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Sugar, Salt, and Mills for the Grand Duke: Dutch Trade and Technological Innovation in Early Seventeenth-Century Livorno

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Abstract

This article examines the role of Dutch merchants, entrepreneurs, and artisans in the circulation of technological knowledge, skills, and commercial expertise between the Low Countries and the Grand Duchy of Tuscany in the early seventeenth century. Focusing on projects promoted under Grand Duke Ferdinando I de' Medici, it analyses attempts to introduce sugar refining, salt processing, and mill technologies into the port of Livorno. Rather than treating innovation as a simple transfer of techniques from one place to another, the article shows how technological circulation depended on the mobility of skilled actors, the mediation of commercial networks, and the support of political authorities. At the same time, it highlights the fragility of these processes: even under favourable legal and economic conditions, migrant ventures could fail or remain incomplete. By reconstructing the interactions between Dutch entrepreneurs, intermediaries, and Medici officials, the article argues that early modern technological innovation emerged from negotiation, adaptation, and the practical use of embodied expertise in a new environment. In this way, the Livorno case shows both the opportunities and the limits of migrant-driven innovation in the early modern Mediterranean and contributes to a broader understanding of how mobility shaped technological circulation on the ground.

Keywords: Technology; Migration; Entrepreneurship; Livorno; Dutch Republic

Introduction

At the close of the sixteenth century, Grand Duke of Tuscany Ferdinando I de' Medici (r. 1587–1609) sought to transform the modest outpost of Livorno into a thriving international port in the Mediterranean. To achieve this, he implemented a series of favourable fiscal and settlement policies designed to attract foreign merchants, seafarers, and skilled artisans, alongside a direct recruitment initiative abroad. Among the many drawn to the Tuscan coast in coming years, the Dutch played a particularly significant role. Indeed, although still involved in the decades-long conflict for independence from the Spanish Crown, the Republic of the United Provinces was emerging as a dynamic and rapidly expanding economic power, at the forefront of technological innovation in many sectors.¹ The

¹ The term “Dutch” is used broadly in this paper to identify people residing and integrated in the social and economic context of the Dutch Republic. This will therefore include people from Flanders, of past or recent immigration to the northern provinces of the Low Countries.

Mediterranean and the Italian Peninsula became key frontiers in its expanding commercial reach.

This convergence of interests set the stage for a dynamic interaction between Dutch merchant-entrepreneurs and the Medici court. While Ferdinando I tried to exploit Dutch networks and technological expertise to develop the productive capacity of Livorno and establish new trade routes, some Dutch merchants saw an opportunity to consolidate their presence in Mediterranean markets by starting local enterprises under the patronage of the Grand Duke. This study explores how these interactions favoured technological exchange between the Low Countries and Tuscany, shaping the economic landscape of Livorno at the beginning of the seventeenth century.

Drawing on extensive research into the role of commercial diasporas, particularly on Jewish and Northern European communities, in shaping the Tuscan port's economic and social fabric, this study also aims to highlight their crucial function as intermediaries between Tuscany and other markets, as well as their interactions with the Medici court.² The works by Engels, Ghezzi, and the more recent collective volume edited by Pessina and Papini have provided essential insights into the Dutch presence in Livorno.³ However, while these contributions have focused primarily on the economic impact of foreign communities and the complexities of social coexistence, less attention has been given to the migrants' role in the processes of knowledge and technology circulation. Furthermore, studies on Tuscan-Dutch relations remain relatively scarce, particularly concerning their early phases. Recent contributions by Brege and Tosco, along with my own research, have begun to explore the collaboration between Dutch entrepreneurs and the Medici court, as well as Tuscan commercial initiatives in the Netherlands.⁴ Yet, the role of technology in these exchanges remains an underdeveloped area of inquiry. Similarly, this article engages with studies on the technological development of the Dutch Republic in the early modern period, particularly drawing from Davids's work, which highlights the Netherlands as

² Francesca Trivellato, *The Familiarity of Strangers: The Sephardic Diaspora, Livorno, and Cross-Cultural Trade in the Early Modern Period* (New Haven, Conn.: Yale University Press, 2009); Stefano Villani, "Una finestra mediterranea sull'Europa: I 'nordici' nella Livorno della prima età moderna," in *Livorno 1606–1806: Luogo di incontro tra popoli e culture*, ed. Adriano Prosperi (Livorno: Allemandi, 2009), 158–77; Stefano Villani, "Protestanti a Livorno nella prima età moderna," in *Protestanten Zwischen Venedig Und Rom in Der Frühen Neuzeit*, ed. Uwe Israel and Michael Matheus (Berlin: Akademie Verlag, 2013), 129–42; Andrea Addobbati, Marcella Aglietti, and Lucia Frattarelli Fischer, eds., *La città delle nazioni: Livorno e i limiti del cosmopolitismo (1566–1834)* (Pisa: Pisa University Press, 2016); Corey Tazzara, *The Free Port of Livorno and the Transformation of the Mediterranean World* (New York: Oxford University Press, 2017); Corey Tazzara, "Port of Trade or Commodity Market? Livorno and Cross-Cultural Trade in the Early Modern Mediterranean," *Business History Review* 94:1 (2020), 201–28; Lucia Felici, ed., *La Livornina: alle origini di Livorno, città cosmopolita in età moderna* (Rome: Viella, 2024).

³ Marie Christine Engels, *Merchants, Interlopers, Seamen and Corsairs: The "Flemish" Community in Livorno and Genoa (1615–1635)* (Hilversum, Netherlands: Verloren, 1997); Renato Ghezzi, *Livorno e l'Atlantico: i commerci olandesi nel Mediterraneo del Seicento* (Bari: Cacucci, 2011); Jacopo Pessina and Silvia Papini, *Gli "olandesi-alemanni" a Livorno. Luoghi, vicende e figure di un incontro multiculturale* (Pisa: Pisa University Press, 2024).

