

ARTICLE

How Network Analysis Uncovers International Networks of Smuggling History: Criminals in Nagasaki, Japan circa 1667

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This paper takes a network analytic approach to investigating crime in seventeenth-century Japan. In 1667, the Nagasaki magistrate's office conducted the largest documented smuggling crackdown in Tokugawa Japan (1603–1867), busting a ring of 87 arms traffickers who had been shipping contraband to Chosŏn Korea (1392–1910). I use the office's "criminal investigation records" (*hankachō* 犯科帳) to build a dataset of the 94 suspects from ten Japanese towns who were interrogated about their involvement at the time. Using a three-mode network (people, place, crime), the resulting graphs and statistics reveal a new geography of the crime in question: contrary to the conclusions of the original investigators and of modern-day historians who "closely read" their records, the digital analysis relocates the epicenter of the smuggling ring to be in Tsushima, not Hakata or Nagasaki, and its ringleader as a merchant named Komoda Kanzaemon, rather than Itō Kozaemon. Though various limitations are recognized, the case study demonstrates the utility of network analysis on early modern crime data in general and for archives built with criminal-investigative intent like the *hankachō* in particular.

Introduction

Since the early 2000s, a "network turn" has been underway in the humanities (Ahnert et al.). As argued by its proponents, the analysis of social and semantic networks has now expanded beyond the domain of network scientists to grasp the attention of an increasing number of arts and humanities scholars. To be sure, the recent interest relates to the "connected" world we live in, defined in part by online social networking platforms. But the notion of networks runs deeper, tracing back at least to eighteenth-century graph theory, for example (i.e., Leonhard Euler's Seven Bridges of Königsberg problem) (Euler 6670; Rätz). And it has long resonated with modern-day humanists who have studied *inter alia* political cliques, information flows, and the circulations of objects, ideas, and people. If "network scholarship" has existed in many forms, however, the recent turn is about a quantitative (or computational) shift in the study and critique of networks. Today, with off-the-shelf softwares like Gephi and Palladio, researchers can produce network graphs that bring "an immediacy to our perception of information" (Ahnert et al. 68). These graphs also offer various epistemic media for data exploration, "from sketch drawings that help us build intuitions about connectivity, to descriptive data visualisation, to visual arguments in a final publication" (Ahnert et al. 68).

This emergence of the modern “network perspective” is winning acceptance (Barabási).¹ But how useful is it for humanistic inquiry? Proponents of network scholarship, notably, Ruth Ahnert, Sebastian Ahnert, Chaterine Coleman, Scott Weingart, Jason Ladd, and others, are subtle: they recognize the challenges of producing significant research outcomes with network analysis tools. Indeed, networks, like all data models, entail a great deal of abstraction and “information loss”—e.g., of literary, paratextual, and historical contexts (Ahnert et al. 79). Other than being reductive, the representations can also be “absurdly illegible (in terms of visual complexity),” in comparison to other more intuitive media such as frequency charts and heat maps (Ahnert et al. 68). Finally, network analyses through off-the-shelf tools come with certain dangers: users can feed data into a “black box” and draw misleading insights without critically engaging with the underlying assumptions (Ahnert et al. 64–70).²

Yet, various consequential case studies have already been advanced. The Six Degrees of Francis Bacon project, for example, presents the British social network, allowing researchers to trace connections among figures such as Francis Bacon, Shakespeare, Isaac Newton, and 13,000 other early modern individuals (Warren et al.). John R. Ladd has likewise demonstrated the early modern book trade in Europe, using book dedications as a source base (Ladd). And various others, including Ruth Ahnert, Sebastian Ahnert, Evan Bourke, and Song Chen, have shown effective analyses of historical social networks, emphasizing letter networks, biographies, and literary collections (Ahnert and Ahnert, “Protestant Letter Networks in the Reign of Mary I: A Quantitative Approach”; Ahnert and Ahnert, “Metadata, Surveillance and the Tudor State”; Bourke; Chen).

I contribute criminal networks to this growing field of historical network analytics. Network scholars from artists to data scientists have demonstrated the utility of analyzing criminal networks. The Ahnerts and their collaborators, for instance, open their book *The Network Turn* with the example of the 9/11 terror attack and how an American artist accurately captured—with his web-like diagrams—the financial network behind Osama bin Laden and the al-Qaeda. Valdis Krebs, moreover, has shown that even a small sample of public information and newspaper clippings could be analyzed to locate “all nineteen of the hijackers [of the 9/11 attack who] were within two email or phone call connections of two al-Qaeda members already known” (Ahnert et al. 3; Krebs).

1 Its proponent Albert-László Barabási, for example, has famously argued how a network approach can advance our understanding of crises, from epidemics and terrorism to economic and environmental catastrophes.

2 Aspiring practitioners, then, are encouraged to put these tools through a rigorous test and understand their potential utility: researchers may study the assumptions that are encoded into these network graphing tools; they may also experiment with different registers of abstraction; and they may discover different kinds of usefulness, by obtaining preliminary graphs for exploratory data analysis, refining results with customized algorithms, and identifying new areas and opportunities for close reading.

Yet, if recent terrorist activity was a “key driver of the network turn,” as some argue, organized crime has been with us since time immemorial (Ahnert et al. 3). Before the rise of modern network science, inquiries into the nature of interpersonal connections were conducted, especially by states, bureaucrats, merchants, and importantly for us, criminal investigators. And despite not enjoying the availability of digital information nowadays, investigators of the past, too, investigated, exposed criminals, and meted out punishment.

But how did they investigate, we may ask? And what might be learned by interrogating their “network perspectives,” if any, with modern, digital tools? Recently, the Ahnerts have begun to answer these questions: they examined the surveillance practices of historical governments, especially how the Tudor state might have predicted individuals likely to “trade in intelligence as either conspirators or double agents.” (Ahnert and Ahnert, “Protestant Letter Networks in the Reign of Mary I: A Quantitative Approach” 11). The present paper, however, contributes new research by analyzing criminal networks more squarely and with the archives produced by criminal investigators themselves (as opposed to, say, the State Papers, of which criminal activity is a small part). It also offers a context that is little known to the field of historical network analytics—maritime East Asia in the seventeenth century.

In 1667, an extensive smuggling enterprise came under the scrutiny of the Nagasaki magistrate’s office. They confronted an international criminal organization which had developed between Chosŏn Korea (1392–1910) and the Tokugawa shogunate (1603–1868) between 1621 and 1667, an organization which trafficked military contraband from Japan into Korea, including but not limited to guns, swords, and ingredients of gunpowder such as saltpeter and sulfur. While busting this organization, the Japanese detectives then performed the largest documented smuggling investigation in the history of early modern Japan: they probed 94 suspects, executed 87 (and their family members), and confiscated the latter’s significant assets into the state treasury (Kazui Tashiro 田代和生; Arano Yasunori 荒野泰典; Yamawaki Teiji 山脇悌二郎; Takeno Yōko 武野要子; Maruyama Yasunari 丸山雍成; Miyake Hidetoshi 三宅英利.; Mori Katsumi 森克己; Yun Yusuk 윤유숙; Knoest). The extensive administrative effort also left behind the *hankachō* (犯科帳 “criminal investigation records,” 1666–1867), which contain essential biographical data on the criminals such as name, age, address, and participation in crime (Morinaga Taneo 森永種夫. 5; Cullen).

