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MapTap and Cornelia
Slow Digital Art History and Formal Art Historical Social Network Research*

I. Introduction

Digital art history (DAH), as stressed by Harald Klinke and Liska Surkemper in their editorial to the first issue of the new *International Journal for Digital Art History* (June 2015),[1] "has existed in many ways for a couple of decades." This, however, does not mean that all art historians have embraced or are embracing DAH.[2] While exponents of DAH, such as Anne Helmreich, Pamela Fletcher, Maximilian Schich, Juan Luis Suárez, Matthew Lincoln, Christian Huemer and Hans J. Van Miegroet and his DALMI team, convincingly show how fields such as computer science and information visualization can help to understand art, history, and culture,[3] the uncertainty and reluctance voiced by many art historians in a 2011 survey clarifying their perceptions about DAH are still very much alive today.[4] This of course is not to say that they bypass all things digital. In fact, art historians developing and refining traditional iconographic, patronage, and stylistic analyses of one or a set of artists or art works increasingly rely on *digitized* art history, that is, the use of online repositories and databases allowing for easy access to images and information, such as those developed by the Getty Research Institute and the Netherlands Institute for Art History.[5] However, as recently stressed by Fletcher, "an intellectually generative digital art history" is still a work in progress.[6]

This essay aims to contribute to this ongoing process of "defining digital art history and its relationship to the larger fields of digital humanities and art history."[7] We coin the expression "slow digital art history" for describing our research methodology and philosophy.[8] In doing so, we do *not* wish to imply that there is some kind of "fast digital art history" – let alone one that would be of inferior quality. We simply want to highlight that our use of digital tools is preceded, inspired, and fueled by a time-consuming process of searching, collecting, organizing, and processing a vast amount and a wide array of archival documents containing rich yet complex data. This process is, for all intents and purposes, slow. In this essay, we introduce *MapTap. Mapping the Antwerp-Brussels-Oudenarde Tapestry Complex via Network Analysis (1620 – 1720)*, an ongoing international and interdisciplinary research project funded by KU Leuven and the Flemish Science Foundation (FWO-Vlaanderen) (2012 – 2016).[9] We first show that MapTap's research questions and methodology are traditionally materialist. In the second part, we introduce the booming yet still slightly amorphous field and methodological framework in which MapTap operates, that is, formal historical network research (HNR).[10] After a discussion of some key precepts and challenges of HNR, we introduce, in the third part, our custom-made digital tool underpinning MapTap's research ambitions. This tool is a database named Cornelia. Finally, a case study that removes or at least mitigates traditional layers of bias against women shows one way in which Cornelia can help us to come to an inclusive understanding of the interplay be-

tween the dynamics of social structure on the one hand and artistic developments in Flemish tapestry on the other.

II. MapTap and Materialist Art History

The KU Leuven research group Early Modern Art (1580 – 1780) has a strong and lively tradition in research on Flemish and European tapestry.[11] In the past, the research agenda was aimed at contradicting the widely accepted yet completely mistaken notion that tapestry is a mere industrial (applied, collaborative, decorative, repetitive) art of lesser art historical importance. This agenda was shared by the small yet thriving community of tapestry scholars in Europe and the United States.[12] In their attempts to put the medium on a par with painting and finally become fully accepted in art history, most, if not all, tapestry scholars isolated tapestry designers, patrons, and tapestry sets from their socioeconomic context and favored studies highlighting the pictorial possibilities and qualities of the medium.

The new approach at KU Leuven, however, puts the elephant back in the middle of the room. MapTap starts from the truism that tapestry production was exceptionally capital-intensive and perilous.[13] While investments in cartoons, labor, and material were immense, the recovery of the invested capital was usually slow and problematic. These were not the concerns and challenges faced by artists and patrons as they made themselves comfortable at the very beginning and the very end of the long and complex production and distribution process. These were the difficulties and threats tapestry producers (or *tapissiers*) had to deal with on a daily basis. *They* had to find ways to maximize their creditworthiness and to minimize information asymmetries about quality, taste, and market conditions to keep their workshops and indeed the industry as a whole up and running. These observations prompt two straightforward interwoven questions: How did Flemish *tapissiers* manage to avoid market failure? How and to what extent did these entrepreneurial strategies shape iconographic and stylistic developments and vice versa?

Interestingly, while MapTap's focus on the socioeconomic dimension of the medium sets it apart from the usual approaches in tapestry scholarship, it ties in nicely with the materialist perspective that from the 1980s permeated the debate on early modern painting. Indeed, invigorated by Baxandall's *Painting and Experience in Fifteenth-Century Italy: A Primer in the Social History of Pictorial Style* (1972) and Becker's *Art Worlds* (1982),[14] art historians have illustrated the rich potential of an approach in which paintings are seen as outgrowths of complex interactions between the inhabitants of the "art worlds," rather than as mysterious manifestations of an artist's genius, free from any kind of organizational restraint.[15] Thus, instead of artists, patrons, and works of art, "network[s] of cooperative links among participants"[16] are at the center of any materialist attempt to come to a deeper understanding of iconographic and stylistic developments in early modern European painting.

A handful of recent studies on Brussels tapestry strongly suggest that these networks should also be MapTap's units of analysis.[17] Like most early modern entrepreneurs,[18] *tapissiers* tried to reduce transaction costs and minimize the numerous risks perceived in entrepreneurial endeavors by embedding themselves in interlocking local, regional, and international networks. These networks seem to have fulfilled four interwoven functions. They channeled information on both artistic and commercial issues, enabling *tapissiers* to fine-tune and revise their entrepreneurial decisions continuously. The networks further facilitated subcontracting and collaboration between families and workshops whenever the need or occasion arose. They

were also crucial for the development and management of social and symbolic capital, which in turn signaled trustworthiness and creditworthiness – arguably the most vital assets for early modern entrepreneurs involved in capital-intensive and high-risk businesses. Finally, as *tapissiers* commissioned most cartoons, the networks can be regarded as one of the prime loci of artistic innovation (!).

And so it transpires that the answers to MapTap's questions could very well lie in a proper understanding of the nature, long-term development, and governance of ever-changing "network[s] of cooperative links among participants." The questions, then, can be rephrased: How can we reconstruct and analyze these networks (or, to rephrase Becker, the "tapestry world")?

III. MapTap and Formal Historical Network Research

In order to answer this question, MapTap turns to the steadily growing field of historical network research (HNR).[19] HNR imports and applies theoretical concepts and methods from social network analysis (SNA). SNA, which has a multidisciplinary origin in psychology, anthropology, and sociology harking back to the 1970s, rests on systematic data acquisition and three tenets.[20] One, the complex figurations of structural relations are often more important for understanding behavior than are such attributes as age, class, and gender. Two, relations can serve a variety of functions and differ in direction, valence, strength, and content; therefore, relations both facilitate and constrain action and affect behavior and opinions. Three, as relations are dynamic processes, networks are dynamic structures. Supported and driven by powerful software, SNA quickly became a powerful analytical paradigm in a wide range of disciplines. A handful of programs such as UCINET and NetDraw allowed computations of a wide array of network measures and interactive depictions of even the most complex networks. SNA thus was one of the first catalysts bringing the computer into the social sciences and the humanities. In doing so, SNA produced a creative discomfort and disturbance that stimulated and forced new approaches and questions.