⁴ Henk Th van Veen and Andrew P. McCormick, *Tuscany and the Low Countries: An Introduction to the Sources and an Inventory of Four Florentine Libraries* (Florence: Centro Di, 1984); Giorgio Tosco, "In Pursuit of the World's Trade: Tuscan and Genoese Attempts to Enter Trans-Oceanic Trade in the Seventeenth Century" (PhD diss., European University Institute, 2020); Brian Brege, *Tuscany in the Age of Empire* (Cambridge, Mass.: Harvard University Press, 2021), 88–114; Massimo Bomboni, "Il galeone Livorno: sogni di gloria e imprese mancate di Ferdinando I de' Medici fra le Indie e il Mediterraneo (1606–1608)," *Mediterranea. Ricerche Storiche* 57 (April 2023), 55–84; Massimo Bomboni, "The New Gateway to the World. Ferdinando I de' Medici, the Dutch Republic, and the Informal Routes of Global Trade in the Early Seventeenth Century," (PhD diss., Università degli Studi di Torino, 2025).

a crucial hub for knowledge exchange and cross-border technological transfer.⁵ By exploring the impact of Dutch technologies in Livorno, an area still largely overlooked by Dutch historiography, this study aims to broaden and deepen these discussions.

Moreover, this study aligns with recent historiographical trends that emphasise a more complex and multifaceted interpretation of technological circulation in the early modern period. As scholars such as Hilaire Pérez, Verna, and Garrioch have shown, the process of dissemination of technical knowledge was not confined to specialised artisans but often involved a broader range of actors, including merchants and political elites.⁶ The aim of this study is therefore to re-evaluate the role of merchants in the modern age as international entrepreneurs and facilitators of technological diffusion, adapting and transmitting new skills, materials, and production techniques in different cultural and economic environments. Likewise, I aim to highlight the role of political power in fostering technological exchange, whether through economic incentives, industrial privileges, direct recruitment, or even industrial espionage. However, as this study will demonstrate, state support alone was not sufficient to guarantee success. The complexity of adapting technologies to a new context, competition on the market, and more general geopolitical and economic conditions have played a decisive role in determining the outcome of these initiatives. In essence, by re-evaluating the relationship between private enterprise and political power in the context of Livorno, this research hopes to shed new light on the mechanisms of technological diffusion in the early modern age and on the challenges of intercultural economic collaboration.

In this analysis we will adopt a two-pronged approach. A broader comparative perspective that will highlight the connections and divergences between the socio-economic contexts of Tuscany and the Low Countries will be flanked by a more detailed analysis of some case studies. By examining the correspondence of the Medici court, as well as notarial documentation and port registers, both in Livorno and in the Low Countries, we will try to reconstruct in detail the social and economic networks of Dutch merchants in Livorno and their interactions with the Medici court, as well as the commitments of the grand duke in the Netherlands. A detailed analysis of the actors involved will be provided, from the merchant-entrepreneurs to the technicians, and of the Medici court, highlighting their respective interests, strategies, and methods of collaboration. Particular attention is paid also to the technologies employed in the initiatives examined, assessing their benefits, limitations, adaptability, and the factors that influenced their successful or unsuccessful implementation in Tuscany.

The article is divided into three parts. The first examines the conditions and dynamics that brought Dutch merchants to interact with the context of Livorno and thus the roots of their collaboration with Grand Duke Ferdinando I. The following two sections analyse specific case studies of Dutch-Tuscan business ventures, the first dedicated to the attempts

⁵ Clé Lesger, ed., *Entrepreneurs and Entrepreneurship in Early Modern Times: Merchants and Industrialists within the Orbit of the Dutch Stable Market* (Den Haag: Stichting Hollandse Historische Reeks, 1995); C. A. Davids, *The Rise and Decline of Dutch Technological Leadership: Technology, Economy and Culture in the Netherlands, 1350–1800* (Leiden: Brill, 2008); André F. L. Van Holk, “Innovation, Institutions and Migration: Transfer of Technology in Dutch Shipbuilding, 500–1700,” *Archaeonautica* 21 (2021), 33–40; Marius Buning, *Knowledge, Patents, Power: The Making of a Patent System in the Dutch Republic* (Leiden: Brill, 2022).

⁶ Liliane Hilaire-Pérez and Catherine Verna, “Dissemination of Technical Knowledge in the Middle Ages and the Early Modern Era: New Approaches and Methodological Issues,” *Technology and Culture* 47:3 (July 2006), 536–65; Stephan R. Epstein and Maarten Roy Prak, *Guilds, Innovation, and the European Economy, 1400–1800* (Cambridge: Cambridge University Press, 2008); C. A. Davids and Bert De Munck, *Innovation and Creativity in Late Medieval and Early Modern European Cities* (London: Routledge, 2019); Arnold Pacey and Francesca Bray, *Technology in World Civilization: A Thousand-Year History* (Cambridge, Mass.: MIT Press, 2021); David Garrioch, ed., *The Republic of Skill: Artisan Mobility, Innovation, and the Circulation of Knowledge in Premodern Europe* (Leiden: Brill, 2022).

to establish a sugar refinery in Livorno, and the second concerning the creation of a salt refinery and the introduction of newly designed wind and water mills.

Privileges and Intermediaries: Bringing the Dutch to Livorno

In the evolving European geopolitical and economic landscape of the late sixteenth century, characterised by the progressive marginalisation of the Mediterranean and the rise of Northern Europe's maritime powers, the port of Livorno symbolised the ambition of the grand dukes of Tuscany, especially Ferdinando I de' Medici (r. 1587–1609), to secure a prominent position on the international stage and integrate into the expanding European trade networks.