Building a small dataset from this *hankachō*, I explore, if you will, a “minimum viable product” of historical criminal network studies (Diminescu 451–58; Bastian et al. 361–62). Namely, using Gephi, this paper advances a two-part argument that recognizes both the possibilities and limitations of said analysis. First, it argues that when pulling from a single, centralized repository of information (such as criminal records kept by a single office), network analytics

can reliably test both the historical “network perspectives” of the Nagasaki investigators as well as the conclusions of modern-day literature on the subject (e.g., who were the main culprits, where were they located?).

In fact, we shall see that the use of digital tools dramatically shifts our perception of the criminal network, generating compelling results that challenge existing scholarship. Yet, as useful as it may be, the method is limited for modeling international crime in the early modern period, which necessarily crosses borders and concerns highly uneven archives (each recorded according to different conventions and intentions). The question thus arises as to the general utility of historical network analysis in the scarcity of well-curated archives like the *hankachō* (in a sense, “ready-made” for network analysis), and the resulting abundance of compromises that need to be made for the historians themselves to mine and build a comparable dataset.

Arms Smuggling on the Korea Strait

The beginning of Japanese arms smuggling goes back to 1621. That year, when a Dutch official Jan Pieterszoon Coen invaded and subdued the Banda Islands (part of the Moluccas), he employed to great effect two small contingents of Japanese mercenaries. These recruits were valued for their martial skill, partaking in most major campaigns by the Dutch East Indies Company (VOC). But as efficacious as they were, the Japanese fighters were cruel, executing local elders by hacking them through the middle, decapitating, and quartering. And their notoriety deeply concerned the shogunate, which went on to ban all military exports—mercenaries and weapons alike (Clulow 205).

Yet, just as Coen continued to insist on mercenary trade despite the shogun’s ban, other buyers were likewise eager to import Japanese military contraband: Chosŏn Koreans (1392–1910). When the shogunate issued the prohibition in 1621, it prevented the Koreans from purchasing Japanese arms such as guns, sulfur, and swords at the Japan House, an entrepot on the southeastern tip of the Korean peninsula. Combined with domestic shortages and wars, however, this then prompted the Chosŏn court to circumvent the shogunate’s prohibition. Ensuing was an international smuggling network which emerged from royal directives: Korean kings and officials commissioned arms dealing through formal diplomatic channels such as embassies to Japan and the daimyos of Tsushima (official brokers of Japan-Korea relations); and responding to their call were also various on-the-ground agents (military officers, merchants, and mariners from Korea and Japan) who trafficked contraband behind the shogunate’s back, and eventually the Tsushima daimyo’s (Yun Yusuk 윤유숙 292–315).

This smuggling enterprise has not gone unexamined in scholarship. But most historians have not understood it as a “network,” except for Jurre Knoest. While advancing an argument about the informal nature of said enterprise, especially from the Japanese perspective, Knoest contended that the smugglers formed a “self-organized network”—i.e., a network “not primarily embedded

in governmental institutionalization” (Knoest 91). To be sure, the Korean data shows that the smugglers were far from “self-organized”: they were in fact sanctioned by the Korean court and orchestrated by its diplomats, interpreters, and merchants. Still, the network perspective is useful to describe the criminal organization which spanned the Korean-Japanese border and included both formal and informal actors of various kinds (Yun Yusuk 윤유숙 292–315).

If the smuggling ring was a relatively complex network, consisting of different layers of transparency, formality, and stability, the Nagasaki investigation can be seen as an attempt at “analyzing” said network. Operating far from the main scenes of arms-dealing, and through a questionable liaison that is the Tsushima daimyo, the shogunate had many odds stacked against its success. First, because smuggling networks ran across domains, the trans-regionality of the problem posed administrative challenges for local authorities with limited jurisdictions. Second, the shogunate also led this “centralized” criminal investigation in the periphery, installing yet another (albeit trusted and time-tested) liaison that is the Nagasaki magistrate’s office. Lastly, due to years of accrued transactions, which trace back to 1607, arms trade and trafficking had already been deeply entrenched, and the Koreans refused to turn over their accomplices, understandably, because that would implicate their high officials and even royalty.

These obstacles combined to pose a Hydra-like problem for the shogunate, where cutting off one head sprouted two more in its place: there were previous crackdowns (e.g., in 1655, which involved 21 executions), but smuggling seemed to only grow worse (Yun Yusuk 윤유숙 295–99; Kuksa p’yŏnch’an wiwŏnhoe, *Pibyŏnsa Tŭngnok* 1656/3/6). How then did the Nagasaki investigators manage?

Remarkably, after 1667, large-scale arms smuggling disappeared from both Korean and Japanese records. Many factors contributed to this, including for example, Korea’s import substitution of Japanese contraband as well as the start of collaborative Chosŏn-Tokugawa efforts at prohibiting smuggling (e.g., transfer of the Japan House, tightening of regulations). But the Nagasaki investigators performed an efficacious crackdown. They gathered up to 94 suspects from ten Japanese towns in three different domains, tracing back the criminal network as far as they could. After finding 87 individuals guilty, and uncovering their past involvement over six years, the shogunate also put on a gory display as a warning against future criminals (Kazui Tashiro 田代和生; Arano Yasunori 荒野泰典; Yamawaki Tejiro 山脇悌二郎; Takeno Yōko 武野要子; Maruyama Yasunari 丸山雍成; Miyake Hidetoshi 三宅英利.; Mori Katsumi 森克己; Yun Yusuk 윤유숙; Knoest; Kang).

This raises the question whether the Japanese navigators possessed a “network perspective” of their own, one which allowed them to grasp, namely, the overall “embeddedness” of smugglers in their broader networks and identify “structurally central” agents who provided seed money and brokerage.

Unfortunately, we do not know what epistemic tools (e.g., charts, diagrams, tables) were under their employ. Alas, other than tactics such as cross-interrogation and the collection of “confessions” (*yōita* 白状) which rattled out collaborators, the various ledgers, notes, and criminal evidence that may have bene found are now lost (Arano Yasunori 荒野泰典 412–13). We do have, however, the aforementioned *hankachō*, which includes biographical data on the criminals including their name, social status, age, address, and participation in crime. Also at the disposal of historians is the conclusion that the Nagasaki investigators reached with this information at their fingertips—i.e., that one man named Itō Kozaemon was the “root” (*chōhon* 張本) of the smuggling network (Arano Yasunori 荒野泰典 412).