Both sociologists and historians applied SNA methods to historical data from the mid-1980s onward. This led to a number of groundbreaking cross-disciplinary publications.[21] However, most of these studies struggled at least to a certain extent with the specificity of historical data – especially those studies focusing on the early modern period. For SNA thrives on complete and coherent datasets, whereas historians almost never have access to clean-cut, balanced panel data. In addition, the research agenda of historical network researchers is often different from those of researchers working in other fields. As a result, in the early 2000s, HNR started to shape itself as an intrinsically complex autonomous technique/tool/philosophy that is "between" socio-economic and cultural history, network science, social network analysis, sociology, statistics, and visual analytics.[22]

Meanwhile, as a rule, art historians bypassed SNA and are now bypassing HNR for three obvious reasons. First, given the focus on structure and patterns, SNA and HNR complicate if not obliterate traditional art historical narratives focused on star artists, illustrious patrons, and works of art. Second, as HNR's process of emancipation and self-definition is still ongoing, there is no readily available, tried-and-tested universal road map guiding practitioners of HNR.[23] Finally, the few early adopters of SNA and/or HNR, such as *Ecartico: Linking Cultural Industries in the Early Modern Low Countries, ca. 1475 – ca. 1725*, have been met with criticism and, worse yet, indifference.[24]

Recently, Lemercier listed five major issues threatening HNR studies.[25] First, most of them are of a purely metaphorical or informal na-

ture (as opposed to *formal* HNR studies that rest on systematic acquisition of relational data abstracted from various sources).[26] Scholars take key SNA concepts and notions as inspiration (such as "the strength of weak ties" and "embeddedness," both coined by American sociologist Mark Granovetter)[27] and borrow them to give weight and additional meaning to the usually fairly limited empirical data they have.[28] In addition, visualizations of "networks" tend to be quite simplistic depictions of enriched genealogical trees.[29] Thus, these studies do little more than demonstrate that social ties between inhabitants of the art worlds existed and mattered. This, of course, is a truism, whereas "describing exactly how, and at which scale, they [social ties] matter – which ties matter for what, which do not, and how different sorts of ties interact – is a more interesting, but also more difficult purpose [of HNR]."[30]

Second, (informal) HNR studies are prone to confirmation bias. Archival research focused on one or a limited set of actors will obviously lead to relational information suggesting, if not "proving," that the selected actor or actors were well connected and had a central position within the network.[31]

Third, HNR studies tend to focus almost exclusively (albeit often implicitly) on the positive effects of family and social ties,[32] while they can be and indeed often are a liability to (entrepreneurial) performance: "the ties that bind can also become the ties that blind."[33]

Fourth, while gauging network effects resulting from (metaphorical descriptions of) the patterns of social ties, (art) historians could fail to stress that not all ties and their effects result from conscious and concerted networking strategies. Consequently, they run the risk of overinterpreting network patterns.[34] It is possible, for example, that two or more actors that appear to be "close" in the network graph did not act on this proximity or were not even aware of it.[35] Yet the image of the network could easily seduce viewers into believing that strategies and collaborative undertakings must have existed. Likewise, it is possible that the layout algorithm, as it can only produce an overview of the available relational information extracted from the sources, creates distance between actors that were actually close friends.[36]

Finally, HNR studies often tend to reconstruct and depict *the* network, that is, a static accumulation of heterogeneous ties abstracted from sources that were recorded on different dates.[37] But of course networks have a temporal dimension: people and ties drift in and out, and the meaning and nature of ties change continuously.[38] Researchers forgetting this basic caveat "tend to build an artificial 'complexity' by mixing heterogeneous ties on long periods, thus adding to the mathematical interest of the study but obscuring its historical meaning."[39]

Consequently, (art) historians embarking on SNA/HNR studies and aiming to develop formal art historical social network research have to devise a refined data-collecting and data-modeling strategy. While defining boundaries of time spans and the network itself, they have to make sure to collect longitudinal data reflecting change and time. This means that, contrary to traditional assumptions, archival research is not simply a tedious "blue-collar" activity performed by art historians low on imagination and intellectual prowess.[40] Instead, the continuous act of collecting and arranging data is also a continuous act of insight into the quality of the research question, the archival finds, and the research strategy. A slow and fine-grained approach to archival data guarantees visualizations and analyses of crucial dimensions and features of social structure, including the precise nature of ties, the difference between interaction and *potential* for interaction, the awareness of relational patterns among the actors, and the temporality of both actors and ties. Starting from these premises, MapTap developed a custom-made database, Cornelia.[41]

IV. Cornelia

Where can we find attribution and relational data shedding light on the people inhabiting the "tapestry world" – longitudinal data reflecting change – and how can we store and arrange the findings in an efficient manner? "In the archives and in a database" is obviously the right answer.

"In the archives" – and in the archives only. We go back to the primary sources. Cornelia includes only archival data mined from a wide array of archival sets.[42] These sets include, but are not limited to, parish records, registers of guilds and corporations, *wijkboeken* (district books), and notarial deeds (which in turn include a wide range of documents, such as business contracts, marriage agreements, and credit transactions). The selection of sets for examination is defined by our expertise in the archives but also – and mostly – by their potential to infiltrate in the tapestry world. This means, for example, that baptism records, while wildly unexciting from a traditional art historical point of view, are very important as they reveal interlocked sub-networks of at least five people per record.[43] The vast majority of Cornelia's data are new finds. Data known through the literature is always traced in the archives and reread before inclusion in Cornelia.

This exclusive focus on archival data obviously means that Cornelia omits information that can readily be found in the literature or in other databases. Tapestries bearing signatures, for example, are not included in the database. Nor are hypotheses and inferences made by art historians, even when they are supported by archival data. We do not aim to compile a "complete" dataset containing everything we know about the tapestry world. Instead, we aim to dig up and arrange long-overlooked archival data that questions or at least breathes new life into accepted wisdom and that allows for a new approach to Flemish tapestry.

"In a database" – one we developed from scratch. The motley assortment of archival data presented one challenge. Our ambition to secure a life for Cornelia beyond MapTap and to create a durable and flexible database for the study of other art worlds/creative communities/creative industries was another one. In order to achieve this goal, we defined a handful of entities (or concepts) that are interlinked within the system.

As archival sources are the Alpha and Omega of the database, *source* is Cornelia's first key concept. A source can coincide with a physical object (e.g., a letter). It can also be a unit within an object (e.g., a probate inventory included in a volume of notarial deeds). Size does not matter. While a probate inventory can easily run to ten pages or more, an entry in a parish record usually counts only a handful of lines.

Sources describe and usually date one or possibly more *events*. An event could have been completed by the time it was recorded. Entries in a list of baptisms, for example, were written down after the ceremony. Sources can also describe the *intention* to realize one or possibly more non-recurrent or recurrent events, either in the near(ish) or in the distant future. A marriage agreement written by a notary, for example, announces a non-recurrent event that was usually executed shortly after the agreement was recorded. However, only an entry in a list of marriages can confirm whether or not the intended event was actually realized. Likewise, a notarial deed in which a master painter agrees to train a young child for a couple of years is, in itself, not actual proof that the artist schooled the boy. An entry in a list of new apprentices compiled by the corporation of painters would reveal whether or not the boy really started his training with the master. However, this entry would fail to give certainty about the actual duration of this relationship. A notarial deed describing the discontinuation of the relationship, or an entry in a list of new masters compiled by the corporation of painters, would shed light on this issue. Put differently, by allowing us to include a wide array of sources describing a wide array

of events, Cornelia enables us (at least theoretically) to observe and assess levels of probability that events were executed, and/or the beginning and ending – and thus the duration – of events.

Events are produced by one or more *actors*. We started from the premise that sources mention names and that they only occasionally *identify* actors. This, of course, means that we continuously have to decide if a name can be linked to an actor that is already in the database, or if we have to create a new actor. As all art historians with archival experience know, this can be a tricky ordeal. Different first names and even family names were sometimes used to describe one and the same actor. Also, two or even more actors living in the same town and in the same period sometimes had identical names. We circumvent these conundrums by taking things slowly. When we feel confident yet not absolutely certain that we can identify an actor, we make sure to add the name as it was recorded in the source (e.g., "Jan Raes de Jonge" or "Jan *den blauverver*"). When we are really not sure about an actor's identity, we create a shadow actor, "[name] b." The "b" stands for "basket," as we can use this unidentified actor to group more mentions of the problematic homonym. Since all names are glued to their source, these precautions allow for effective and quick data-cleaning campaigns as we let the dataset grow and flesh out actors.

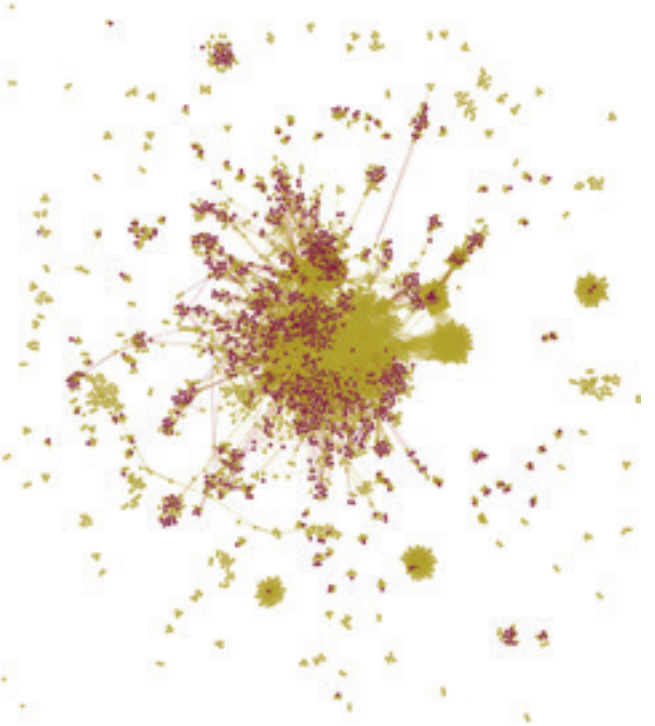
Cornelia includes *all* actors mentioned in the sources. While processing probate inventories, for example, we take not only the leading figures, but also the telephones that do not ring immediately, such as seemingly unimportant creditors and debtors listed in the document. They may or may not have played significant roles in the art world inhabited by the deceased and his or her colleagues. Only time, that is, additional archival research, will tell. Meanwhile, we do not let go to waste their possible potential.

