graphs based on Pegolotti’s manual have been standardised into modern English. They are not the city names as written by Pegolotti in the fourteenth century.

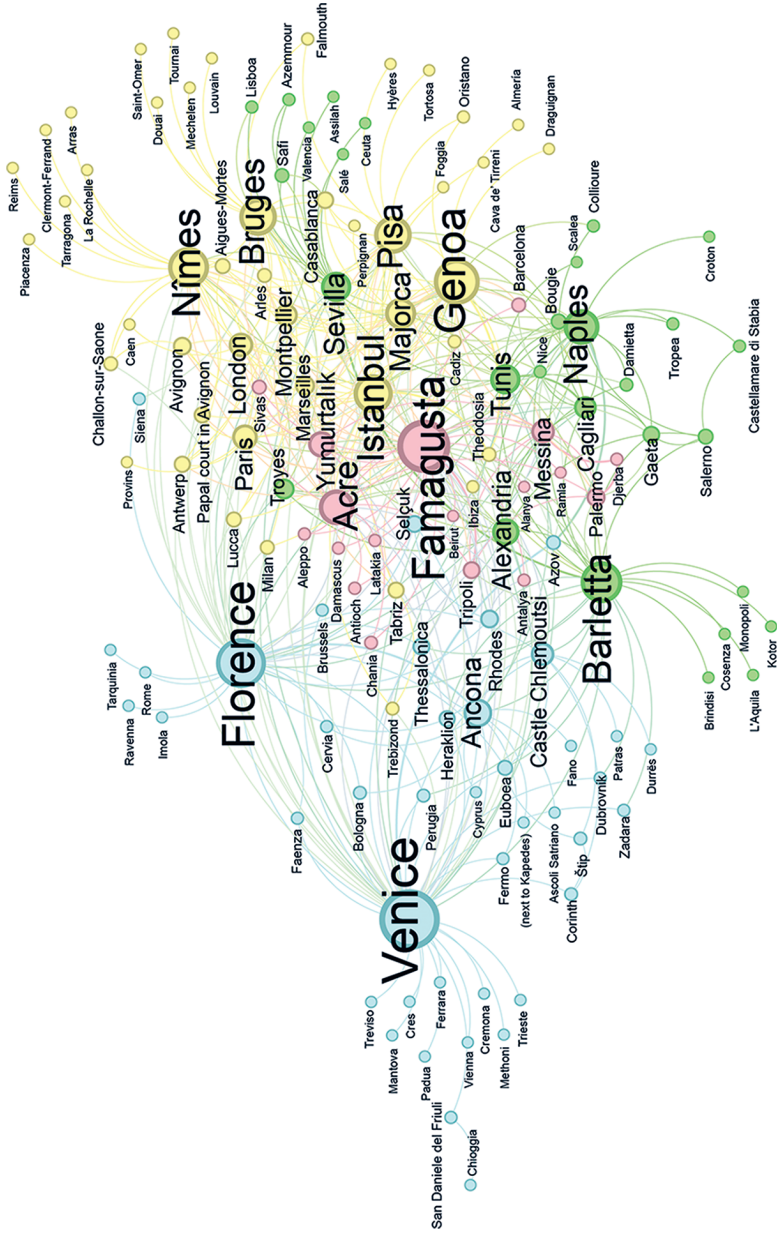


Fig. 2: Network of mid-fourteenth century trade in Pegolotti's *La pratica della mercatura*. The node size reflects the frequency of mentions of a given place, combining imports and exports—the larger the circle, the more frequently a place appears in Pegolotti's lists. The four colours represent 'communities' or 'groups' of intensive inter-trade. Graphic by Jean-Paul Rehr and Noémie Lacroix.