Taken together, these can help formulate a targeted inquiry about the Nagasaki investigation. If the *hankachō* preserves the essential metadata of criminals which the Japanese authorities used, then the same data can be processed using digital analytic tools for a comparison. That comparison should generate insights for evaluating the nature of the seventeenth-century “network analysts.” It should moreover serve to test modern scholarship on the subject, based on close reading of the investigation records.

From Hankachō to Gephi, Metadata to Network Analysis

It has been shown that even small sets of metadata can be useful for historical network analysis. In “Using Metadata to Find Paul Revere,” for example, sociologist Kieran Healy presents a case study that is comparable to the one proposed here. Drawing on historian David Hackett Fischer’s meticulous study, Healy sets out to identify key individuals in Boston on the brink of the American Revolutionary War (1775–1783). He analyzed about 260 “suspects” and their varying membership in Boston’s seven different organizations (e.g., North Caucus, the London Enemies List). The resulting dataset is small, to be sure, constituting “the merest sliver of metadata about a single modality of relationship between people.” Yet, the resulting analysis still located Paul Revere with little difficulty: Mr. Revere, the equestrian patriot, was a member of many organizations, and he occupied a structurally central position within the broad community of suspects (Healy; Fischer; Shin-Kap).³

I will use a similar dataset to find the ringleaders of the Korean-Japanese smuggling network. Compared to Healy’s, the haystack of suspects from the *hankachō* is even smaller, including only a set of 94 unique individuals from ten Japanese towns ([Table 1](#)). The metadata, however, is “thicker”: because it contains different kinds of information—and not just organization membership, one can set up a multi-modal network. For example, other than the modalities of person and crime, I added that of “place” to reflect the particular attention paid by Japanese investigators to the geographical

3 Healy’s work is based on the research of historian David Hackett Fischer. For a similar yet more detailed study using Fischer’s data, see Shin-Kap.

Table 1. Data from the Hankachō*

ID	Last Name	JPN_Name	Type	Place	Crime
1	Ōgi	扇角右衛門	Person	Tsushima	1662, 1663, 1664A
2	Shingu	新宮惣兵衛	Person	Tsushima	1662, 1666A
3	Nakajima	中嶋利左衛門	Person	Tsushima	1662
4	Itō	伊藤小左衛門	Person	Nagasaki	1663, 1664A
5	Komoda	小茂田勘左衛門	Person	Tsushima	1663, 1664A, 1665, 1666A
6	Takagi	高木惣十郎	Person	Hakata	1663, 1664A
...
31	Nakazato	中里弥次右衛門	Person	Tsushima	1664B, 1665, 1666B
32	Oburaya	油屋彦右衛門	Person	Nagasaki	1664B, 1665, 1666B
...
95	1662		Crime		
96	1663		Crime		
97	1664A		Crime		
98	1664B		Crime		
99	1665		Crime		
100	1666A		Crime		
101	1666B		Crime		
102	Tsushima	対馬	Place		
103	Nagasaki	長崎	Place		
104	Hakata	博多/福岡	Place		
105	Osaka	大阪	Place		
106	Shimabara	島原	Place		
107	Yanagawa	柳川	Place		
108	Miyazaki	宮崎	Place		
109	Kurume	久留米	Place		
110	Karatsu	唐津	Place		
111	Yatsushiro	八代	Place		

* This table is a snapshot of the dataset, which includes information on 94 unique suspects who from 10 Japanese towns, and their involvement in seven initiatives of arms smuggling from years 1662–1668.

distribution of criminals. This in turn opens up greater possibilities for bimodal analyses to be conducted with different combinations of nodes (detailed in the next section).

In addition to the dataset, which I manually entered,⁴ the nature of the original source—*hankachō*—has its own affordances as well. If Healy pulled together multiple rosters in eighteenth-century Boston to “find” the key suspect (Paul Revere), I employ “after the fact” criminal records from Nagasaki that had already identified and verified the suspects and their involvement. This means that with the *hankachō* alone, one can’t truly play “historical detective,” expecting to discover new criminals hitherto unnoticed by historians and

⁴ Thanks to modern Japanese scholars who have already transcribed and translated the original *hankachō* documents, I was able to manually enter the data into Excel as a Comma Separated Values (.csv) file, before inputting the data as an edges file into Gephi. Arano Yasunori 荒野泰典 413.

Nagasaki investigators alike. Yet the advantages of working with *hankachō* are, first, that even with minimal input and heuristics by the researcher, one can utilize the primary source as a centralized repository of information to be network-analyzed.⁵ Also, because said repository was built with criminal-investigative intent, it lends itself to more “controlled” comparisons for the digital humanist: that is, when the intentions of the primary source authors and modern historians converge, differences in their resulting analyses can take on further significance.

Yet, speaking of “difference,” does network analysis indeed change the existing narrative or geography of the crime?

Relocating the Smuggling Ring: In Three Visualizations

This section compares the results of digital network analysis with the conclusions of the Nagasaki investigators and their historians. In doing so, it appreciates key differences in the perception of the smuggling network, particularly with regards to the “who, where, and when” of the crime and criminals in question.

To date, Japanese historians have predominantly emphasized the aforementioned merchant Itō Kozaemon and his coterie in Hakata. By closely reading the *hankachō* and related documents, they thus affirmed and substantiated the view of the original investigators (Toyama Mikio 外山幹夫; Egoshi Hiroto 江越弘人). But my digital analysis relocates the epicenter of the smuggling ring: another figure named Komoda Kanzaemon (小茂田勘左衛門) emerges as the uncontested ringleader and his peers from Tsushima as the prime movers in the criminal network.

This argument is borne out in three visualizations produced on Gephi through bimodal analyses: 1) a person-crime mode analysis, which visualizes the interpersonal ties between criminals based on their shared participation in crime event ([Figure 1](#)), 2) a place-people mode analysis, which shows the geography of the crime based on criminals from the same location ([Figure 2](#)), and 3) a crime-people mode analysis ([Figure 3](#)), which demonstrates the connectedness of crime events based on mutual participants.⁶

The first “criminal network” graph is already revealing ([Figure 1](#)). The nodes here indicate unique individuals, and the edges the ties between those who collaborated. Using a force-directed algorithm, the graph also shows clusters where the criminals participated in the same smuggling event, and separations when they operated independently from each other. I used weighted markers to render the argumentative “substance” of the graph easily graspable: the

⁵ However, this is not to suggest that the *hankachō* is immune to partiality. The author’s discretion was used in flattening the complexities of some data points, for example, when some individuals had multiple geographical affiliations (due to differences in place of origin and residence). On the “partial perspectives,” see Ryan and Ahnert 85.

⁶ A useful guide for multimodal network analysis can be found in a series of blog posts in Seire.