No more than a castle and a dock until the last quarter of the sixteenth century, Livorno became the destination of major efforts by the first grand dukes of Tuscany to transform it into an important international port in the hope of revitalising trade and manufacture in their domains. The main endeavours were then directed to making it an attractive destination for foreign merchants, artisans, and seafarers who would have helped connect Tuscany to wider international trade circuits and contributed to local productive development. Thus, as early as the 1580s, an important urban expansion project was launched, providing the port with all the necessary infrastructure to accommodate a growing volume of traffic and population, from houses and warehouses to lazarettos, fortifications, and docks.⁷ To encourage migration and trade, appeals were made throughout the Mediterranean and Europe, offering generous incentives such as tax exemptions, forgiveness for past crimes, and religious tolerance to anyone who settled in the new port. The main example of these were the so-called Livornine of 1591 and 1593, aimed at attracting Jewish merchants, who received privileges superior to any other community in the grand ducal port.⁸ All these conditions proved effective in catalysing a growing flow of migration and trade from the Mediterranean area and beyond towards Tuscany, quickly transforming Livorno into a vibrant multicultural and multireligious centre.⁹

The port's appeal to foreigners was further enhanced by its status as a newly established commercial hub and city. As even Tuscan presence was scarce in its early years, the limited competition created significant opportunities for entrepreneurs to establish their activities. Unlike other major cities of the Italian Peninsula, Livorno also had no guilds or corporations to regulate the market and manufacture production; instead, economic authority rested solely with the grand duke. Ferdinando I eagerly supported those willing to bring capital into his domains, granting numerous trade and industrial privileges to foreign merchants and artisans who presented their business proposals to his officials.¹⁰ This facilitated the diffusion of new technologies and production in the emerging port.

As was common in these dynamics in early modern Europe, these processes of economic migration and circulation of knowledge were not always mass movements but rather

⁷ On Livorno's early stages of urban development, see Giuseppe Gino Guarnieri, *Livorno medicea nel quadro delle sue attrezzature portuali e della funzione economica-marittima: Dalla fondazione civica alla fine della dinastia medicea (1577–1737)* (Livorno, 1970); Olimpia Vaccari, "Il porto alle origini della 'città nuova' di Livorno," in *Livorno, 1606–1806: luogo di incontro tra popoli e culture*, ed. Adriano Prosperi (Turin: U. Allemandi, 2009), 302–23; Tazzara, *The Free Port of Livorno*; Lucia Frattarelli Fischer, *L'Arcano del mare: un porto nella prima età globale: Livorno* (Pisa: Pacini editore, 2018).

⁸ Felici, *La Livornina*.

⁹ Adriano Prosperi, ed., *Livorno, 1606–1806: luogo di incontro tra popoli e culture* (Turin: U. Allemandi, 2009); Addobbati, Aglietti, and Frattarelli Fischer, *La città delle nazioni*.

¹⁰ Tazzara, *The Free Port of Livorno*, 56–7. On the importance of guilds and licences in the economy of the early modern age, see also Carlo Marco Belfanti, "Guilds, Patents, and the Circulation of Technical Knowledge: Northern Italy during the Early Modern Age," *Technology and Culture* 45:3 (July 2004), 569–89; Epstein and Prak, *Guilds, Innovation, and the European Economy, 1400–1800*.

carried out by small groups or individuals. Moreover, the transfer of technicians and artisans from abroad was not always permanent, but instead temporary for the duration of a specific project or based on earning opportunities. In these activities, started to exploit local raw materials or carve out an exclusive space on different markets, technology and skilled labour were often brought directly from abroad. In many cases, local workers could be trained, favouring the transfer of knowledge to support future business expansion. Then, as regards the specific case of Livorno, there were also Tuscan merchants and agents of the grand duke abroad who identified profiles useful for the development of the port, acting as intermediaries between the court and these potential partners, entering into collaboration themselves in new activities, persuading foreign merchants and artisans to move, or even engaging in industrial espionage, learning how to reproduce useful foreign technologies at home.

The rapid growth of the grand duke's port in the last decade of the sixteenth century was also closely linked to a broader shift in international trade: the increasing presence of northern European merchants in the Mediterranean. Although English merchants had made sporadic visits to the area since the 1570s, it was only in the 1590s that this process gained significant momentum. A series of droughts, particularly severe on the Italian Peninsula, forced governments and sovereigns to procure grain from Baltic and Atlantic ports. Lacking their own commercial fleets, Italian states relied on northern European transporters and merchants – English, Hanseatic, and Dutch above all – who, as a result, began frequenting Mediterranean ports with greater regularity and eventually establishing permanent communities.¹¹ The direct financial involvement of Grand Duke Ferdinando I in this trade, combined with Livorno's particularly favourable conditions, contributed to making the Tuscan port one of the preferred destinations for these commercial flows.¹²

The arrival of Dutch ships loaded with grain in Livorno marked the first significant interaction between the Grand Duchy of Tuscany and the Republic of the United Provinces, two states that were geographically and, above all, politically distant.¹³ Although Tuscan merchants had traded profitably in Antwerp in the first half of the sixteenth century, the outbreak of the Dutch revolt against the Habsburg government in the 1560s had severed these ties.¹⁴ When the independent republic was born in 1581, with the conflict still ongoing, the Medici's deep dynastic and political ties with the Habsburgs prevented any relations

¹¹ There are numerous studies on this particular phenomenon, which is deeply intertwined with the debate on the economic divergence between Northern Europe and the Mediterranean starting from the end of the sixteenth century and already initiated by Fernand Braudel. On the subject see Gigliola Pagano De Divitiis, "Grano del Nord e carestie in Italia tra fine Cinquecento e inizio Seicento," *Miscellanea Di Studi Storici* 9 (1996), 147–82; Gigliola Pagano De Divitiis, *English Merchants in Seventeenth-Century Italy* (Cambridge: Cambridge University Press, 1997); Fernand Braudel, *Civiltà e imperi del Mediterraneo nell'età di Filippo 2* (Turin: Einaudi, 2010); Molly Greene, "Beyond the Northern Invasion: The Mediterranean in the Seventeenth Century," *Past & Present* 174:1 (1 February 2002), 42–71; Maria Fusaro, *Political Economies of Empire in the Early Modern Mediterranean: The Decline of Venice and the Rise of England, 1450–1700* (Cambridge: Cambridge University Press, 2015).