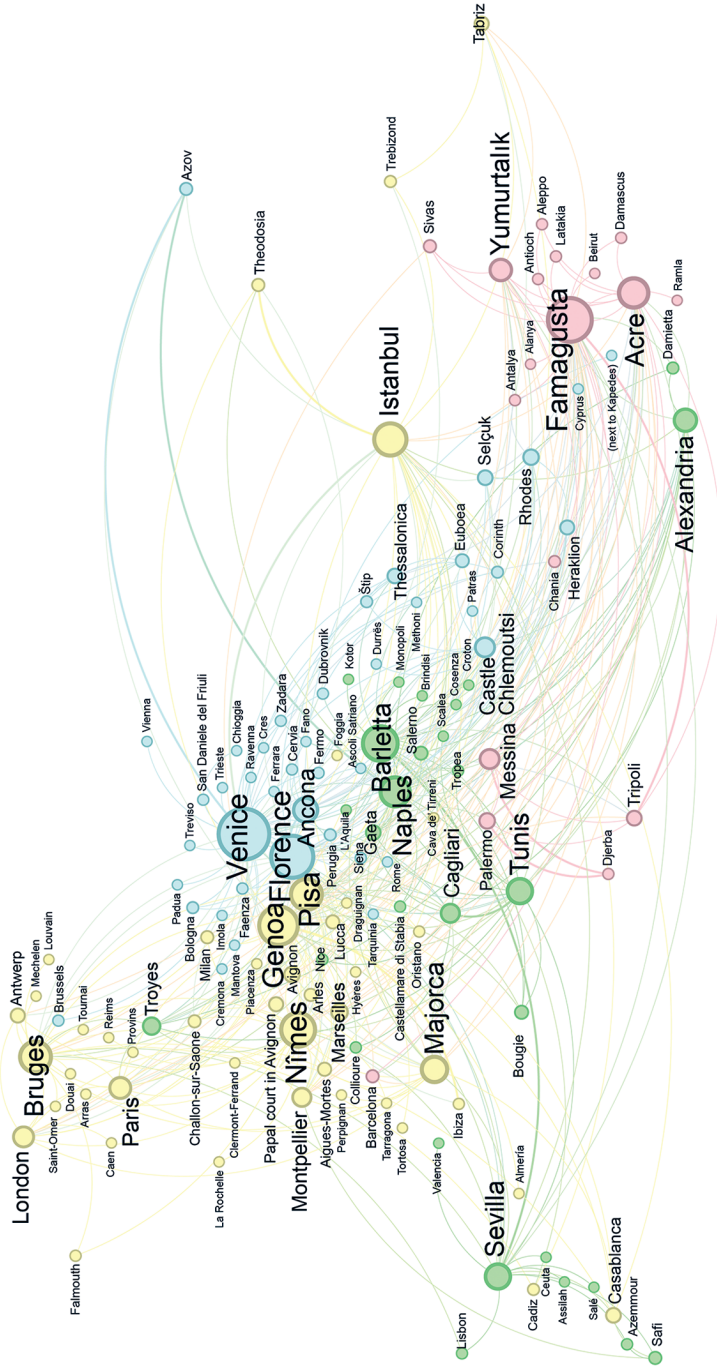


Fig. 3: Network of mid-fourteenth century trade in Pegolotti's *La pratica della mercatura*, with the same criteria as Fig. 2, except that it is displayed according to geographic coordinates. The colours represent the same 'communities' or 'groups' of intensive inter-trade. Graphic by Jean-Paul Rehr and Noémie Lacroix.