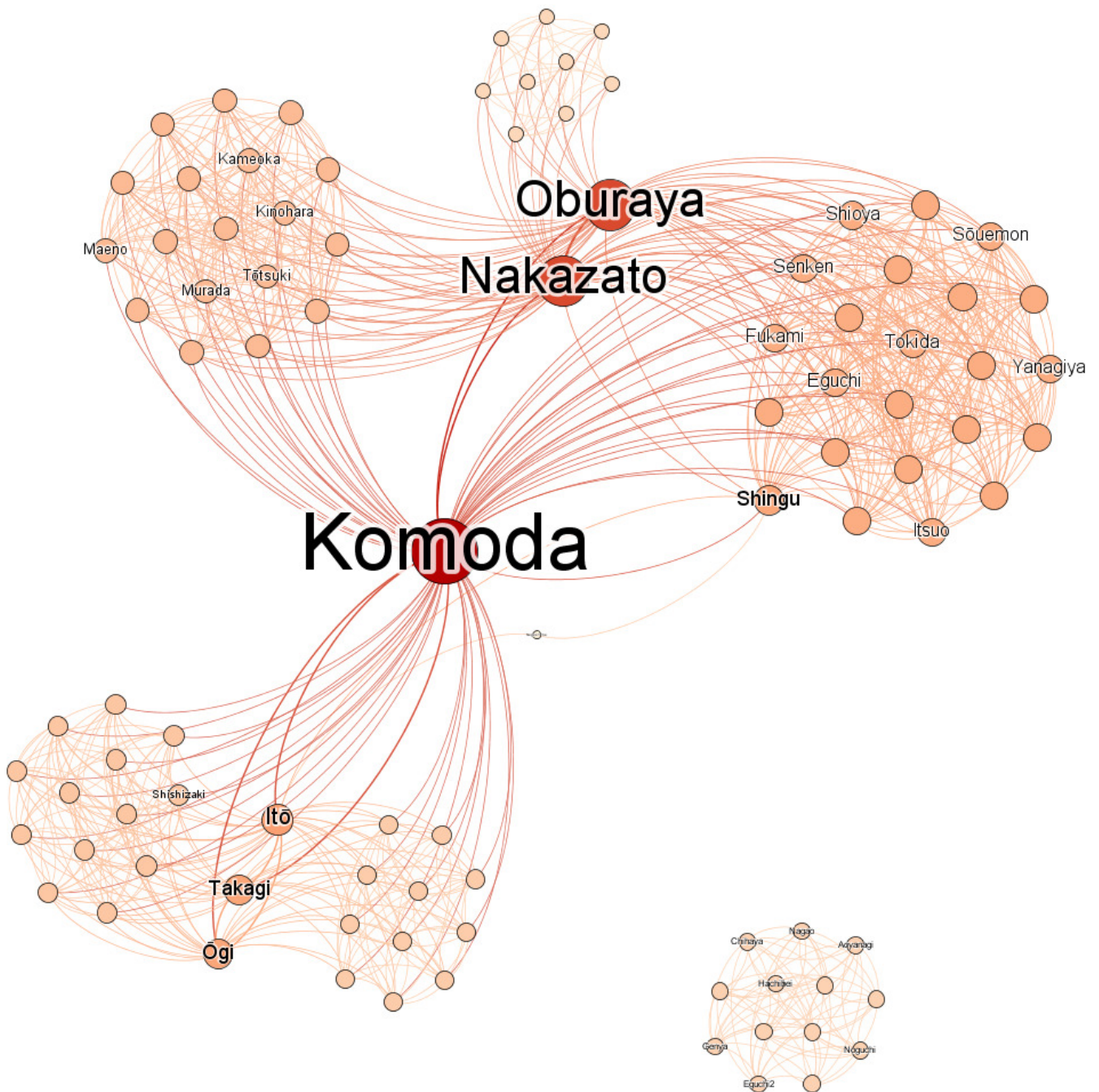


Figure 1. Person-Crime Mode Analysis.

A visualization of interpersonal ties between smugglers as defined by their participation in incidences of crime. Major actors in the network are labeled with their transliterated surnames.

color and size of nodes as well as the color of edges have been darkened or enlarged based on the relative frequency of inter-criminal connections. This enhancement is based on statistical evidence, albeit of a basic kind: the graph uses a centrality measure called “degree centrality,” the total number of edges connected to a particular node, to highlight individuals who are best-connected in the network (Bourke 3–11).

For our purposes, this graph highlights a trio of individuals ([Table 2](#)): the aforementioned Komoda Kanzaemon, who is the epicenter of the entire network, and to a lesser extent, Nakazato Yajimon (中里弥次右衛門) and

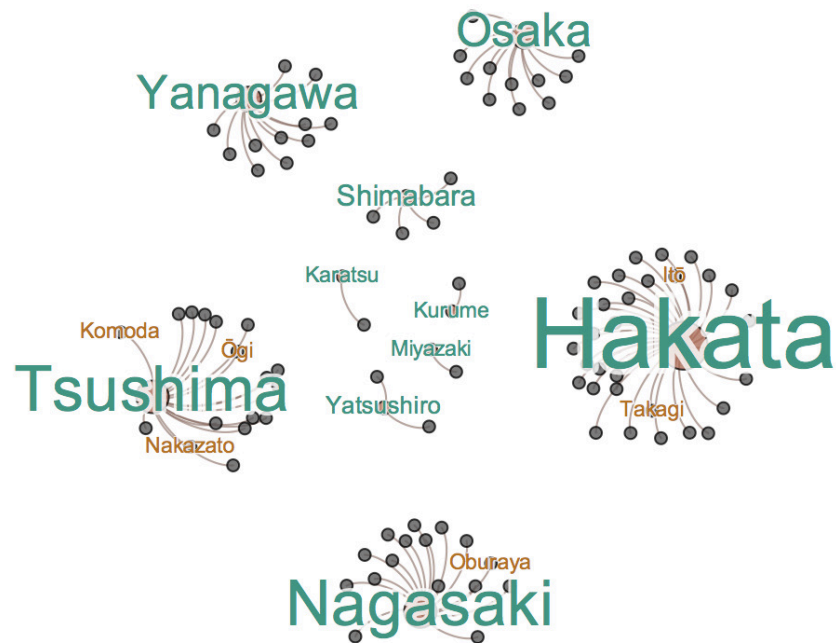


Figure 2. Place-People Mode Analysis.

A visualization of intergroup ties based on geographical background. Places are marked by orange nodes and turquoise labels. Individuals are marked by grey nodes, and “core” members with their last names in yellow.

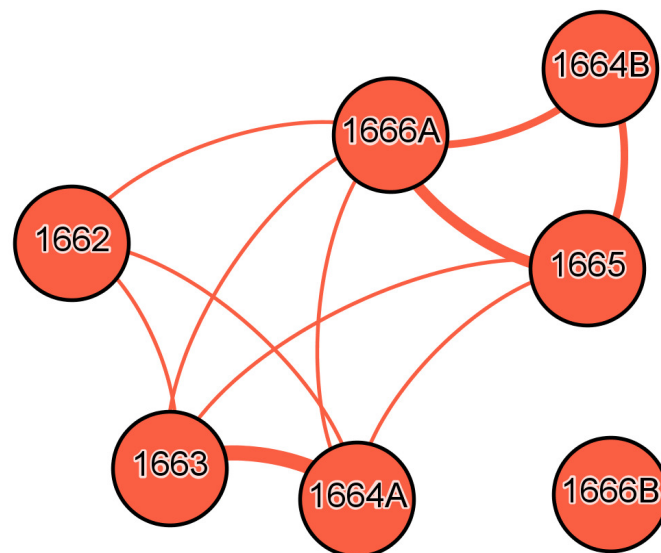


Figure 3. Crime-People Mode Analysis.