Sources describe actors as playing/having played/planning to play one or possibly more *roles*. This can be a stand-alone role (e.g., bachelor) or it can be relational. Sources can also describe events in which one or more actors are linked to one or more actors. These sources produce coupled roles. While processing a baptism source, for example, we link the baby to his/her father, godfather, godmother, and mother. We also connect the father and mother. As these coupled roles are linked to a source, they also bear a time stamp. Sources can describe events in which one or more actors are linked to one or more *groups*. A group is an agglomerate of actors functioning as a cultural, economic, political, social, or religious body. Thus, groups include corporations, guilds, *poorters* (citizens), and theatre companies. Furthermore, sources can describe events in which one or more actors are linked to one or more *places*. These include countries, cities, parishes, streets, or houses. Finally, sources can describe events in which one or more actors are linked to one or more *works of art*. For every source, Cornelia includes *all* attribution and relational data tying actors to other actors, groups, places, and works of art.

As has become clear, our normalization process is source-oriented, that is, we capture all data as elements of the source. However, it is obviously not our goal to make statements about occurrences of names in a source or about the relations between sources. Our goal is to make statements about people inhabiting the tapestry world. In this sense, in a research project such as MapTap, the data model continues to be something of a moving target. As the research yields new relations to be explored, the data modeling needs to be adapted. While this modus operandi might seem heresy to standard database developers, in this case it is actually part of the research itself, as developing the data model goes hand in hand with evolving insights into how the tapestry world is organized and reflected in the available sources.

All constituents of the system and all ties connecting the constituents are meticulously identified, dated, and labeled. Consequently, data

provenance ("And where exactly did you get this particular piece of information?") and data cleaning will never be an issue. This also means that we can transform the countless complex multiplex and multimode networks (networks consisting of different nodes – actors, groups, places, and works of art – connected to each other by different kinds of ties) that are essentially cluttered and unreadable into partial unimode networks that can be analyzed through computation and visualization. These analyses can then be used to come to a better understanding of the dynamics shaping the tapestry world, as we will now demonstrate by developing a case study that gives voice to a large yet almost completely forgotten group within the Flemish tapestry landscape, that is, women.



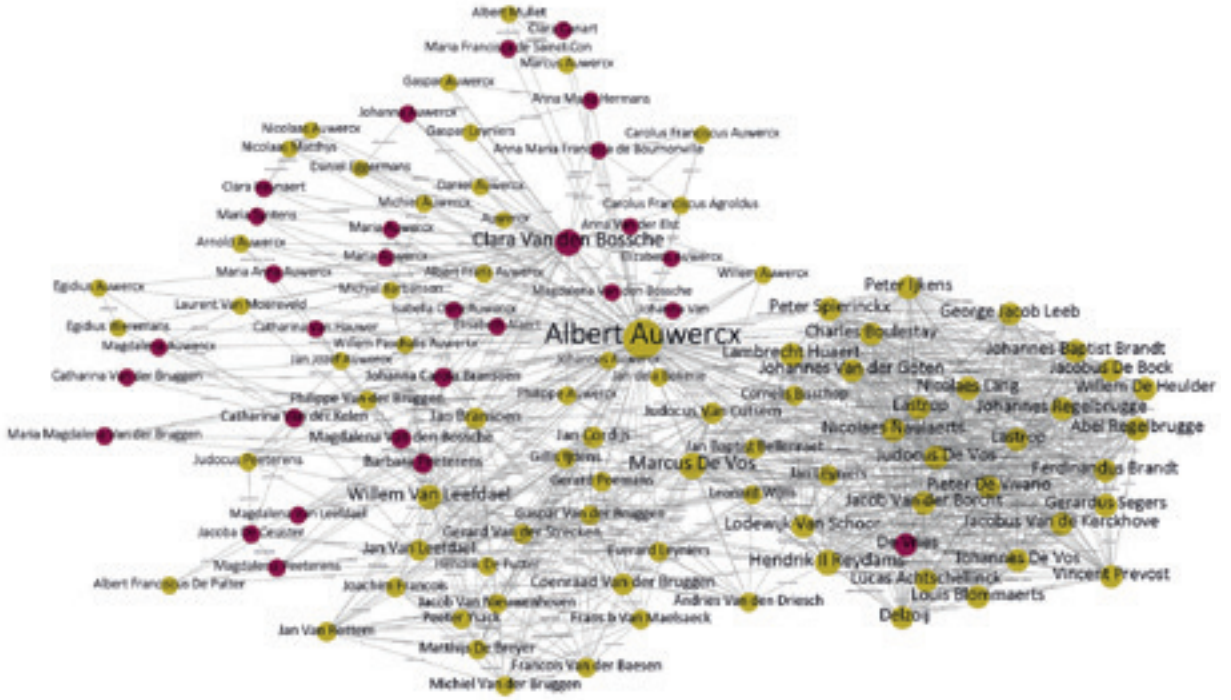
1 Cornelia's 1200 female (purple) and 2600 male (lime) actors and ties (February 2016)

V. Cornelia in Action: Women and/in the Tapestry World

Fig. 1 depicts all actors and all their ties included in Cornelia. It shows the presence of women in the dataset.[44] Cornelia now (February 2016) includes about 4300 actors. About 1400 of these (circa 30 percent) are women.

Over the past few decades, there has been substantial interest in women artists and the cultural and economic roles women played in the Low Countries and elsewhere in Europe from the sixteenth through the eighteenth centuries.[45] However, the picture is far from complete,[46] and our insight into the agency of women in creative and collaborative "art worlds" remains highly lacunal.[47] This certainly applies to our understanding of the Flemish "tapestry world." Indeed, only a handful of women make their appearance in the literature. The vast majority of these women surface as "the widow of," and are discussed cursorily or relegated to the footnotes.[48] There are two obvious reasons why women are by and large overlooked by tapestry historians. They never signed tapestries,[49] and they hardly figure in the limited set of archival sources embraced by tapestry scholars. However, our inclusive data-mining strategy and Cornelia's ontological tenets help us to remove or at least mitigate this bias against women, as shown by fig. 1.

Interestingly, the women included in Cornelia are not only widows and single women, but also married women. The latter group is traditionally very hard to muster and analyze as their legal status tends to minimize their visibility in archival sources.[50] However, by correlating all women in the dataset on the one hand with a set of economic roles and their husbands on the other, Cornelia reveals high levels of participation by married women in business activities. Examples abound. Elisabeth Seghers seems to have taken the lead in the administration of the workshop of her husband Joris Leemans, who might not have been able to write (and read?) in the first phase of his career.[51] Elisabeth Luyckx, who was



2 Zooming in on Albert Auwercx, Clara van den Bossche, and the Brussels tapestry world in the 1650s – 1660s

married to Brussels *tapissier* Jan Francois van den Hecke, and Maria Van der Strecken, *huisvrouw* of Van den Hecke's colleague Gerard Peemans, received payments from the Antwerp firm Forchondt.[52] Anna van Heil, who was married to Brussels *tapissier* Jacques Cordys, made a business trip to Antwerp where she contracted to produce tapestries.[53] Granting his wife Catharina Blommaert unlimited power of attorney, *coopman-tapissier* Odemaert Baert entrusted his partner completely with the financial administration of his business.[54] Baert was not alone in granting his wife blank power of attorney. Anne Claudine de Brière, who was married to Brussels-based tapestry *coopman* Charles de la Fontaine;[55] Isabella Maria de Cocqueel, married to Antwerp tapestry entrepreneur Nicolaas Naulaerts;[56] Barbara Wauters, married to Naulaerts's contemporary Cornelis de Wael;[57] Johanna-Maria Verheylewegen, married to Brussels *tapissier* Judocus de Vos:[58] all these and other women virtually ran the business of their husbands at one or more points in time while the men were still alive. Thus, Cornelia vividly illustrates the assertion that while "we may never learn much about specific actors who produced few written records, […] by collecting the underrepresented together, we can hear in aggregate what's often too quiet to discern individually."[59]