¹² Pagano De Divitiis, "Grano del Nord e carestie in Italia"; Tazzara, *The Free Port of Livorno*, 50.

¹³ On Dutch grain trade to the Mediterranean see P. C. van Royen, "The First Phase of the Dutch Straatvaart (1591–1605): Fact and Fiction," *International Journal of Maritime History* 2:2 (December 1990), 69–102; Jonathan I. Israel, *Dutch Primacy in World Trade, 1585–1740* (Oxford: Clarendon, 2002), 53–4; Milja van Tielhof, *The "Mother of All Trades": The Baltic Grain Trade in Amsterdam from the Late 16th to the Early 19th Century* (Leiden: Brill, 2002). Tazzara, "Port of Trade or Commodity Market?," 223.

¹⁴ On the Florentine community in Antwerp see Luca Maggiore, "De Italiaanse Kolonie Te Antwerpen (1598–1648)" (MA thesis, KU Leuven, 1998); Christophe Schellekens, "Merchants and Their Hometown: Florentines in Antwerp and the Duchy of Florence (ca 1500–1585)" (PhD diss., European University Institute, 2018). On the Dutch Revolt see Jonathan I. Israel, *The Dutch Republic: Its Rise, Greatness, and Fall; 1477–1806* (Oxford: Clarendon, 1998); Graham Darby, ed., *The Origins and Development of the Dutch Revolt* (London: Routledge, 2001); Anton van der Lem, *Revolt in the Netherlands: The Eighty Years War, 1568–1648* (London: Reaktion Books, 2018); P. M. H. Groen, *The Eighty Years War: From Revolt to Regular War, 1568–1648* (Leiden: Leiden University Press, 2019).

from being established.¹⁵ However, at the rise of Ferdinando I de' Medici, with the need for supplies, the particular convenience of chartering Dutch ships, of which there were many in the Baltic ports, as well as the importance of Dutch merchants and ports in this traffic, led to this obstacle being overcome.

Dutch ships hence constituted a major share of Livorno's maritime traffic since Ferdinando I's first years, but with them, also merchants from the republic began reaching Tuscany, facilitating a growing exchange of goods. Alongside cereals, they introduced staple commodities from Northern Europe, including salted fish, metals, and cheap woollen fabrics, which they traded for local products such as oil, rice, wine, alum, and fine silk textiles, as well as other goods imported from across the Mediterranean.¹⁶ With the flourishing of trade, an increasingly stable presence was established in the port, as witnessed by the election of a consul in 1597, shared with the Hanseatic merchants, and finally by the formal constitution of the *Nazione Olandese-alemannica* (Dutch-German Nation) in 1608.¹⁷ Such an association was not unusual in the early modern period, when the concept of nationality was more flexible than today. It was common for merchants from neighbouring geographical or cultural regions engaged in similar trades to be represented by the same consul, as was also the case in Genoa, where a single consul served German, Dutch, and English traders concurrently.¹⁸ Although Germans were initially the more numerous and influential group, the Dutch presence in Livorno eventually became dominant.

However, even within this community there was significant heterogeneity. The terms "Olandesi" (Dutch) or the more common "Fiamminghi" (Flemish), often used interchangeably in Tuscan sources, referred to natives of the northern provinces of the Low Countries but also, especially in the early years, to Antwerp merchants who had relocated to Dutch ports.¹⁹ In fact, as the war in the Low Countries progressed, the port of Antwerp, a dominant commercial hub in previous decades, began to decline, prompting a mass migration of its inhabitants, particularly Protestants, to cities and ports of the Dutch Republic in search of refuge and economic opportunity.²⁰ In many cases, it was the Flemish merchants who had closer contacts with the Italian Peninsula, thanks to trade in Antwerp in previous decades, and therefore they were the ones to start the first shipments from the republic towards the Mediterranean. Religious diversity further characterised the Dutch merchant community of Livorno, which included both Catholics and Protestants. However, this did not pose particular conflict; while Protestants could not openly practice their faith, unlike the Jews, nor proselytise, they were generally tolerated by the grand duke, who prioritised economic prosperity and sought to facilitate trade in every possible way.²¹

In fact, it did not escape the attention of the grand duke and the Tuscan merchants that the republic was becoming an increasingly important player on the international trade scene; its ports, with Amsterdam in the foreground, were progressively taking that role from Antwerp as a link between Northern Europe, the Mediterranean, and even the oceans, with Dutch ships starting to sail in ever-increasing numbers on the routes to Asia and the

¹⁵ Unfortunately there are not many studies regarding the position and involvement of the Grand Duchy of Tuscany in the revolt in the Netherlands. For some essential references see Veen and McCormick, *Tuscany and the Low Countries*; Nina Lamal, *Italian Communication on the Revolt in the Low Countries (1566–1648)* (Leiden: Brill, 2023).

¹⁶ Engels, *Merchants, Interlopers, Seamen and Corsairs*, 34–8.

¹⁷ Archivio di Stato di Firenze (hereafter, ASF), Pratica Segreta, 190, c. 28–29, 13 March 1597. Engels, *Merchants, Interlopers, Seamen and Corsairs*, 125–6; Pessina and Papini, *Gli 'olandesi-alemanni' a Livorno*, 34.

¹⁸ Engels, *Merchants, Interlopers, Seamen and Corsairs*, 126.

¹⁹ *Ibid.*, 129–30.