A visualization of relations between incidences of crimes. Red nodes indicate crime events and the varying thickness of edges represents relative strength of inter-event connection.

Oburaya Hikoemon (油屋彦右衛門). These individuals are, if you will, the inner “core” of the smuggling ring. They occupy structurally central positions in the network, as indicated by the size of their nodes, and by the color of

Table 2. The “Core” Group

ID	Name	JPN_Name	Type	Place	Crime	Network Analysis Results
5	Komoda	小茂田勘左衛門	Person	Tsushima	1663, 1664A, 1665, 1666A	Inner core (<i>primus inter pares</i>)
31	Nakazato	中里弥次右衛門	Person	Tsushima	1664B, 1665, 1666A	Inner core
32	Oburaya	油屋彦右衛門	Person	Nagasaki	1664B, 1665, 1666A	Inner core
1	Ōgi	扇角右衛門	Person	Tsushima	1662, 1663, 1664A	Outer core
4	Itō	伊藤小左衛門	Person	Nagasaki	1663, 1664A	Outer core
6	Takagi	高木惣十郎	Person	Hakata	1663, 1664A	Outer core

their edges as well as inter-nodal gravity. The dark red edges emanating from them further suggest that the three smugglers were closely associated. To be sure, there was a second triumvirate of prominent individuals in the bottom left. This is the outer “core,” consisting of the Hakata merchant Itō Kozaemon as well as Takagi Sojuro (高木惣十郎) and Ōgi Kakuzaemon (扇角右衛門). However, while the second trio of smugglers has salient nodes and inter-group connections, they pale in comparison to the inner core in terms of both degree centrality—and other network metrics such as betweenness and eigenvector measures.⁷

The identification of Komoda as ringleader (and *primus inter pares* among the inner core) is a significant divergence from the conclusions of the Nagasaki investigators and modern-day historians. What’s more, there are four other key individuals who have largely gone undetected in scholarship (Kazui Tashiro 田代和生; Arano Yasunori 荒野泰典; Yamawaki Teijiro 山脇悌二郎; Takeno Yōko 武野要子; Maruyama Yasunari 丸山雍成; Miyake Hidetoshi 三宅英利.; Mori Katsumi 森克己; Yun Yusuk 윤유숙; Knoest).

Turning to the second visualization, what about the geographical distribution of these core groups? The place-people mode (Figure 2) visualizes intergroup ties based on geographical background. Displaying a total of ten Japanese towns (orange nodes), and their affiliated criminals (grey nodes), this graph clusters individuals according to their place of origin, and designates weighted markers (e.g., size of labels and nodes) to indicate the quantity of affiliated criminals per location. Incidentally, in order to trace the earlier conversations on the “core” group, it also marks all of its six individuals with yellow labels.

The first observation that emerges is that there are three important towns: Hakata, Nagasaki, and Tsushima. Hakata in particular was home to the greatest number of smugglers (32%), followed by Nagasaki (19%) and Tsushima (18%).

⁷ I focused on degree centrality because it is the most straightforward and reliable network metric for my particular dataset. Other measures such as betweenness and eigenvector does confirm with minor variations the composition of both the inner and outer core. However, as shown in the conclusion of this essay, they turned out to be less “robust” compared to degree centrality—i.e., more susceptible to data loss, based on results from the Network Robustness Tool by Yann C. Ryan and Sebastian E. Ahnert: https://networkingarchives.shinyapps.io/network_robustness_tool. Also see Ryan and Ahnert 70–83.

Table 3. Smugglers by Role from the Three Top Towns

Role	Tsushima	Hakata	Nagasaki	All
Main Culprits (e.g., supercargo, investor)	8 (28%)	7 (24%)	13 (45%)	29
Broker	3 (100%)	0	0	3
Interpreter	3 (100%)	0	0	3
Captain	1 (25%)	2 (50%)	0	4
Crew	0	17 (35%)	4 (8%)	48
Other	2 (29%)	3 (43%)	1 (14%)	7
Total	17 (18%)	29 (30%)	18 (19%)	94

At face value, this may be read in support of existing scholarship that accentuates the Hakata-based individuals. Itō, for example, also served as the important role of investor, and from Hakata hailed just as many “main culprits” (*shuhan* 主犯, e.g., supercargo, investor) as from Tsushima (Table 3).⁸ However, not only did Nagasaki in fact outscore Hakata in this measure of main culprits, but in terms of other roles, most Hakata individuals played minor ones, contributing disproportionately as ship captain or crew.

Navigating the waters itself was an important task, to be sure, but arguably more central to the criminal network were persons handling logistics. In that regard, individuals from Tsushima represented an irreplaceable asset: they provided for instance someone like Komoda Kanzaemon who served as supercargo on four smuggling operations. The island was also the only supply of brokers and interpreters (essential for contacting the Koreans) in the network (Arano Yasunori 荒野泰典 413; Knoest 106–11). It should be noted as well that Tsushima produced three “core” individuals (marked in yellow labels)—two of whom belonged to the inner core—while Hakata had two and all from the outer core at that.

The third graph further shows Tsushima’s prominence in the network (Figure 3). This visualization is based on a crime-people mode analysis of a total of seven crime events during years 1662–1666. Represented in it are the connections between crime events in terms of the people shared between them. The edges have been weighted to show the relative strength of relations between events: the thicker the edge, the more criminals shared between the two connected nodes.

What stands out immediately are three disparate groups of events. First, we can disregard the isolated cluster of nodes in the bottom right of the graph. This insular group coincides with the crime event, 1666B, which was schemed but not carried out; it was also led by a new, independent group of smugglers that

⁸ Arano, “Kozzaemon to Kinemon,” 415.

Table 4. Main Culprits from Tsushima and Hakata*

	Cluster 1 (1663, 1664A)		Cluster 2 (1664B, 1665, 1666A)	
	Unique individuals	Total	Unique individuals	Total
Tsushima	Komoda Kanzaemon Ōgi Kakuzaemon	2	Komoda Kanzaemon Ōgi Kakuzaemon Nakazato Yajiemon Kihara Ichiemon Kameoka Heiemon	5
Hakata (Fukuoka)	Itō Kozaemon Shinozaki Den'emon Takagi Sōjūrō	3	Maeno Magoemon Murata Ichiemon Tōsuki Rokurōemon Sōemon	4

had sprung up for the first time that year. More interesting, however, are the two clusters of strongly linked events in the bottom (1663, 1664A: hereafter Cluster 1) and in the top right (1664B, 1665, 1666A: hereafter Cluster 2).