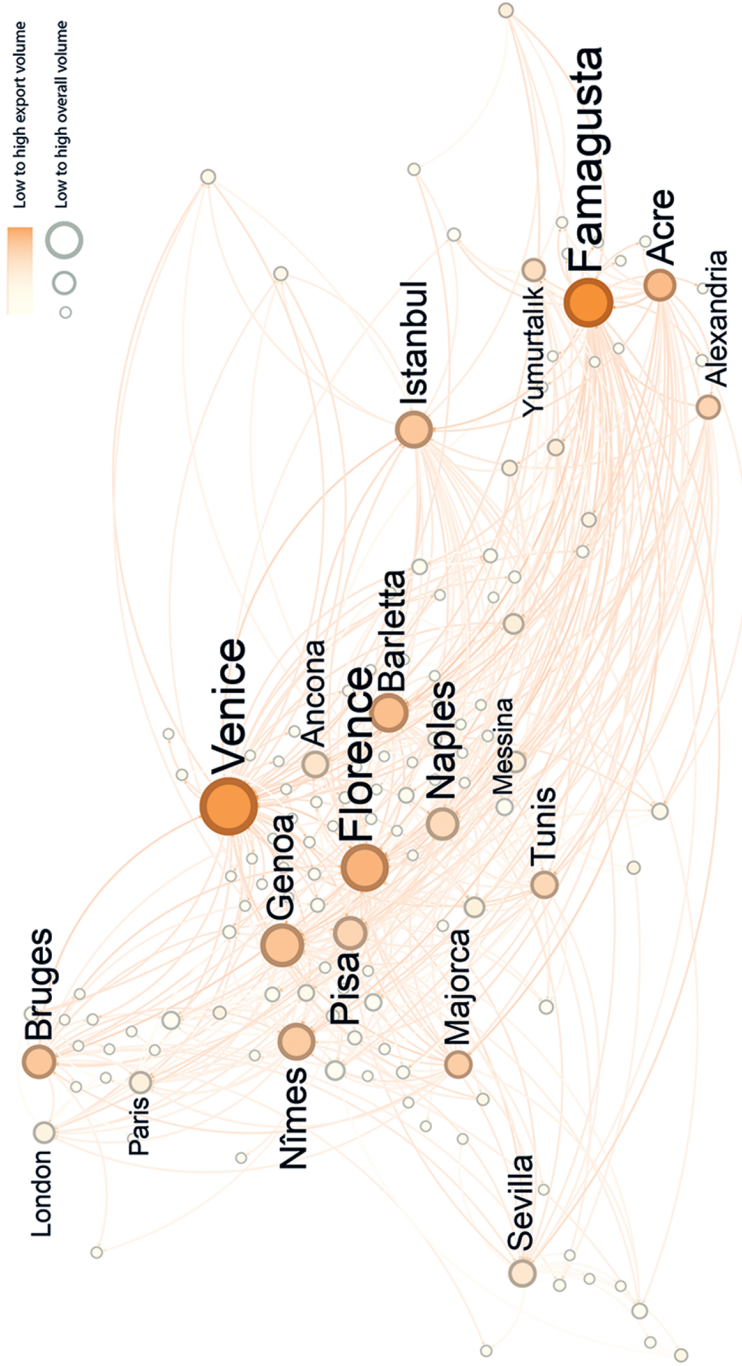


Fig. 4: Network of mid-fourteenth century trade in Pegolotti's *La pratica della mercatura*, with emphasis on exports. The node size reflects the frequency of overall mentions of a given place, the intensity of orange node color represents greater export volumes. Graphic by Jean-Paul Rehr and Noémie Lacroix.