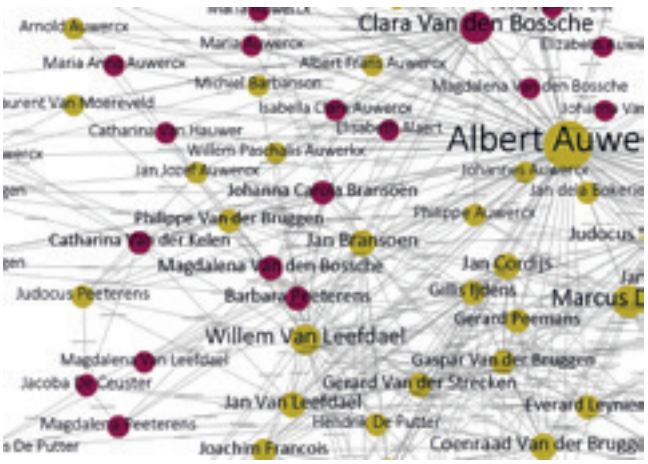
Cornelia allows us to shed light not only on the economic action and entrepreneurial importance of women, but also on how they underpinned networks of collaboration between their fathers and husbands. Though presented here as a static image, fig. 1 is zoomable. We can also grab and move actors. We can thus unfold a slow exploratory process, making parts and details of the multimode and multiplex network readable and understandable, or transforming it into partial unimode networks – all thanks to the fact that we have identified, dated, and labeled all constituents of the system and all connecting ties.

Fig. 2, for example, zooms in on the network of Brussels *tapissier* Albert Auwercx (1629 – 1709) and his wife, Clara van den Bossche (1635 – 1689),[60] in the 1650s and 1660s. Previous research *suggested* that Auwercx managed to develop his career by collaborating with a number of colleagues and "through marriage and what could be called astute christening politics," since at least six of his children had godparents that can be linked to the tapestry industry.[61] Fig. 2 supports this assertion and reveals the girth and depth of this partial network. The image shows that Clara van den Bossche was the daughter of Auwercx' colleague Gillis van den Bossche and his wife, Barbara Alaert. It also reveals that, on several occasions, Clara's aunts Magdalena (1604 – prior to 1675) and Maria van den Bossche, both single, lent money to *tapissier* Gaspard van der Bruggen.[62] A further exploration of the sub-network (fig. 3) demonstrates that Magdalena van den Bossche was godmother of no fewer than twelve children of Brussels tapestry producers, including Auwercx, obviously, but also Hendrik de Putter (1622 – 1709), Willem van Leefdael (1632 – 1688), and Philippe van der Bruggen (1634 – prior to 1678) (who were also godparents of children of Albert Auwercx). These three men were married to, respectively, Magdalena Peeterens,[63] her sister Barbara Peeterens,[64] and Johanna Carola Bransoen,[65] who was the sister of Jan Bransoen (who was Auwercx's best man at his wedding).[66] These were all nieces of Clara van den Bossche.

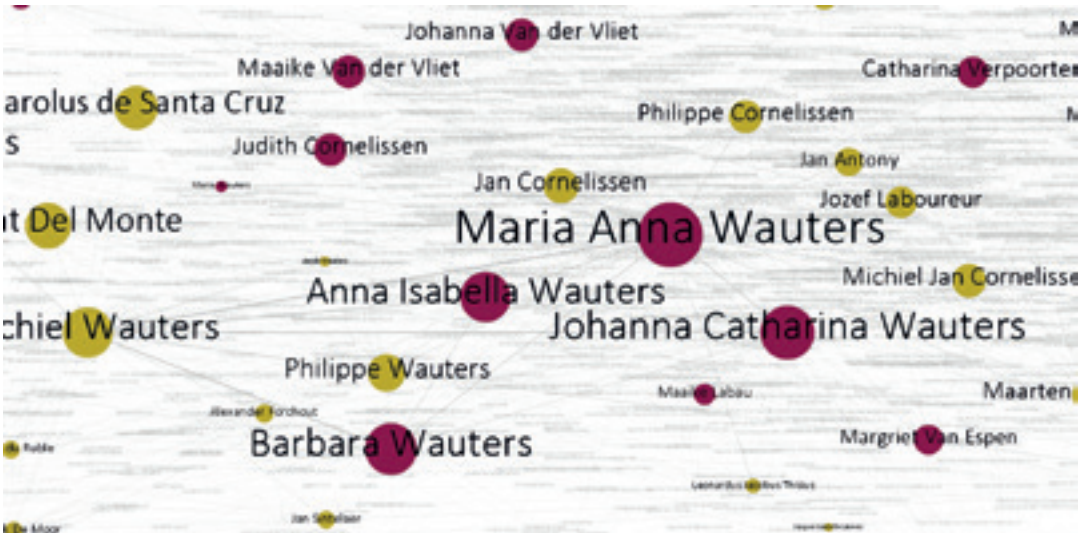
Fig. 4 zooms in on inhabitants of the Antwerp tapestry world in the 1670s and 1680s. This image shows not only the usual male suspects such as Michiel Jan Cornelissen and Leonardus Jacobus Thisius, but also a handful of women whose contribution to the Antwerp tapestry industry and trade could very well have been far more significant than expected.[67]

In sum, interactive visualizations of the networks show that women not only participated in the management of workshops, but were also crucial components of the social structure enabling and fostering collaborative projects. This observation helps, if not forces us, to assess or re-assess traditional attributions and datings of tapestries and editions, as cartoons were shared, pooled, and transmitted within this network. In fact, the size and depth of the social tapestry underpinning the Auwercx collaborative network – and it is safe to assume that more nodes and ties will appear as the dataset grows – seem to suggest that, in this case at least, we could perhaps refrain from trying to attribute unsigned pieces to a *tapissier*'s workshop and opt for linking tapestries to a group of families that were closely intertwined by family, social, *and* neighborhood ties (for preliminary research strongly suggests that most of these people lived in or around the *Schietspoelstraat* in the parish of Our Lady of the Chapel). A number of *Story of Cyrus* tapestries woven in Brussels between about 1650 and 1675 after mid-sixteenth-century cartoons are a case in point.[68]

Going back to the bigger picture (fig. 1) and then zooming in on a different sub-network, we find that women also filled structural holes between Antwerp, Brussels, and Oudenarde. In doing so, they linked complementary informa-