When read in context, these clusters indicate the growing importance of Tsushima agents over time. As shown in [Table 4](#), counting unique individuals (main culprits) from each cluster suggests the ascendancy of the islanders in the network: individuals from Tsushima doubled in number (2 to 5) while Hakata-based ones grew only slightly (3 to 4). More important than just this aggregate count, however, is the permanence of key individuals over time. Main culprits from Tsushima such as Komoda and Ōgi (both members of the “core” group) remained prominent in both clusters, but no one from Hakata did: Itō, for example, was only involved in Cluster 1, becoming inactive after 1664.⁹

Why? Given the contextual information available, we will likely never know. But an important clue is the coincidence of Cluster 2 with the expansion of the criminal network under Komoda’s leadership. During the years 1655–1666, Komoda took the reins by doing three things. First, in 1655, he replaced Itō’s presence by recruiting heavily from Hakata (1665 is ironically the year when the greatest number of main culprits participated from Hakata). Second, the next year, Komoda then killed a longtime partner from Tsushima, Shingū, perhaps to consolidate competing factions: Shingū was part of the first crime event (1662), which consisted entirely of Tsushima individuals but not Komoda. Third, under the emerging ringleader, the network grew geographically. In 1665, he included a great many smugglers from Osaka. The next year, he replaced the Hakata smugglers entirely by enlisting new members from four Japanese towns, namely, Kurume, Karatsu, Miyazaki, and Yanagawa (Arano Yasunori 荒野泰典; Knoest; Kang).

⁹ According to Knoest’s dataset, there is a certain “Denemon/伝右衛門 from Shinozaki” who participated in crime events 1664A and 1666A. This is a misreading of the original source: the name of the criminal in question is Shinozaki Den’emon who in fact hailed from Hakata, and he only participated in 1664A. There are other typos and mistakes in the data due to what seems to be accidental duplication. The data for my network analysis was taken from Arano’s research. See Arano Yasunori 荒野泰典 413; Knoest 106–11. See note 4 for more details.

Taken together, these graphs show that contrary to the findings of the original investigators and modern-day scholars, the epicenter of the smuggling ring was Tsushima, not Hakata, and its ringleader Komoda Kanzaemon, rather than Itō Kozaemon. What explains this discrepancy?

From the Library to the Data Lab and Back

As responsible digital humanists, we should first entertain the possibility that the visualizations produced in Gephi might be misleading. Some caveats are in order regarding the nature of the data.

Consider for example potential issues with the criminal records themselves. Though neatly compiled in the *hankachō*, the Nagasaki investigators were never quite done: they could not figure out, for instance, the Japanese manufacturer (likely in Osaka) who had been supplying contraband armor to Komoda “due to various circumstances” (Knoest 105). In fact, they in the end discovered little about Komoda himself. The elusive ringleader used an alias (Ōku 大久), which might have thrown off the investigators (Arano Yasunori 荒野泰典 466n13). We also know from another source that he trafficked contraband into Korea as many as fifteen times (Knoest 105), but only four of his smuggling operations from 1663 to 1666 entered the criminal records.

What the Nagasaki records show is indeed just the tip of the iceberg: if one closely reads the Korean records, many “main culprits” appear there as well. The Korean network stretched deep into the peninsula: beginning at the Japan House, it included the nearby towns of Pusan and Tongnae—their resident interpreters (*yōkkwan*), merchants, and military officers; it also included at its heart Hansŏng (present-day Seoul), where high-ranking civil officials, the top brass, and even Korean kings orchestrated the smuggling operations. As introduced earlier, the Korean enterprise also traced back significantly further than the seven incidents investigated by the Japanese. Arms trade began as early as 1607, when Chosŏn opened the Japan House (a trading outpost maintained by the Sō of Tsushima), and it became after 1621 (the year of the shogunate’s ban) a smuggling enterprise supported secretly by the Korean kings and Tsushima daimyos.

Adding this Korean data, however, would not have solved the problem. The Korean side of the network is amply documented for the entire period (1607–1661) and often with names and dates. But it is significantly less amenable for network analyses. Contrary to the *hankachō*, the information is scattered across the court annals which were curated for a different purpose (i.e., to record the king’s daily duties, rather than investigate crime). The data thus needs to be mined and manipulated to a significant extent by the digital humanist. And even when processed in this way, the result would be highly uneven and incommensurate with the *hankachō* data: some Korean individuals are mentioned only once in vacuo, while others (mostly office holders) can be matched with bureaucratic, biographical, and even genealogical data (Kuksa p’yŏnch’an wiwŏnhoe, *Hyŏnjong sillok* 1664/2/29; Kuksa p’yŏnch’an

wiwŏnhoe, *Pibyŏnsa Tŭngnok* 1656/3/26, 1664/3/3, 1664/3/4). The internationality of the crime as it happened in both Korea and Japan is difficult to represent with consistency.¹⁰

These caveats notwithstanding, the foregoing network analysis still stands. Despite the absence of significant data and the distractions of secondary scholarship, the visualizations pointed us to the right direction: it was indeed Tsushima, not Hakata, that was the epicenter of the Japanese side of the network.

A close reading of the sources left by the “smugglers” confirms this. While no records have survived by the hand of Komoda, Itō, or the other individuals executed in 1667, we have decades of transactions documented in the archives of the Korean and Tsushima authorities. These archives show, first, that during the period of open military trade (1609–21), Chosŏn Koreans imported a significant volume of Japanese arms and armor by dispatching envoys to Japan as well as purchasing directly from the private markets near the Japan House. After 1621, both the Chosŏn and Sō pressed on, dealing Japanese goods behind the shogunate’s back. And the daimyos of Tsushima profited greatly from this, using arms smuggling as a tactic to gain political and economic concessions from the Korean court. To be sure, by the 1660s, the Sō of Tsushima was no longer involved in arms trafficking due to the increased risks of exposure. But the Koreans then dispatched agents directly to Tsushima to partner with individual profiteers in the island. Some of these profiteers were prominent Tsushima officials such as Sago Shikiemon who in 1655 was ordered disembowelment for dealing with the Koreans. But by the 1660s, as we learn through the *hankachō*, other private merchants like Komoda, Ōgi, and Nakazato had risen to the occasion.

Arms smuggling across the Korea Strait was thus longstanding, systematic, and orchestrated by state and non-state agents from Korea and Tsushima. What is surprising, however, is that a basic network analysis run on just the last six years of this phenomenon revealed a significant clue as to how and where it began.

In this sense, then, network analysis can be better than its data. For this case study, building a more inclusive dataset would have been impractical due to the inconsistencies laid out above. It would also have added little value: even a cursory reading of Korean or Tsushima records shows their systematic involvement in the smuggling network. The point, however, is that even in the absence of “complete” data—which is an impossible pursuit anyway, historical networks are indeed “remarkably robust” (Ryan and Ahnert 85). As Yann C. Ryan and Sebastian E. Ahnert have convincingly argued, network analyses

¹⁰ There was also some information which did not enter Gephi. Depending on the severity of crime, the 87 individuals found guilty were recorded with differing attention to details such as age, residence, home ownership, and penalty. Such details were excluded from the network data due to their inconsistency.