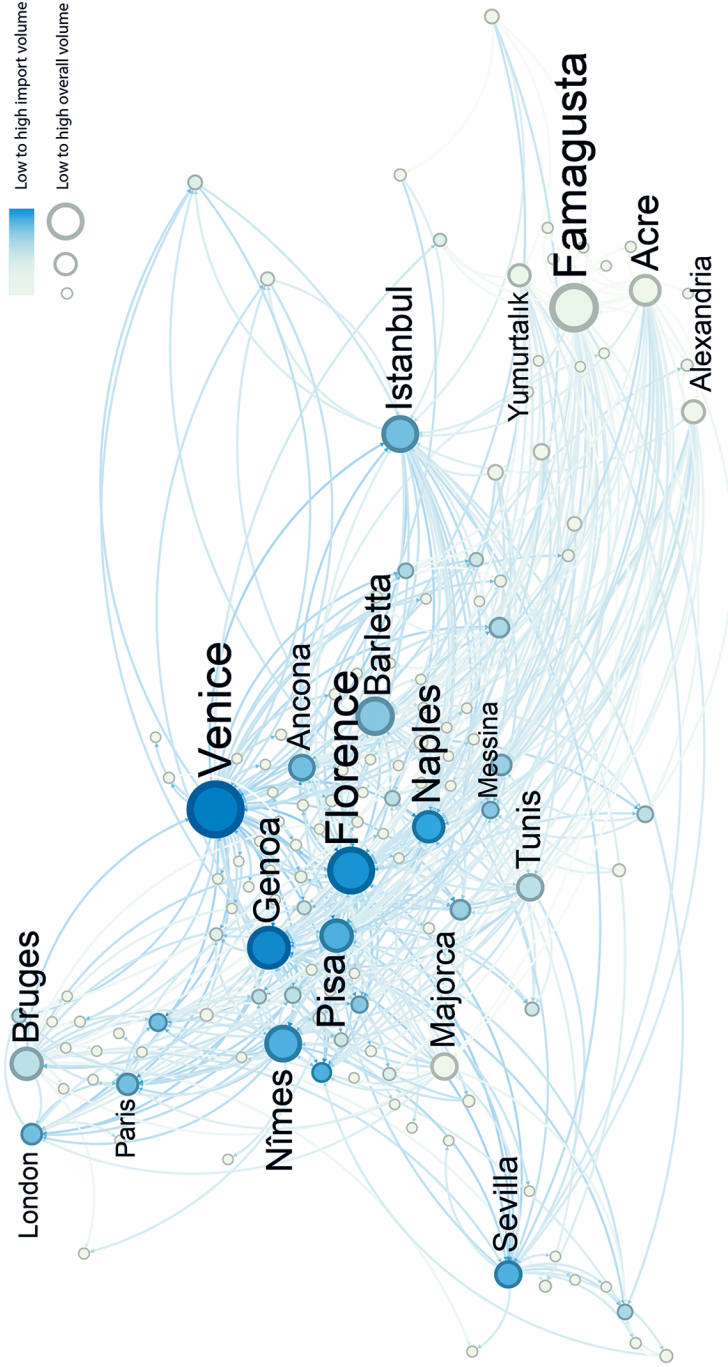


Fig. 5: Network of mid-fourteenth century trade in Pegolotti's *La pratica della mercatura*, with emphasis on imports (to compare with exports in Fig. 4). The node size reflects the frequency of overall mentions of a given place. The intensity of the blue node colour represents greater import volumes. Graphic by Jean-Paul Rehr and Noémie Lacroix.

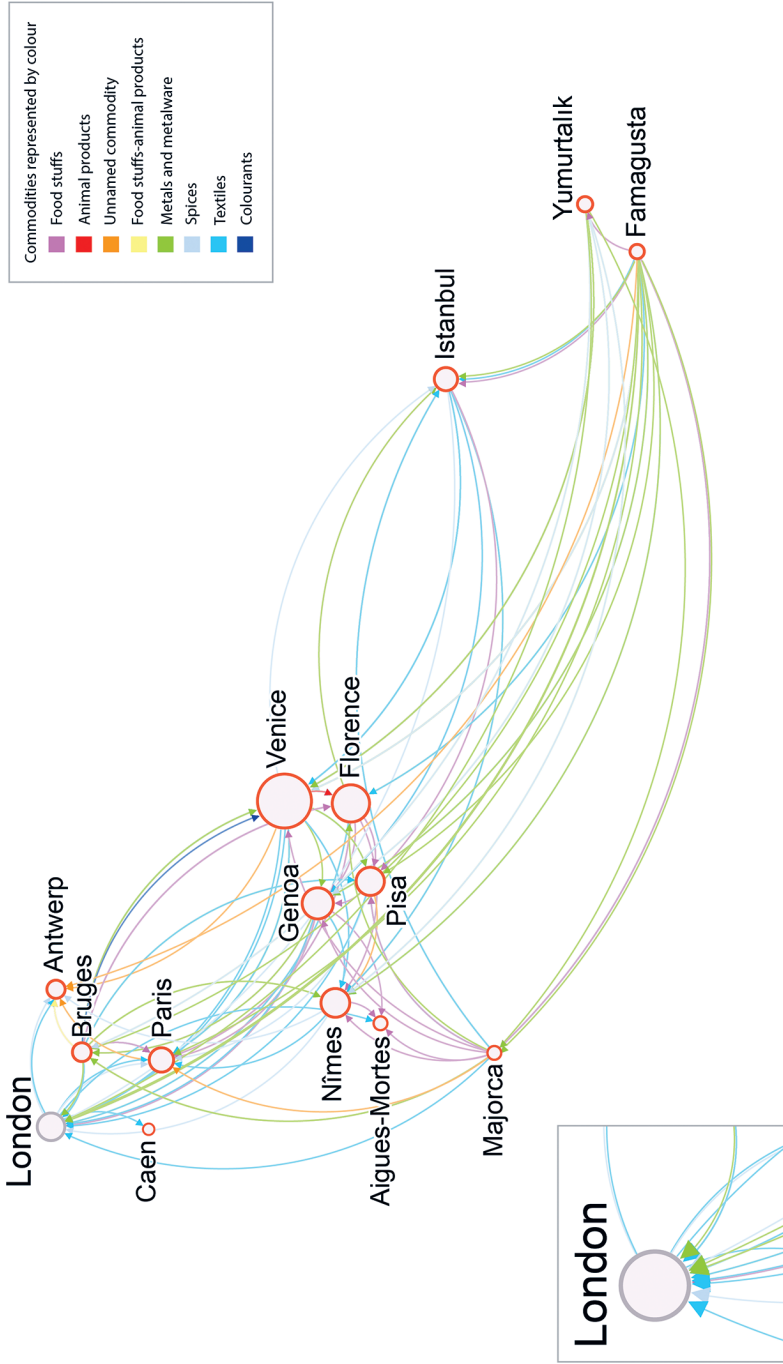


Fig. 6: Network of trade with London in Pegolotti's *La pratica della mercatura*. The edge colour equates to a type of textile, as indicated in the graphic legend. Graphic by Jean-Paul Rehr and Noémie Lacroix.

eastern Mediterranean, the western Mediterranean, and a broad axis between Genoa, Pisa, and northwestern Europe, extending up to England. However, these are not neatly contained: Brussels, Alexandria, Istanbul, Troyes, and Barcelona all appear as significant breaks in the apparent geographic continuity.