3 Zooming in on Albert Auwercx and Clara van den Bossche

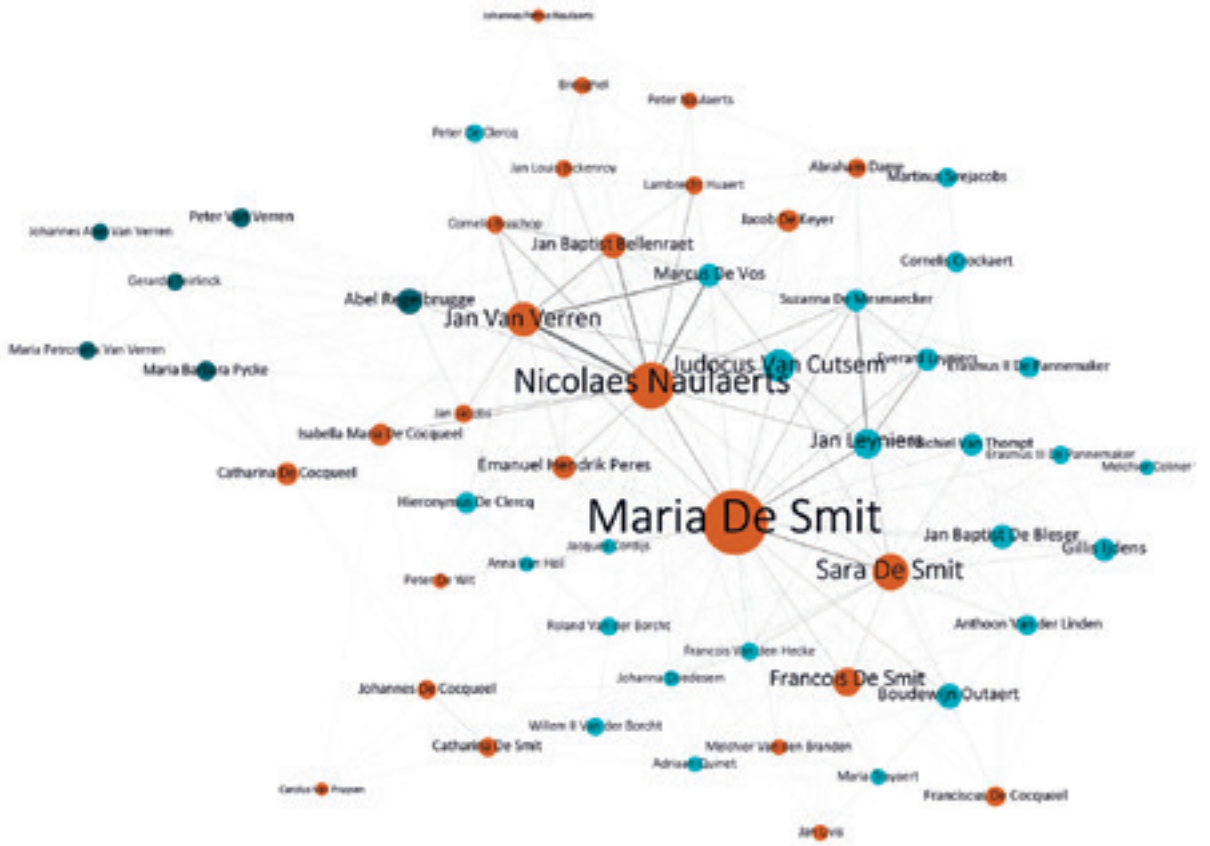


4 Zooming in on women in the Antwerp tapestry world in the 1670s – 1680s

tion and resources, thus facilitating collaboration and the dispersal of ideas between cities.[69] Fig. 5, for example, directs our attention to Maria and Sara de Smit. Tapestry scholarship had already identified the de Smit sisters as Antwerp *coopvrouwen* and *facteuressen van tapijten*, meaning that they acted as agents for Brussels and Oudenarde tapestry producers in the Antwerp *tapissierspand* and the Antwerp *Beurs*.[70] It is now clear that Maria and Sara de Smit were embraced by Antwerp,[71] Brussels,[72] and Oudenarde[73] tapestry producers and dealers as godmothers of their children. Interestingly, the Brussels *tapissiers* reached out to the de Smit sisters in the early 1670s, right about the time the use of French cartoons in Brussels stirred the tapestry landscape and Albert Auwercx complained about "the current disastrous times in which nothing or hardly anything can be sold" (1671).[74] Thus, we can now surmise that Maria and Sara de Smit, independent entrepreneurs, played a key role in guiding Brussels tapestry through a period of tension and disruption – which eventually led to a palmy Indian summer of Brussels tapestry.

In sum, our methodology, embodied by Cornelia, allows us to reassess the role women played in the tapestry world.[75] Explorations of the fine-grained network visualizations enabled by our inclusive data-collecting and arrangement strategy reveal not only that married women participated frequently and fundamentally in the management of the workshops and the entrepreneurial process. They also show that women initiated and guaranteed cohesion within both intracity and intercity production and trading networks that seem to have been more complex, dynamic, and time-sensitive than has been assumed.

Obviously, this focus on women is only one example of how slow digital art history and formal art historical social network research can further our understanding of the tapestry world. Indeed, the (still growing) dataset is open to many more questions. This, however, does not mean that the dataset in itself will yield only singular responses. If anything, the case study shows that data visualizations can trigger a suite of possible solutions and questions as well as answers. As a result, slow digital art history and more traditional approaches are *by no means* mutually exclusive. The complaint voiced by Albert Auwercx in 1671, for example, will never be included in the database – for the statement re-



5 Zooming in on Maria and Sara de Smit (1660s – 1670s); Antwerp, Brussels, and Oudenarde actors are in orange, light blue, and dark blue, respectively

veals neither attribution nor relational data on the inhabitants of the tapestry world. Yet it is obvious that the lament is of great importance, as it helps to explain the *meaning* of the pattern and trend emerging from the network visualization, that is, Brussels tapestry producers flocking to Antwerp entrepeneurs.

Finally, the ontology of the database and the case study show the capability of Cornelia and our research methodology to move beyond tapestry studies. In fact, in October 2017, MapTap moves up a gear and transforms into *Coral: The Interplay Between Social Structure, Collaboration and Innovation in Flemish Painting and Tapestry Design (1600 – 1650) Through Formal Art Historical Social Network Research*.[76] As we have developed the database in such a way that it can host attribution and relational data on *all* creative communities and creative industries, the database could establish itself as a relevant tool for the long term, supporting (art) historians zooming in on "the coral reef of culture"[77] and trying to understand how the dynamics of creativity and collaboration depend on a population's ever-changing social tapestry.

* We would like to thank Nils Büttner (Staatliche Akademie der Bildenden Künste Stuttgart), Katlijne Van der Stighelen (University of Leuven), and the anonymous reviewers for their valuable remarks and suggestions.

1 Harald Klinke and Liska Surkemper, Editorial, in: *International Journal for Digital Art History* 1, 2015, 6 – 9, here 6.

2 A full-text search for "digital art history" in JSTOR gives a mere six results (February 2016). Only three of them are proper articles, published in 1997, 1997, and 2012. One is a series of shorter articles grouped under the title *Digital Culture and the Practices of Art and Art History* (published in: *The Art Bulletin* 79, 1997, 187 – 216).

3 For these pioneering scholars and their projects, see schich.info; cultureplex.ca/people/juan-luis-suarez; matthewlincoln.net; learn.bowdoin.edu/fletcher/london-gallery; Pamela Fletcher and Anne Helmreich, Local/Global: Mapping Nineteenth-Century London's Art Market, in: *Nineteenth-Century Art Worldwide. A Journal of Nineteenth-Century Visual Culture* 11, 2012, issue 3, URL: 19thc-artworldwide.org/index.php/autumn12/fletcher-helmreich-mapping-the-london-art-market (all last accessed on 1 February 2016); and Victoria Szabo, Transforming Art History Research with Database Analytics: Visualizing Art Markets, in: *Art Documentation: Journal of the Art Libraries Society of North America* 31, 2012, issue 2, 158 – 175. Recent publications by Hans J. Van Miegroet and Sandra van Ginhoven, as well as the research in progress of H. Coe Smith, all link traditional art historical concerns, quantitative methods, statistical analytical methods, and data visualization. Sandra van Ginhoven, Guilliam Forchondt and the Role of the Greater Netherlands in the Dissemination of Flemish Art in Latin America, in: *De Zeventiende Eeuw* 31, 2015, special issue: In Search of Netherlandish Art: Cultural Transmission and Artistic Exchanges in the Low Countries, ed. by Filip Vermeylen and Karolien De Clippel, 59 – 178, and Hans J. Van Miegroet, New Data Visualizations on the Mechelen Export Industry and Artist Migration Patterns, ibidem, 179 – 190.

4 Diane M. Zorich, Digital Art History: A Community Assessment, in: *Visual Resources* 29, 2013, 14 – 21. The 2011 survey was sponsored by the Samuel H. Kress Foundation in conjunction with the Roy Rosenzweig Center for History and New Media at George Mason University, Fairfax, Virginia.

5 Johanna Drucker, Is There a "Digital" Art History?, in: *Visual Resources* 29, 2013, 5 – 13, here 7, and Thomas W. Gaehtgens, Thoughts on the Digital Future of the Humanities and Art History, in: *Visual Resources* 29, 2013, 22 – 25, here 23.

6 Pamela Fletcher, Reflections on Digital Art History, in: *caa.reviews*, 18 June 2015, URL: caareviews.org/reviews/2726 (date of last access 1 February 2016).

7 Ibidem.

8 We presented core issues of this essay at the international symposium *Digital Art History* organized by Christoph Wagner and Daniel Isemann (Institut für Kunstgeschichte und Lehrstuhl für Medieninformatik, Universität Regensburg), 7 – 9 April 2016.