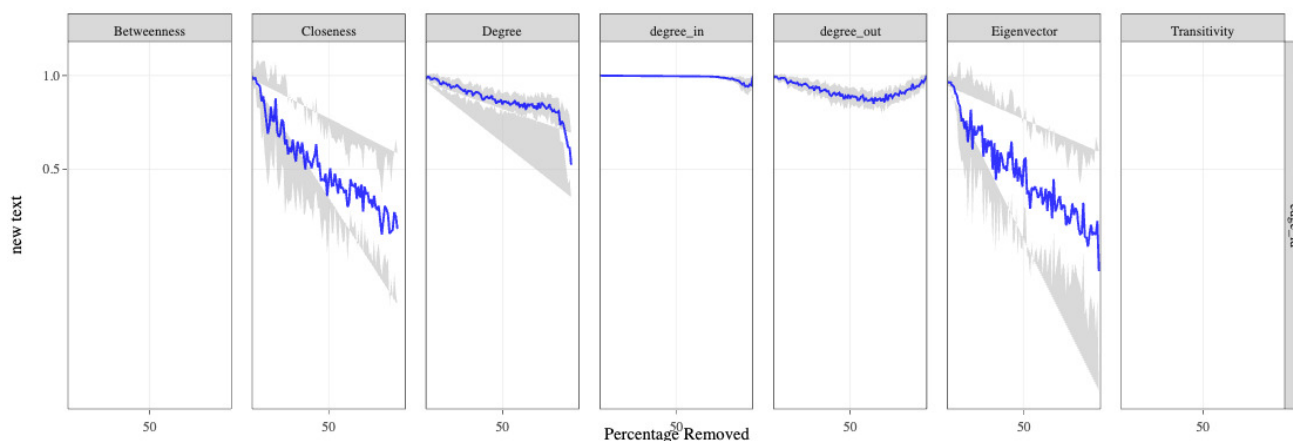


Figure 4. Robustness of the smuggling network.

Measured by the Network Robustness Tool developed by Yann C. Ryan and Sebastian E. Ahnert, it shows high stability for the degree centrality measures up to 75% of data removal or more for in-degree and out-degree. The closeness and eigenvector measures were more sensitive, likely due to the small size of dataset.

yield reliable results up to more than 50% of random data loss. Their Network Robustness Tool was built for historical datasets of another order of magnitude, but feeding the *hankachō* data into it returns a similar conclusion: the latter, too, is shown to be highly robust, especially in terms of degree centrality measures ([Figure 4](#)).

Conclusions

Using a small dataset of metadata about criminals, I have demonstrated that adopting a network perspective can radically alter the conclusions reached about their history: even when working with the authorities' data, which seemed to emphasize a rich Hakata merchant, the network analysis effectively isolated another individual from Tsushima who was in fact more central. This conclusion rightfully challenges core assumptions in the archives and related modern scholarship. It also points to prospective areas of research which may or may not benefit from network analysis: the evolution of the smuggling network from the smugglers' (e.g., Korean, Tsushima) perspective; the history of commercial and diplomatic exchanges between East Asian states and non-state agents; and the nature of contraband networks in the early modern world.

For the purposes of this essay, however, let us return to the question posed above: if not data problems, what explains this discrepancy between the results of network analysis and those of the original investigators as well as modern-day scholars? There are at least two interpretations, not mutually exclusive.

The first is that the Nagasaki investigators lacked a systematic understanding of the network. During the four decades of arms smuggling (from 1621 to 1666), many transactions accumulated which would have surprised the shogunate. But in the end, the shogunate did not know that its neighboring state had been

methodically operating an illicit enterprise at its border. Even more important, they did not realize that their own daimyos—the Sō of Tsushima—were deeply involved at first, collaborating with the Koreans behind their back.

Of course, the shogunate had its doubts. In fact, the Sō's secrets came close to being exposed early on (during a political scandal of 1635) such that they thereafter withdrew from further arms smuggling. But during the 1667 investigation, the Japanese authorities still suspected the Sō's knowledge of—and complicity with—the smuggling incidents, pressing the daimyo to come clean. In the end, however, the daimyo emerged unscathed: he blamed the profiteering by individual smugglers, of which the daimyo had no part; he also used an official explanatory letter from the Korean court to convince the shogunate that neither his clan nor the Korean court had been formally involved (Arano Yasunori 荒野泰典 418; Kang).

The Japanese investigation was limited to be sure, but understandably so. For one thing, we have all been duped by these smugglers: as noted, most modern-day historians ended up repeating the assumptions of the *hankachō* and of its original compilers perhaps because they read it “too closely” (Toyama Mikio 外山幹夫; Egoshi Hiroto 江越弘人). But digital tools serve not merely to perform autopsy on historical acts: another interpretation suggests the investigation in fact was methodical and effective in its own right.

In the absence of knowledge about the entire criminal network stretching into Tsushima and Korea, it makes sense from the shogunate's perspective to emphasize Itō Kozaemon as the “root” of the crisis. Taking an economic perspective, for example, Itō was indeed a leading investor who financed the first smuggling transaction in 1663 by providing seed money as well as arranging for the ship, its captain, and the seamen from Hakata.¹¹ In turn, because Itō was already a renowned merchant at the time, his crime was easier to detect and more “profitable” to prosecute. The Hakata merchant not only owned a house in Nagasaki, the home of the investigation. But he loomed large in the eyes of both his contemporaries and historians due to the great wealth he had accumulated from the Dutch trade. When after 1667, Itō and his sons were executed, his staggering asset of 700,000 taels of silver was also confiscated, an amount which exceeded the asset of “the third richest person of the Dutch Republic” (Knoest 100–14, 114n60). In a sense, then, the Japanese authorities successfully traced the smuggling network as far back as they could, especially in terms of following the source of the money; it was also effective in identifying the person of cultural and economic significance who had brazenly flouted in the face of shogunal authority.