Pegolotti's tables of town trade actually contain directionality, or imports and exports. This directionality is captured in *Fairs in History* and exported with the data, allowing us to explore the movement of merchandise. Figs 4 and 5 present the trade direction, with Fig. 4 depicting the importance of towns in exports and Fig. 5 focused on their relative position as importers. Comparing the two side by side, we see that certain towns like Venice are true "hubs," with merchandise flowing in and out, while "hubs" like Famagusta are really centres of export. The same Pegolotti dataset can produce other insights too. Although *Fairs in History* is not meant to be an 'accounting system' per se, all trade can be encoded for commodity, volume, and value. Marta Gravela encoded all the commodities traded between the towns recorded by Pegolotti. In Fig. 6, the commodity data is rendered from the point of view of trade with a particular town, called an 'ego network' in network analysis. The exchanges between towns ('edges') are coloured according to the category of merchandise (foodstuffs, textiles, metal, etc.), demonstrating the reach of the commercial network of the English trade centre in the fourteenth century as seen by this Italian merchant.

The second example comes from the *Collection* "Museum Plantin-Moretus, PK.OP.21317 (Jost Amman's allegory / fair calendar) (COL0104)."²¹ In 1585, the draughtsman and engraver Jost Amman created an allegory of commerce represented in the form of the town and port of Anvers (see Fig. 7). In the upper part of the engraving, he included a calendar of European fairs. This calendar provides an overview, month by month, of the principal fairs with the name and coat of arms of the host towns. As with other fair calendars, the names of the towns and the dates of their fairs were entered into *Fairs in History* so as to see all fairs of the same epoch together. That data can be downloaded in geoJSON-format to be imported into a cartographic or geographic information system (GIS) in order to produce a simple map that allows one to understand the geographic coverage of Amman's calendar (see Fig. 8).

²¹ Ulf Christian Ewert, Noémie Lacroix. Museum Plantin-Moretus, PK.OP.21317 (Jost Amman's allegory/fair calendar) (COL0104). In *Configurations of European Fairs*, Gaulin, Rau (eds.). <https://fairs-in-history.huma-num.fr/collection/COL0104> (06 January 2024).