9 See www.maptap.be (date of last access 1 February 2016). Core members of the team are art historian Koenraad Brosens, art historian Klara Alen, socio-economic historian Astrid Slegten, and Fred Truyen, who holds a PhD in philosophy and leads the Cultural Studies/Digital Media Lab and the Computer Department of the KU Leuven Faculty of Arts. Other KU Leuven members are historian Erik Aerts, art historians Katlijne Van der Stighelen and Guy Delmarcel, and Jan Aerts, who is a bioinformatician specializing in data visualization at the ESAT–STADIUS Centre for Dynamical Systems, Signal Processing and Data Analytics. Sociologist Paul McLean (Rutgers University) and deans Neil De Marchi, an economist who studies art markets, and art historian Hans J. Van Miegroet (both at Duke University) complete MapTap's ranks. Thus, MapTap rubs shoulders with the Duke Art, Law and Markets Initiative (DALMI) led by Hans J. Van Miegroet (www.duke-dalmi.org [date of last access 1 February 2016]).

10 Matthias Bixler, Historical Network Research: Taking Stock, in: *Bulletin of the German Historical Institute London*, Supplement 3, 2015, 43 – 67.

11 Koenraad Brosens, So eine Arbeit wird eigentlich nie fertig. Guy Delmarcel and the Study of Flemish Tapestry, in: idem (ed.), *Flemish Tapestry in European and American Collections. Studies in Honour of Guy Delmarcel*, Turnhout 2003, 9 – 13.

12 Pascal-François Bertrand and Guy Delmarcel, L'histoire de la tapisserie, 1500 – 1700. Trente-cinq ans de recherche, in: *Perspective. La revue de l'INHA* 2, 2008, 227 – 250.

13 Koenraad Brosens, Tapestry. Luxurious Art, Collaborative Industry, in: Babette Bohn and James M. Saslow (eds.), *The Blackwell Companion to Renaissance and Baroque Art,* Oxford 2013, 296 – 298; Koenraad Brosens, Quality, Risk and Uncertainty and the Market for Brussels Tapestry, 1450 – 1750, in: Neil De Marchi and Sophie Raux (eds.), *Moving Pictures. Intra-European Trade in Images, 16th – 18th Centuries,* Turnhout 2014, 19 – 36.

14 Howard S. Becker, *Art Worlds*, Berkeley 1982.

15 Michael Baxandall, *Painting and Experience in Fifteenth-Century Italy: A Primer in the Social History of Pictorial Style*, Oxford 1972; Svetlana Alpers, *Rembrandt's Enterprise: The Studio and the Market*, Chicago 1988; John M. Montias, *Vermeer and His*

Milieu: A Web of Social History, Princeton 1989. For an overview of related studies up to 1990, see idem, Socio-Economic Aspects of Netherlandish Art from the Fifteenth to the Seventeenth Century: A Survey, in: *The Art Bulletin* 72, 1990, 358 – 373. De Marchi and Van Miegroet co-wrote and co-edited numerous books and essays where many bibliographic leads to related studies will be found; e.g., Neil De Marchi and Hans J. Van Miegroet, History of Art Markets, in: Victor Ginsburgh and David Thorsby (eds.), *Handbook on the Economics of Art and Culture*, vol. 1, Amsterdam/London/Tokyo 2006, 69 – 122; Neil De Marchi and Hans J. Van Miegroet (eds.), *Mapping Markets for Paintings in Europe, 1450 – 1750,* Turnhout 2006; De Marchi and Raux 2014 (as note 13).

16 Becker 1982 (as note 14), 35.

17 Koenraad Brosens, Nouvelles données sur l'Histoire de Cléopâtre de Poerson. Le réseau Parent et la tapisserie bruxelloise à la française, in: *Revue belge d'Archéologie et d'Histoire de l'Art* 74, 2005, 63 – 77; idem, Revisiting Brussels Tapestry, 1700 – 1740. New Data on tapissiers Albert Auwercx and Judocus de Vos, in: *Textile History* 43, 2012, 183 – 199; idem, Can Tapestry Research Benefit from Economic Sociology and Social Network Analysis?, in: idem, Katlijne Van der Stighelen, and Leen Kelchtermans (eds.), *Family Ties. Art Production and Kinship Patterns in the Early Modern Low Countries*, Turnhout 2012, 43 – 51; Brosens 2014 (as note 13).

18 Peter Mathias, Strategies for Reducing Risk by Entrepreneurs in the Early Modern Period, in: Clé Lesger and Leo Noordegraaf (eds.), *Entrepreneurs and Entrepreneurship in Early Modern Times: Merchants and Industrialists within the Orbit of the Dutch Staple Market*, The Hague 1995, 5 – 24.

19 Claire Lemercier, Formal Network Methods in History: Why and how?, in: *HAL archive ouvertes*, 2011, URL: hal.archives-ouvertes.fr/halshs-00521527/document (date of last access 1 February 2016); Marten Düring and Ulrich Eumann, Historische Netzwerkforschung: Ein neuer Ansatz in den Geschichtswissenschaften, in: *Geschichte und Gesellschaft* 39, 2013, 369 – 390; Markus Gramper, Linda Reschke, and Marten Düring, Das Millenium der Netzwerkforschung? Die Bedeutung eines relationalen Paradigmas in der internationalen und deutschen Wissenschaft, in: idem (eds.), *Knoten und Kanten III. Soziale Netzwerkanalyse in Geschichts- und Politikforschung,* Bielefeld 2015, 7 – 15; Bixler 2015 (as note 10); Claire Lemercier, Taking Time Seriously. How to Deal with Change in Historical Networks?, in: Gramper, Reschke, and Düring 2015 (as above), 183 – 211; Martin Grandjean, Introduction à la visualisation de données: l'analyse de réseau en histoire, in: *Geschichte und Informatik* 18/19, 2015, 109 – 128; Marten Düring, Ulrich Eumann, Martin Stark, and Linda von Keyserlingk (eds.), *Handbuch Historische Netzwerkforschung. Grundlagen und Anwendungen*, Berlin 2016. For a quick introduction to the field, see martenduering.com and historicalnetworkresearch.org (all last accessed on 1 February 2016).

20 Stanley Wasserman and Katherine Faust, *Social Network Analysis: Methods and Applications*, Cambridge 1994; David Knoke and Song Yang, *Social Network Analysis*, Los Angeles/London/New Delhi/Singapore 2008.

21 These include but are not limited to Darrett B. Rutman and Anita H. Rutman, *A Place in Time: Middlesex County, Virginia, 1650 – 1750*, New York 1984; Naomi Rosenthal et al., Social Movements and Network Analysis: A Case Study of Nineteenth-Century Women's Reform in New York State, in: *The American Journal of Sociology* 90, 1985, 1022 – 1054; Peter S. Bearman, *Relations into Rhetorics: Local Elite Social Structure in Norfolk, England, 1540 – 1640*, New Brunswick, NJ, 1993; John F. Padgett and Christopher K. Ansell, Robust Action and the Rise of the Medici, 1400 – 1434, in: *The American Journal of Sociology* 98, 1993, 1259 – 1319; Charles Wetherell, Andrejs Plakans, and Berry Wellman, Social Networks, Kinship, and Community in Eastern Europe, in: *The Journal of Interdisciplinary History* 24, 1994, 639 – 663; John F. Padgett and Paul McLean, Obligation, Risk, and Opportunity in the Renaissance Economy: Beyond Social Embeddedness to Network Co-Constitution, in: Frank Dobbin (ed.), *The Sociology of the Economy*, New York 2004, 193 – 222; Paul McLean, *The Art of the Network: Strategic Interaction and Patronage in Renaissance Florence*, Durham 2007; Sheryllynne Haggerty and John Haggerty, Visual Analytics of an Eighteenth-Century Business Network, in: *Enterprise & Society* 11, 2010, 1 – 25.

22 Bixler 2015 (as note 10), 67.

23 Lemercier 2015 (as note 19), 184 and 206; Bixler 2015 (as note 10), 45 and 66 – 67.

24 *Ecartico* is a database supported by the Amsterdam Centre for the Study of the Golden Age (University of Amsterdam) that has been online since December 2011; URL: vondel.humanities.uva.nl/ecartico (date of last access 1 February 2016). While it aims to be "a 'social medium' for the cultural industries of the Dutch and Flemish Golden Ages," it is predominantly, if not exclusively, used as a handy wiki-esque retrieval tool.

25 Lemercier 2011 (as note 19). In this essay, Lemercier criticizes historical network studies that appear to be multidisciplinary yet rest on a rather thin methodological base. Many "researchers in various sciences and social sciences," Lemercier argues, joined "'network studies' with no knowledge of – or interest in – the sociological and anthropological theories, methods and software developed on this topic during the last 35 years."