11 This is not to backpedal on my argument regarding Tsushima's salience vis-à-vis Hakata. In reality, investors were dispensable: there were multiple investors for most transactions, including Komoda himself. Arano Yasunori 荒野泰典 412; Knoest 106–11

Data Repository: <https://doi.org/10.7910/DVN/F2MAOK>

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REFERENCES

- Ahnert, Ruth, et al. *The Network Turn: Changing Perspectives in the Humanities*. Cambridge University Press, 2020, <https://doi.org/10.1017/9781108866804>.
- Ahnert, Ruth, and Sebastian E. Ahnert. "Metadata, Surveillance and the Tudor State." *History Workshop Journal*, vol. 87, 2019, pp. 27–51, <https://doi.org/10.1093/hwj/dby033>.
- . "Protestant Letter Networks in the Reign of Mary I: A Quantitative Approach." *ELH*, vol. 82, no. 1, 2015, pp. 1–34, <https://doi.org/10.1353/elh.2015.0000>.
- Arano Yasunori 荒野泰典. "Kozaemon to Kinemon – chieki to kaikin wo meguru danshou" 小左衛門と金右衛門 - 地域と海禁をめくる断章." *Umi kara mita Nihon bunka* 海から見た日本文化, edited by Ōbayashi Taryō, Shōgakkan, 1992, pp. 407–47.
- Barabási, Albert-László. *Linked: The New Science of Networks*. Perseus, 2002.
- Bastian, Mathieu, et al. "Gephi: An Open Source Software for Exploring and Manipulating Networks." *Proceedings of the Third International ICWSM Conference*, vol. 3, no. 1, Mar. 2009, pp. 361–62, <https://doi.org/10.1609/icwsml.v3i1.13937>.
- Bourke, Evan. "Female Involvement, Membership, and Centrality: A Social Network Analysis of the Hartlib Circle." *Literature Compass*, vol. 14, no. 4, Apr. 2017, <https://doi.org/10.1111/lic3.12388>.
- Chen, Song. "Governing a Multicentered Empire: Prefects and Their Networks in the 1040s and 1210s." *State Power in China, 900–1325*, edited by Patricia Ebrey and Paul J. Smith, University of Washington Press, 2016, pp. 101–52.
- Clulow, Adam. "'Great Help from Japan': The Dutch East India Company's Experiment with Japanese Soldiers." *The Dutch and English East India Companies: Diplomacy, Trade and Violence in Early Modern Asia*, edited by Adam Clulow and Tristan Mostert, Amsterdam University Press, 2018, pp. 179–210.
- Cullen, Louis. "Japanese Archives: Sources for the Study of Tokugawa Administrative and Diplomatic History." *Japan Review*, vol. 25, 2013, pp. 33–65.
- Diminescu, Dana. "Introduction: Digital Methods for the Exploration, Analysis and Mapping of e-Diasporas." *Social Science Information*, vol. 51, no. 4, Nov. 2012, pp. 451–58, <https://doi.org/10.1177/0539018412456918>.
- Egoshi Hiroto 江越弘人. *Toppikusu de yomu Nagasaki no Rekishi* 「トピックスで読む」長崎の歴史. Genshobo, 2007.
- Euler, Leonhard. "Leonhard Euler and the Königsberg Bridges." *Scientific American*, vol. 189, no. 1, July 1953, pp. 66–70, <https://doi.org/10.1038/scientificamerican0753-66>.
- Fischer, David Hackett. *Paul Revere's Ride*. Easton Press, 1996.
- Healy, Kieran. "Using Metadata to Find Paul Revere." *Kieran Healy*, 9 June 2013, <https://kieranhealy.org/blog/archives/2013/06/09/using-metadata-to-find-paul-revere>.
- Kang, Hyeok Hweon. *Kingpins at Court: Contraband Diplomacy between Korea, Japan, and Tsushima, 1607–71*.
- Kazui Tashiro 田代和生. *Wakan: sakoku jidai no Nihonjin-machi* 倭館: 鎖国時代の日本人町. Bungei Shunjū, 2002.
- Knoest, Jurre. "'The Japanese Connection': Self-Organized Smuggling Networks in Nagasaki circa 1666–1742." *Beyond Empires: Self-Organizing Cross-Imperial Economic Networks vs Institutional Empires, 1500–1800*, edited by Cátia Antunes and Amélia Polónia, 2016, pp. 88–137.
- Krebs, V. E. "Mapping Networks of Terrorist Cells." *Connections*, vol. 24, no. 3, 2001, pp. 43–52.
- Kuksa p'yŏnch'an wiwŏnhoe, editor. *Hyŏnjong sillok*. Seoul, 1955–1958.
- , editor. *Pibyŏnsa Tŭngnok*. 1959–1960.

- Ladd, Jason R. "Imaginative Networks: Tracing Connections Among Early Modern Book Dedications." *Journal of Cultural Analytics*, vol. 6, no. 1, Mar. 2021, pp. 180–216, <https://doi.org/10.22148/001c.21993>.
- Maruyama Yasunari 丸山 雍成. *Chūō Kōronsha*. 1992.
- Miyake Hidetoshi 三宅英利. *Kinsei Ajia no Nihon to Chōsen Hantō* 近世アジアの日本と朝鮮半島. Asahi Shinbunsha, 1993.
- Mori Katsumi 森克己. "Kinsei ni okeru Tsushima mitsu bōeki to Tsushima han" 近世に於ける對鮮密貿易と對馬藩. *Shien*, vol. 54, 1950, pp. 49–73.
- Morinaga Taneo 森永種夫. *Hankachō: Nagasaki Bugyō no kiroku* 犯科帳: 長崎奉行の記録. Iwanami Shoten, 1962.
- Räz, Tim. "Euler's Königsberg: The Explanatory Power of Mathematics." *European Journal for Philosophy of Science*, vol. 8, no. 3, 2018, pp. 331–46, <https://doi.org/10.1007/s13194-017-0189-x>.
- Ryan, Yann C., and Sebastian E. Ahnert. "The Measure of the Archive: The Robustness of Network Analysis in Early Modern Correspondence." *Journal of Cultural Analytics*, vol. 7, 2021, pp. 57–88.
- Seire, Maarja. *Gephi Guidelines for Cuneiform Archives. Part 5: Transforming a 2-Mode Network into a 1-Mode Network*. <http://persiababylonia.org/archives/methods/gephi-guidelines-for-cuneiform-archives-part-5-transforming-a-2-mode-network-into-a-1-mode-network>. Accessed 1 Oct. 2022.
- Shin-Kap, Han. "The Other Ride of Paul Revere: The Brokerage Role in the Making of the American Revolution." *Mobilization*, vol. 14, no. 2, June 2009, pp. 143–62, <https://doi.org/10.17813/maiq.14.2.g360870167085210>.
- Takeno Yōko 武野要子. *Shōnin gunzo* 商人群像. Reimei Shuppan, 1991.
- Toyama Mikio 外山幹夫. *Nagasaki Bugyo: Edo bakufu no mimi to me* 長崎奉行:江戸幕府の耳と目. Chuokoronsha, 1989.
- Warren, Christopher N., et al. "Six Degrees of Francis Bacon: A Statistical Method for Reconstructing Large Historical Social Networks." *Digital Humanities Quarterly*, vol. 10, no. 3, 2016, <http://digitalhumanities.org/dhq/vol/10/3/000244/000244.html>.
- Yamawaki Teijiro 山脇悌二郎. *Nukeni: sakoku jidai no mitsubo eki* 抜け荷: 鎖国時代の密貿易. Nihon Keizai Shinbunsha, 1965.
- Yun Yusuk 윤유숙. "17 segi Cho Il-gan Ilbon-jae mugiryu ūi kyoyōk kwa milmae" 17세기 조일간 일본제 무기류의 교역과 밀매. *Sach'ong*, vol. 67, 2008, pp. 292–93.