²⁰ Oscar Gelderblom, *Zuid-Nederlandse Kooplieden En de Opkomst van de Amsterdamse Stapelmarkt (1578–1630)* (Hilversum: Verloren, 2000).

²¹ Regarding the acceptance of Protestants in Livorno, see Villani, "Protestanti a Livorno."

Americas.²² These trades had profound repercussions on the republic's economy, not only considerably increasing the commercial offer but also stimulating a rapid growth in manufacture production in traditional sectors, such as textiles, brewing, and metalworking, and in those linked to the "rich trades" in which the Dutch were increasingly involved, such as sugar refining or silk processing.²³ This economic development was sustained, but at the same time it fuelled a considerable level of technological innovation, favoured by a particular internal dynamism, but above all by the progressive influx of migrants. Traders or specialised craftsmen from Flanders, but also from France, Portugal, and Germany settled in the republic since the last decade of the sixteenth century, where they found conditions particularly favourable to the development of their activities.²⁴ However, as competitiveness increased, many from the republic looked to new markets to expand their activities, leveraging the technologies widespread in their homeland.

The rapprochement between Tuscany and the Dutch Republic, facilitated by trade in Livorno, favoured mutual understanding and interest in further opportunities for collaboration. For Tuscan merchants and especially for the grand duke, this presented an opportunity not only to integrate Tuscany into more profitable commercial networks by taking advantage of the recent global expansion of the Dutch, but also to increase exports by collaborating with the Dutch to start new local production initiatives. At the same time, Livorno's favourable conditions for commercial and industrial development, together with the grand duke's receptiveness to such initiatives, encouraged some Dutch entrepreneurs to seek his patronage to start their activities here.

However, the convergence of these interests was neither immediate nor simple in this initial phase of relations at the beginning of the seventeenth century. Despite the grain trade and the increasing arrival of Dutch ships in Livorno, the Mediterranean remained a relatively unknown arena for Dutch merchants, and their stable presence in the port was still limited. Furthermore, the ongoing war in the Netherlands complicated interactions between the grand duchy and the Dutch Republic, not only exposing trade routes to the risk of Spanish attacks but also limiting the ability of the grand duke and Tuscany to engage directly with the Dutch market. In fact, there were no Tuscan merchants or other contacts operating in the republic at this stage, but those remaining in the Netherlands were concentrated, for both political and religious reasons, in Spanish Flanders.²⁵ Among them were some merchants in Antwerp, together with a handful of Tuscan adventurers who had enlisted in the Spanish army in Flanders.²⁶ Nevertheless, it was precisely the interactions within these informal networks, between the first Dutch merchants in Livorno on the one hand and the few Tuscans remaining in Flanders on the other, together with some agents sent undercover by the grand duke to the republic, that allowed the latter to identify

²² Engels, *Merchants, Interlopers, Seamen and Corsairs*, 64–7; Israel, *The Dutch Republic*, 303 and following.

²³ Davids, *The Rise and Decline of Dutch Technological Leadership*, 115–98.

²⁴ On foreign contribution to Dutch technological and economic development, see Gelderblom, *Zuid-Nederlandse Kooplieden*; Clé Lesger, *The Rise of the Amsterdam Market and Information Exchange: Merchants, Commercial Expansion and Change in the Spatial Economy of the Low Countries, c. 1550–1630* (Aldershot, UK: Ashgate, 2006); Davids, *The Rise and Decline of Dutch Technological Leadership*, 207–19.

²⁵ Pope Clement VII issued a bull in 1596 forbidding merchants and Italians in general to reside in countries where Catholic worship was not freely permitted, creating serious inconvenience for those already trading in Protestant-majority territories such as Germany or England, as well as the northern Netherlands. Francesco Vitali, *I nunzi Pontifici nella Firenze di Ferdinando I (1587–1609)* (Rome: Edizioni Nuova cultura, 2017), 137; Paola Volpini, Ramiro Domínguez Hernanz, and Francisco Zamora Rodríguez, *Los Medici y España: príncipes, embajadores y agentes en la Edad Moderna* (Madrid: SILEX, 2017).

²⁶ About Tuscan soldiers in Flanders, see Gregory Hanlon, *The Twilight of a Military Tradition: Italian Aristocrats and European Conflicts, 1560–1800* (London: UCL Press, 1998), 63, 80; Maurizio Arfaio, "Bastion of Empire: The Italian Terzo Vecchio of the Army of Flanders (1597–1682)," *Journal of Military History* 85:1 (January 2021), 27–50; Lamal, *Italian Communication on the Revolt in the Low Countries*, 31–46.

potential useful profiles and promising partners for the introduction of new commercial and productive activities in Livorno.²⁷ At the same time, it was this intermediary network that allowed Dutch merchant-entrepreneurs to establish links with the Tuscan court and seek its support for their commercial endeavours.

The meeting of interests between the grand ducal court and the Dutch merchant-entrepreneurs was therefore a non-linear process, but multifaceted and mediated, made up of research, repeated negotiations, proposals, and experiments. In this dynamic, the Tuscan court and its officials, both official and informal, and the Dutch merchant-entrepreneurs themselves played a fundamental and complementary role, putting the two realities in contact. The following section will explore specific episodes in which these factors came into play, leading to the transfer of people, goods, knowledge, and technologies between the Netherlands and Tuscany, albeit with varying degrees of success.

The Quest for Sugar

The first case we intend to examine in this study did not actually begin in the Republic of the United Provinces or Livorno, but in Antwerp, which, despite its decline, was still a crucial crossroads for Tuscan and Dutch business at the beginning of the 1600s and a primary commercial hub.²⁸ Here in fact was Don Giovanni de' Medici, half-brother of Grand Duke Ferdinando I and a talented military engineer, who had arrived for his second stay in the Flanders in 1602 to follow the developments of the war in the ranks of the Spanish army.²⁹ When he was not in the field, especially during winter breaks from military operations, he spent most of his time in the port on the Scheldt, serving as a crucial intermediary between the Medici court and merchants or entrepreneurs whom Ferdinando I sought to attract to his port.³⁰ It was on this occasion that he was entrusted with the task of investigating whether there was anyone willing to collaborate in the creation of a sugar refinery in Livorno, a project long sought after by the Medici family.