26 Bixler 2015 (as note 10), 54.
27 Mark S. Granovetter, The Strength of Weak Ties, in: *American Journal of Sociology* 78, 1973, 1360 – 1380; idem, Economic Action and Social Structure: The Problem of Embeddedness, in: *American Journal of Sociology* 91, 1985, 481 – 510.
28 See, for example, Brosens 2005 (as note 17) and Martine Vanwelden, Netwerken en flexibiliteit: de rol van de familie van Verren in de Oudenaardse tapijtweverij, in: *Handelingen van de Geschied- en Oudheidkundige Kring van Oudenaarde, van zijn Kastelnij en van den Lande tusschen Maercke en Ronne* 53, 2016, 7 – 41.
29 See, for example, Koenraad Brosens, *A Contextual Study of Brussels Tapestry, 1670 – 1770: The Dye Works and Tapestry Workshop of Urbanus Leyniers (1674 – 1747)*, Brussels 2004, 368.
30 Lemercier 2011 (as note 19).
31 See, for example, Brosens 2004 (as note 29).
32 See, for example, Jeremy Howarth, The Steenwyck Paintings, Products of Family Enterprise, in: Brosens, Van der Stighelen, and Kelchtermans 2012 (as note 17), 145 – 158.
33 Laurel Smith-Doerr and Walter W. Powell, Network and Economic Life, in: Neil J. Smelser and Richard Swedberg (eds.), *The Handbook of Economic Sociology*, Princeton/Oxford/New York 2005, 391.
34 Bixler 2015 (as note 10), 51 and 57.
35 Brosens 2004 (as note 29), 368, for example, shows Brussels *tapissiers* Gerard van der Strecken and Nicolaas Moncornet very close to each other, but so far there is no data showing that they had an operative relationship.
36 Brosens 2004 (as note 29), 368, for example, does not show the close business and personal ties that connected Urbanus Leyniers and Hendrik II Reydams. Likewise, Ecartico's "three step network of all documented relations" of Peter Paul Rubens (vondel.humanities.uva.nl/ecartico/networks/index.php?ego=6423&types=all&level=3 [date of last access 1 February 2016]) puts Rubens's close friend and collaborator Jan Brueghel not close to Rubens. For Rubens and Brueghel, see Anne T. Woollett, Two Celebrated Painters: The Collaborative Ventures of Rubens and Brueghel, ca. 1598 – 1625, in: *Rubens & Brueghel: A Working Friendship* (exh. cat. Los Angeles, J. Paul Getty Museum), ed. by Anne T. Woolett, Los Angeles et al. 2006, 1 – 42.
37 This is what makes Ecartico's networks and networks included in publications such as Brosens 2004 (as note 29) and Brosens, Van der Stighelen, and Kelchtermans 2012 (as note 17) often problematic to use.
38 Lemercier 2015 (as note 19), 183 – 211.
39 Lemercier 2011 (as note 19).
40 Joost Vander Auwera, Over het blijvend nut van archivalisch onderzoek voor de kunstgeschiedenis. Drie beknopte gevalstudies, in: *Liber Memorialis Erik Duverger. Bijdragen tot de Kunstgeschiedenis van de Nederlanden,* ed. by Henri Pauwels, André Van den Kerkhove, and Leo Wuyts, Wetteren 2006, 531 – 533.
41 It is not short for anything. We simply find the name beautiful. In 2015 we presented Cornelia (and MapTap) at various conferences: Koenraad Brosens, "Industrial Atmosphere." The Organization and Dynamics of the Brussels Tapestry Industry, held at: *Grand Design: Pieter Coecke van Aelst and Renaissance Tapestry: An International Symposium* (New York, The Metropolitan Museum of Art, 10 – 11 January 2015); idem, Klara Alen, Astrid Slegten, and Frederik Truyen, Big Data, Artistic Production and Social Structure: Or How Can We Use Data Visualization and Network Analysis to Study Early Modern Creative Communities?, evening lecture at: *5th Bern Research Camp for the Applied Arts* (University of Bern, 28 – 30 May 2015); idem, Visualizing Complex and Dynamic Networks of Antwerp and Brussels Tapestry Entrepreneurs (1640 – 1720), held at: *Arts, Humanities and Complex Networks. 6th Leonardo Satellite Symposium* (Zaragoza, NetSci2015, 1 – 5 March 2015); idem, Cornelia Loves Data: A Networked Approach to Early Modern Flemish Tapestry and Creative Communities, held at: *Methodik zwischen Theorie und Praxis* (University of Bonn, Arbeitskreis Niederländische Kunst- und Kulturgeschichte, 2 – 4 October 2015). We also presented a poster at *Blue Skies Above, Solid Ground Below* (London, King's College, 18 June 2015) and the *XXXV Sunbelt Conference of the International Network for Social Network Analysis* (Brighton, 23 – 28 June 2015).
42 Mostly kept at the Antwerp City Archives (Felixarchief), the Brussels City Archives, and the State Archives of Belgium in Brussels.
43 As a rule, one record or entry lists the names of the baby, mother, father, godmother, and godfather.
44 This and other network visualizations were made in Gephi 0.9.1. For a quick introduction, see Mathieu Bastian, Sebastien Heymann, and Mathieu Jacomy, Gephi: An Open Source Software for Exploring and Manipulating Networks, in: *International AAAI Conference on Weblogs and Social Media*, 2009, URL: gephi.org/publications/gephi-bastian-feb09.pdf (date of last access 1 February 2016).
45 See, for example, Katlijne Van der Stighelen, Ravissant of astrant, feminien of 'onvraulic'? Vrouwelijke kunstenaars in de Zuidelijke Nederlanden tussen 1500 – 1800, in: *Elck zijn waerom. Vrouwelijke kunstenaars in België en Nederland 1500 – 1950* (exh. cat. Antwerp, Koninklijk Museum voor Schone Kunsten and Arnhem, Museum voor Moderne Kunst), ed. by Katlijne Van der Stighelen and Mir-

jam Westen, Ghent 1999, 27 – 41; Sheilagh Ogilvie, Women and Labour Markets in Early Modern Germany, in: *Jahrbuch für Wirtschaftsgeschichte/Economic History Yearbook* 45, 2004, 25 – 60; Ariadne Schmidt, Vrouwenarbeid in de vroegmoderne tijd in Nederland, in: *Tijdschrift voor sociale en economische geschiedenis* 2, 2005, 2 – 21; idem and Elise van Nederveen Meerkerk, Reconsidering the "First Male-Breadwinner Economy": Women's Labor Force Participation in the Netherlands, 1600 – 1900, in: *Feminist Economics* 118, 2012, 69 – 96; Anne Montenach and Deborah Simonton (eds.), *Female Agency in the Urban Economy: Gender in European Towns, 1640 – 1830*, New York 2013; Klara Alen, Envy and Pride: Maria Faydherbe (Mechelen, 1587 – after 1633), a Woman Sculptor in a Man's World, in: Hannelore Magnus and Katlijne Van der Stighelen (eds.), *Facts & Feelings. Retracing Emotions of Artists, 1600 – 1800*, Turnhout 2015, 77 – 99. On 24 – 25 April 2015, the University of Antwerp and the University of North Carolina at Charlotte organized the international symposium *Considering Women in the Early Modern Low Countries*, which addressed issues such as gender in the legal system and women's work and economic roles (clas-pages.uncc.edu/consideringwomen). See also the *Digitaal Vrouwenlexicon van Nederland*, URL: resources.huygens.knaw.nl/vrouwenlexicon (both last accessed on 1 February 2016).

46 Realizing that the dataset included a mere six percent women, in January 2016 *Six Degrees of Francis Bacon* (a digital reconstruction of the social network of early modern Britain, URL: sixdegreesoffrancisbacon.com [date of last access 1 February 2016]) organized an "add-a-thon" to raise the number of female actors.

47 One of the few essays zooming in on this issue is Leen Kelchtermans, Portret van een zeventiende-eeuwse schildersvrouw: Anna Schut, huisvrouw en weduwe van Peter Snayers, in: *Oud Holland* 126, 2013, 178 – 197.