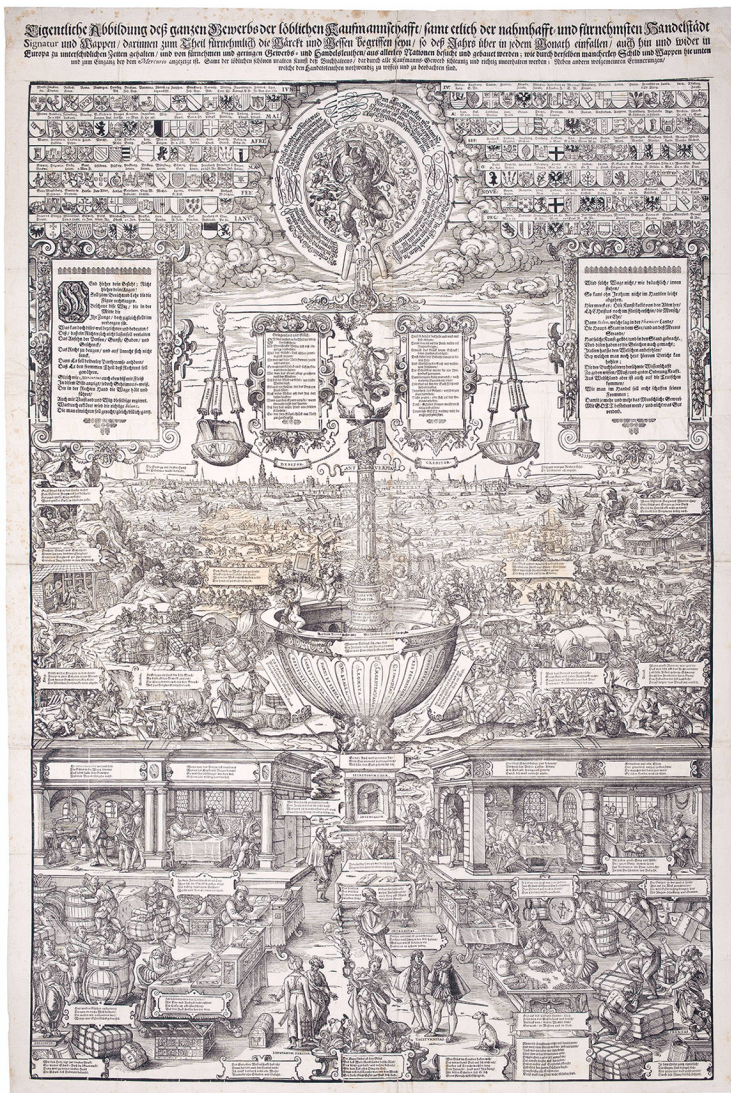


Fig. 7: Allegory of commerce, Jost Amman, 1585.²²

²² Jost Amman, *Eigentliche Abbildung deß ganzen Gewerks der loeblichen Kaufmannschafft/Samt etlich der nahmhafft und fuernehmsten Handelstaedt Signatur und Wappen zum Theil fuernehmlich die Maerckt und Messen begriffen seyn/so deß Jahr ueber in jedem Monath einfallen/auch hin und wider in Europa zu unterschiedlichen Zeiten gehalten [. . .]*, wood engraving (on paper), ca. 1585, 95 cm x 64 cm, Antwerp, Museum Plantin-Moretus, PK.OP.21317. Photo credit: Peter Maes.

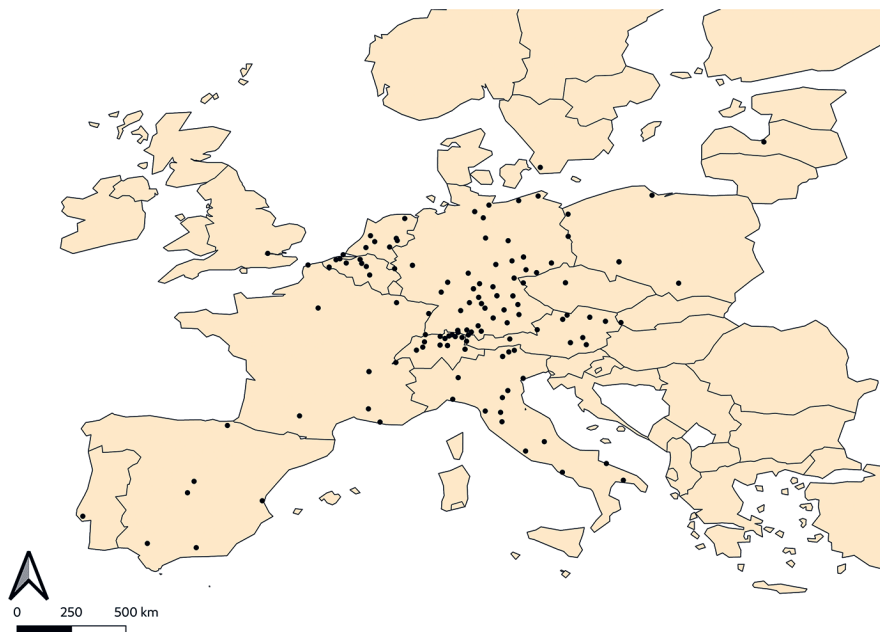


Fig. 8: Fair locations cited in Jost Amman's calendar projected on to a modern map of Europe. Map graphic by Noémie Lacroix.

This tour of the CoMOR database, *Fairs in History*, only touches briefly on its potential. The opportunities are three-fold for researchers. The first is the data already present, as entered by the first members of the CoMOR research team, which demonstrates the possibilities of a database that unifies heterogeneous sources. The second are the tools, ready to use, for exploiting the data through both quantitative and qualitative methods. The third opportunity is an expression of the founding idea of the project: the database is not simply a container of final project data as some fixed deliverable; it is a living entity that invites other researchers and their students to not only reuse the existing project data, but to join in a collaboration that continues to seek, through the ongoing contribution of a variety of sources, more insights into the fundamental reshaping of markets that occurred in the transition from the Middle Ages to the beginning of the modern era.

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