²⁷ Unfortunately, there are no works uniquely devoted to the network of agents and spies of the Grand Duke of Tuscany, which were fundamental elements of his international strategy. We can, however, find in the numerous diplomatic and economic studies on the Medici family the presence of these figures with the most varied profiles. See Paola Volpini, "Una storia di spie tra Ferdinando I di Toscana e Filippo II di Spagna (fine secolo XVI)," *Archivio Storico Italiano* 163:2 (June 2005), 229–58; Hans Cools, Marika Keblusek, and Badeloch Noldus, eds., *Your Humble Servant: Agents in Early Modern Europe* (Hilversum: Uitgeverij Verloren, 2006); Brendan Dooley, "Making It Present," in *The Dissemination of News and the Emergence of Contemporaneity in Early Modern Europe*, ed. Brendan Dooley (Farnham, UK: Routledge, 2010), 95–114; Sheila Barker, "'Secret and Uncertain': A History of Avvisi at the Court of the Medici Grand Dukes," in *News Networks in Early Modern Europe*, ed. Joad Raymond and Noah Moxham (Leiden: Brill, 2016), 716–38; Brege, *Tuscany in the Age of Empire*; Davide Trentacoste, "All the Grand Dukes' Men: An Overview of the Persian Information Network of Medici Tuscany between 1600 and 1639," *Mediterranean Historical Review* 38:1 (2 January 2023), 93–111.

²⁸ Herman van der Wee, *The Growth of the Antwerp Market and the European Economy: Fourteenth–Sixteenth Centuries. II Interpretation* (Dordrecht: Springer, 1963), 274–8.

²⁹ On Don Giovanni de' Medici and his stay in the Low Countries (1587–89; 1602–5) see Paola Volpini, "Medici, Giovanni de'," in *Dizionario biografico degli italiani* (Rome: Istituto della Enciclopedia italiana, 2009); Brendan Dooley, "Le battaglie perse del Principe Giovanni," *Quaderni Storici* 39:115 (April 2004), 82–117; Brendan Dooley, "Art and Information Brokerage in the Career of Don Giovanni de' Medici," in *Your Humble Servant: Agents in Early Modern Europe*, ed. Hans Cools, Marika Keblusek, and Badeloch Noldus (Hilversum: Uitgeverij Verloren, 2006), 81–97; Marina Macchio, *Il Discorso del Sig.re Cosimo Baroncelli fatto a' suoi figliuoli dove s' intende la vita di Don Giovanni Medici* (Florence: Nicomp Saggi, 2009).

³⁰ Just to mention one of the examples of this scouting and mediation activity of Don Giovanni in Flanders, in 1589, during his first stay in the north, he had organised the journey of important Flemish tapestry master Jean River of Namur and his apprentices to Florence, where they were employed in the service of Ferdinando I. ASF, Mediceo del Principato (hereafter, MdP), 5151, c. 360, 7 March 1589.

Although promising significant profits, such a venture required numerous preconditions for its effective implementation, including a continuous supply of raw material; specific tools such as ovens, large copper basins and a large collection of pottery; and specialised labour. Principal refinery centres in Europe thus emerged from the late fifteenth century in those ports with easy access to sugar cane production areas both in the Mediterranean, as for Venice with Cyprus, or Lisbon and Antwerp with Brazil and the other Iberian territories in the Atlantic. Here, imported raw sugar was boiled several times and purified with lime, egg white, or ox blood to obtain refined products in varying degrees of purity, which was then resold to greater profits. The development of this industry transformed sugar from a luxury good reserved for the consumption of courts and the wealthiest, as well as for use in pharmacology, to a consumer good.³¹

Although Tuscany, first in Pisa and then in Livorno, received shipments of sugar from the Levant and Portugal, and some Florentine families even managed to settle in Brazil and own plantations, the refining industry struggled to develop.³² The first attempt came in 1576, when some Portuguese New Christians, crucial actors for the spread of American commodities in Tuscany, opened the first refinery in the city of Pisa.³³ However, this activity does not seem to have survived the last decades of the century. It was probably difficult to have a regular and cheap supply of raw sugar, as ships from the Americas always had to pass through Lisbon and Seville before sailing to any other destination, and production in the Mediterranean was in the hands of the Venetians. Therefore, with the purchase costs of raw materials at a higher price to the transport costs and those of equipment and plant start-up, together with a probable scarcity of suitable labour, it must have taken years to create a truly profitable sugar industry in Tuscany.

To overcome these difficulties, during the reign of Ferdinando I, several attempts were made to negotiate with the court in Madrid, which from 1580 also ruled Portugal and its overseas dominions, for a licence to send ships directly from Livorno to Brazil, avoiding the obligatory passage through Lisbon. This was again a joint initiative with Portuguese merchants, the Ximenes, long established in Tuscany, who intended to establish a new refinery in the port of Livorno and start a profitable sugar trade.³⁴ However, negotiations conducted by Medici ambassadors in 1591 and again in 1594 were both unsuccessful. The Habsburgs' distrust of direct foreign participation in trade with their colonies, as well as the risk of creating a production centre that could potentially compete with Lisbon, led to the ultimate failure. Facing such hostility, the grand duke and his subjects explored alternative routes.