48 Arguably the most "famous" widow-*tapissier* is Catharina van den Eynde, widow of Jacques Geubels; Nora De Poorter, Over de weduwe Geubels en de datering van Jordaens' tapijtenreeks *De taferelen uit het landleven,* in: *Gentse bijdragen tot de kunstgeschiedenis* 25, 1979 – 1980, 208 – 224, and Erik Duverger, Enkele archivalische gegevens over Catharina van den Eynde en over haar zoon Jacques II Geubels, tapissiers te Brussel, in: *Gentse bijdragen tot de kunstgeschiedenis* 26, 1981 – 1984, 161 – 193; Koenraad Brosens and Veerle De Laet, Matthijs Roelandts, Joris Leemans and Lanceloot Lefebure: New Data on Baroque Tapestry in Brussels, in: *The Burlington Magazine* 151, 2009, 360 – 367, shed some light on Elisabeth Seghers, widow of Joris Leemans.

49 There are two exceptions proving the rule. Jozef Duverger, De Brusselse tapijtwever Guilliam van de Vijvere (ca. 1580 – 1652) en zijn atelier, in: *Artes Textiles* 7, 1971, 103 – 104, published two tapestries signed by "the widow of Guilliam van de Vijver," whom Cornelia now identifies as Anna de Backere. In his eagerly awaited *Lexicon of Marks and Signatures on Flemish Tapestries*, Guy Delmarcel includes an edition of the *Genesis* series cosigned by Jan Aerts and "the widow Francx," whom Cornelia now identifies as Judith Geubels.

50 For the legal status of women in urban economies and the traces they left in the archives, see Laura Van Aert, Tussen norm en praktijk, Een terreinverkenning over het juridische statuut van vrouwen in het zestiende-eeuwse Antwerpen, in: *Tijdschrift voor Sociale en Economische Geschiedenis* 2, 2005, 22 – 42; Danielle van den Heuvel and Elise van Nederveen Meerkerk, Introduction: Partners in Business? Spousal Cooperation in Trades in Early Modern England and the Dutch Republic, in: *Continuity and Change* 23, 2008, 209 – 216; Kim Overlaet, "Ghehouden ende gheacht voor een coopwijf" in Antwerpen rond 1600: een vloek of zegen voor Antwerpse handelsvrouwen en hun handelspartners?, in: *Historica Amsterdam* 2, 2011, 16 – 21.

51 See, for example, Brussels, *Algemeen Rijksarchief*, Notariaat Generaal van Brabant 4428 (23 October 1640). Prior to 1644, Leemans signed documents with "ILM"; afterwards, he wrote his name in full.

52 Antwerp, *Stadsarchief*, Insolvente Boedelskamer 1244 (12 January 1699) and 1218 (24 January 1699).

53 Antwerp, *Stadsarchief*, Notariaat 160 (3 July 1685).

54 Antwerp, *Stadsarchief*, Notariaat 159 (26 March 1682). Thus, she played the leading role in the business correspondence with Antwerp *coopman-tapissier* Cornelis de Wael; see Antwerp, *Stadsarchief, Insolvente Boedelskamer* 724 (*Rekeningenboek Cornelis de Wael, 1682 – 1685*). For De Wael, see Erik Duverger, *Documenten betreffende de Antwerpse tapijthandelaar Cornelis de Wael, erfgenaam van de firma Wauters*, Brussels 2008.

55 Brussels, *Algemeen Rijksarchief*, Notariaat Generaal van Brabant 2485 (1) (14 April 1646) and 1885 (1) (15 February 1647).

56 Antwerp, *Stadsarchief*, Notariaat 2824 (3 July 1691).

57 Antwerp, *Stadsarchief*, Notariaat 860 (22 April 1713).

58 Brussels, *Algemeen Rijksarchief*, Notariaat Generaal van Brabant 1077 (9 August 1720) and 4236 (8 February 1724).

59 Scott Weingart and Jessica Otis, Gender Inclusivity in Six Degrees, in: *Six Degrees of Francis Bacon, reassembling the early modern social network of Francis Bacon*, 5 January 2016, URL: 6dfb.tumblr.com/tagged/gender (date of last access 1 February 2016).

60 Brussels, *Stadsarchief*, Parochieregisters 390 (28 May 1654). For Auwercx, see Brosens 2012 (as note 17), 183 – 199.
61 Ibidem, 185 – 187, 187.
62 Brussels, *Algemeen Rijksarchief*, Notariaat Generaal van Brabant 4423 (11 May 1639), 4427 (27 August 1647), and 1266 (2) (18 January 1670).
63 Brussels, *Stadsarchief*, Parochieregisters 390 (4 May 1658). Magdalena Peeterens was the daughter of Johannes Peeterens and Catharina van den Bossche.
64 Brussels, *Stadsarchief*, Parochieregisters 390 (31 January 1654).
65 Brussels, *Stadsarchief*, Parochieregisters 391 (29 June 1662). Johanna Carola Bransoen was the daughter of Willem Bransoen and Anna van den Bossche.
66 Brussels, *Stadsarchief*, Parochieregisters 338 (6 April 1632).
67 Of these women, only Maria Anna Wauters (1654 – prior to 1719) has received some scholarly attention; Jan Denucé, *Antwerpsche tapijtkunst en handel*, Antwerp 1936; Erik Duverger, Antwerpse tapijtkunst en tapijthandel, in: *Antwerpse wandtapijten* (exh. cat. Deurne, Zilvermuseum Sterckshof), ed. by Anne-Marie Peré, Erik Duverger, and Jan Walgrave, Deurne 1973, 17 – 40, here 31; Guy Delmarcel, *Het Vlaamse wandtapijt,* Tielt 1999, 258 – 259; Duverger 2008 (as note 54).
68 Koenraad Brosens, *European Tapestries in the Art Institute of Chicago*, Chicago/New Haven/London 2008, 166 – 173, with contributions by Pascal-François Bertrand, Charissa Bremer-David, Elizabeth Cleland, Nello Forti Grazzini, and Christa C. Mayer Thurman.
69 Ronald S. Burt, *Structural Holes: The Social Structure of Competition*, Cambridge 1995.
70 Martine Vanwelden, *Productie van wandtapijten in de regio Oudenaarde. Een symbiose tussen stad en platteland (15de tot 17de eeuw),* Leuven 2006, 325 ("de Smet"); Brosens 2004 (as note 29), 69 and 325; Klara Alen, Zooming In and Out on the Antwerp *coopman-tapissier* Nicolaas Naulaerts (1654 – 1703). The Complexities of Archival Research on Late Seventeenth-Century Antwerp Tapestry Production and Trade, in: Koenraad Brosens, Klara Alen, and Astrid Slegten (eds.), *Engineering Flemish and French Tapestry in the Seventeenth and Eighteenth Centuries*, Brepols 2016 (forthcoming); Klara Alen, *Vertrouwen en kwaliteit in de Antwerpse wandtapijtproductie en -handel, 1660 – 1720*, unpublished PhD dissertation, Katholieke Universiteit Leuven [2017]; and Astrid Slegten, *Reputatie & Innovatie. Samenwerkingsnetwerken tussen Brusselse wandtapijtproducenten 1640 – 1720*, unpublished PhD dissertation, Katholieke Universiteit Leuven [2017].
71 Antwerp, *Stadsarchief*, Parochieregisters 144 (10 July 1684).
72 Brussels, *Stadsarchief*, Parochieregisters 348 (3 September 1671), 183 (19 September 1673), and 255 (19 December 1673).
73 Oudenaarde, *Stadsarchief*, Parochieregisters 373 (7 July 1676) and 373 (20 December 1677).
74 Brussels, *Stadsarchief*, Register der Tresorije 1300, fol. 202r. Quoted by Brosens 2004 (as note 29), 23. For Brussels tapestry in the 1660s and 1670s, see Koenraad Brosens, Charles Le Brun's Meleager and Atalanta and Brussels Tapestry c. 1675, in: *Studies in the Decorative Arts* 11, 2003 – 2004, 5 – 37; Brosens 2005 (as note 17), 63 – 77; idem, Bruxelles/Paris/Bruxelles. Charles de La Fontaine et la diffusion des modèles des tapisseries de Charles Poerson à Bruxelles, 1650 – 1675, in: *Revue belge d'Archéologie et d'Histoire de l'Art* 76, 2007, 43 – 60.
75 For a more elaborate discussion, see the forthcoming dissertations by Klara Alen and Astrid Slegten (as note 70).
76 *Coral* will be developed by two PhD students and one IT engineer (2017 – 2021).
77 Ernst H. Gombrich, *The Sense of Order: A Study in the Psychology of Decorative Art,* Ithaca 1979, 209.

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