³¹ On the sugar trade and industry in Europe and Italy in the early modern age see Christopher Ebert, *Between Empires: Brazilian Sugar in the Early Atlantic Economy, 1550-1630* (Leiden: Brill, 2008); Stuart B. Schwartz, ed., *Tropical Babels: Sugar and the Making of the Atlantic World, 1450-1680* (Chapel Hill: University of North Carolina Press, 2004); E. Stols, "The Expansion of the Sugar Market in Western Europe," in *Tropical Babels: Sugar and the Making of the Atlantic World, 1450-1680* (Chapel Hill: University of North Carolina Press, 2004), 237-88; Alessandro Favatà, "Pratiche di circolazione e di consumo di un bene globale in età moderna: lo zucchero nella penisola italiana del XVII secolo" (PhD diss., Università degli Studi di Padova, 2024).

³² The Florentine families of Cavalcanti and Giralaldi became important landowners in Brazil during the sixteenth century and managed to be integrated into the Portuguese nobility. See Brege, *Tuscany in the Age of Empire*, 60-1; Favatà, "Pratiche di circolazione e di consumo," 37.

³³ Marco Tangheroni, ed., *Pisa e il Mediterraneo: Uomini, merci, idee dagli Etruschi ai Medici* (Milan: Skira, 2003), 318.

³⁴ The Ximenes family had members all throughout the major economic centres of Europe – Lisbon, Seville, Cadiz, Florence, Livorno, Venice, Hamburg, and mostly Antwerp – where they dedicated to the trade of spices, sugar, grain, gems, wood, textiles, and books. They also married into prominent Low Countries families and had familial ties with other successful Portuguese merchant clans, including the D'Evora and the D'Andrade. On the Ximenes and their projects see Ebert, *Between Empires*, 70; Francisco Bethencourt, *Strangers Within: The Rise and Fall of the New Christian Trading Elite* (Princeton, N.J.: Princeton University Press, 2024); Favatà, "Pratiche di circolazione e di consumo," 37-8.

This brings us to Ferdinando I's request to Giovanni de' Medici in Antwerp, the most important centre for the trade and refining of sugar in Europe in the sixteenth century.³⁵ Here, in fact, the particular connection with Lisbon and Brazil, guaranteed not only by the frequentation of Portuguese merchants but also by the participation of the Flemish themselves in the plantations and then in the transport and redistribution of the final product, had guaranteed an important development of this industry. Although with the outbreak of war in the Low Countries and the naval blockade of the Scheldt by the Dutch navy, traffic was progressively diverted towards the ports of the Dutch Republic, Antwerp continued to be a crucial centre for its management, and contacts across the border remained crucial.³⁶ In fact, the Spanish embargoes on Dutch ships, especially in the early 1600s, were not applied with the same severity as in previous years, and many Dutch ships, especially those sent by Antwerp merchants, managed to sail to Portuguese territories. For these reasons, it did not take long for Don Giovanni to find people interested in the grand duke's projects.

Once word of the grand duke's intentions had spread, in January 1603 Florentine merchant Alessandro di Giunta introduced Don Giovanni to another influential player on the market, the Fleming Maximilian Hulscher, long involved in the trade between the Low Countries, Portugal, and Brazil.³⁷ A detailed memorandum outlining the merchant's proposal was soon sent to Florence. The merchant was prepared to invest a capital of 60,000 scudi and had already arranged to ship six hundred to eight hundred boxes of sugar from the ports of Zeeland in the Dutch Republic to Livorno to kickstart the refinery's activity. Additionally, one of their ships was ready to depart from Hamburg – another strategic port used by the Dutch to bypass the Spanish embargoes – destined for Brazil, with instructions to sail directly to Livorno without any intermediate stops.³⁸ In exchange, Hulscher sought an exclusive monopoly from the grand duke on the trade and refining of sugar from Brazil, the Canary Islands, and São Tomé in Tuscany, a crucial guarantee to safeguard the investment in a new and distant market like Livorno. Unfortunately, the sources do not provide any information regarding the tools needed to establish the production plant, whether they were to be brought from the Low Countries or to be newly made in Livorno by Flemish technicians. The same lacuna concerns the labour to be employed in the workshop. We can assume that Hulscher would have provided for these needs, taking advantage of his contacts in Antwerp and the Dutch Republic to arrange for their transportation to Tuscany.

Such a proposal was accurately evaluated. In the opinion of Don Giovanni de' Medici, intermediary between the parties, Hulscher's offer was fair and promising, with good guarantees for the grand duke. The activity would in fact stimulate a considerable economic return, not only from the commercial point of view, but also as regards the general economy of Livorno, making use of many houses and warehouses. He optimistically predicted that other Flemish merchants would probably join in if the enterprise was successful, each contributing two or three ships a year to Livorno, thus stimulating production even more. However, if the agreed quantity of imported and refined sugar was not respected, the privilege granted could easily be revoked, preventing any abuse or speculation.³⁹ In any case, to guarantee a thorough assessment, Don Giovanni sent to Florence Giovanni Battista Ghinucci, a Florentine merchant himself, with the task of personally discussing the proposal

³⁵ Yda Schreuder, *Amsterdam's Sephardic Merchants and the Atlantic Sugar Trade in the Seventeenth Century* (New York: Springer, 2018); Stols, "The Expansion of the Sugar Market," 258–67.

³⁶ Ebert, *Between Empires*, 81.

³⁷ ASF, MdP, 5155, c. 127, 10 January 1603; Ivi., c. 155, 24 January 1603. On Maximilian Hulscher see Ebert, *Between Empires*, 79.

³⁸ ASF, MdP, 5155, c. 155, 24 January 1603. Ivi, c. 166, 29 February 1603.

³⁹ ASF, MdP, 5155, c. 166, 28 February 1603; Ivi, c. 375, 7 March 1603.

with the grand duke. However, even though he was particularly expert in the field, Don Giovanni specified, Ghinucci intended to start the same business from Lisbon to Livorno.⁴⁰

As the matter disappeared from Don Giovanni's correspondence in March 1603, it is difficult to reconstruct its development. However, there is no evidence of granted privileges for sugar trade in the following months, and no refinery was built in Livorno. It is possible that the political risks, given the Spanish court's hostility towards this trade, were considered too great. At the same time, it is also plausible that Hulscher's conditions were considered excessive, as the grand duke did not intend to grant a foreign merchant full control of such a profitable trade. With this in mind, it is also very likely that the other merchants involved in the sugar trade in the grand duchy, such as Giovanni Battista Ghinucci or the Ximenes family, with similar ambitions, had persuaded Ferdinando I to curb the initiative. Without further evidence, the exact cause of the failure remains speculative.

Despite this first setback, the Dutch method still seemed promising. A few years later, in 1605, another proposal reached the grand duke's court, this time from Isaac Lus of Amsterdam. He was a member of a wealthy merchant family of Piedmontese origin, long established in the Dutch Republic and among the first "Dutch" to settle in Livorno thanks to the grain trade. From here they quickly managed to establish a relationship of trust with the court of Ferdinando I de' Medici, becoming crucial commercial agents on the Dutch market and towards Russia, their main area of activity, and useful informants regarding both trade and the war in the Flanders.⁴¹ Taking advantage of this relationship, they tried to strengthen their position in the Livorno market, presenting ambitious commercial proposals to Grand Duke Ferdinando I in exchange for exclusive privileges and financial support.⁴² Among these we can find a detailed report with precise instructions on how to organise trade with Brazil from Amsterdam and start a refinery in Livorno with large profits.⁴³ Despite the sugar industry being relatively new in the Dutch Republic, with the first refinery opening in Amsterdam in 1597, the increased availability of raw materials thanks to the smuggling and raiding operations of Dutch ships on the Atlantic routes, and the contribution of immigrants from Antwerp and Portugal, it did not take long before it became widely spread.⁴⁴ Consequently, even merchants like Lus, although not yet directly involved, could acquire crucial knowledge to export this traffic to other less competitive markets such as Livorno.

According to their proposal, the grand duke had to obtain the necessary navigation licences not only from the king of Spain but also from the Dutch Republic, which had by

⁴⁰ The merchant Giovan Battista Ghinucci was particularly dedicated to the sugar trade from Portugal, which he re-exported to Northern European ports such as Hamburg and Antwerp. In later years Ghinucci forged important relationships with Dutch merchants, entering into trade with Russia together with Jan Thijszoon Vleushower. ASF, MdP, 5155, c. 166, 28 February 1603; Archivio di Stato di Venezia (hereafter, ASV), Notarile, Catti 3370, c. 167, 29 April 1599; Jarmo Kotilaine, *Russia's Foreign Trade and Economic Expansion in the Seventeenth Century: Windows on the World* (Leiden: Brill, 2005), 71; ASF, MdP, 5155, c. 180, 17 March 1603, Don Giovanni de' Medici to Ferdinando I de' Medici.

⁴¹ On the Lus family and their relationship with Grand Duke Ferdinando I, see Annie Versprille, "Sion Luz, Tafelhouder," *Jaarboekje oor geschiedenis en oudheidkunde van Leiden en omstreken*, 1957, 106–18; Engels, *Merchants, Interlopers, Seamen and Corsairs*, 136–7; Massimo Bomboni, "Da Amsterdam a Livorno: I commerci internazionali della famiglia Lus," in *La Livornina: alle origini di Livorno, città cosmopolita in età moderna*, ed. Lucia Felici (Rome: Viella, 2024).

⁴² Among the various proposals of the Lus, we can mention their attempt to obtain the privilege on the trade of salted fish from Amsterdam to Livorno or their attempt to establish a triangular trade between the Netherlands, Tuscany, and Russia. ASF, Miscellanea Medicea (hereafter, MM), 94, ins. 25, c. 1, 1 May 1603; ASF, MdP, 921, c. 287, 22 January 1604; Bomboni, "Da Amsterdam a Livorno."

⁴³ ASF, MM, 97, ins. 89, c. 3, date missing, probably 1605. "Dissegnando ancora S. A. S. sopra il susditto negotio di traficar in Brasilia per introdur a Livorno la rafineria de succari [...]"

⁴⁴ Davids, *The Rise and Decline of Dutch Technological Leadership*, 188.

now become an unavoidable presence on the Atlantic routes. Then, the necessary ships had to be purchased or rented in Amsterdam, as chartering costs to South America were more convenient than the Mediterranean, resulting in lower prices for the goods. Ships had to be loaded with Dutch textiles or Canary wine, which were the best goods to sell in Brazil. Once returned to Livorno with raw sugar, the vessels would have been loaded again with refined sugar already produced in the port, together with alums, salt, and rice to sell in the Netherlands. A fully efficient triangular system would be established, with the port of Livorno finally integrated into the major international trade circuits. The Lus family would have presumably assumed a crucial role in this system, taking care of logistics and acting as crucial partners for the grand ducal court, which would have had to bear most of the costs.

However, this initiative was abandoned at an early stage. If the Spanish licences were difficult to obtain, the Dutch ones were no less so. After the request was sent to the States General of the United Provinces through the Tuscan ambassador in Paris, no reply followed. French ministers then told the ambassador that the Dutch were now so involved and jealous of the trade towards the Americas that the republic had denied the same licence even to the king of France, Henri IV of Bourbon.⁴⁵ These nearly insurmountable difficulties were further compounded by the rapid decline of the Lus family, which went bankrupt in 1606, bringing any further progress on the project to a halt.

At the death of Grand Duke Ferdinando I de' Medici in 1609, neither the Dutch, the Tuscans, nor other foreign merchants managed to set up a sugar refinery in Livorno, nor even establish a direct trade with South America. Although shipments of sugar continued to reach the port from Portugal and the Mediterranean, often on Dutch ships, the impossibility of guaranteeing a continuous supply and, above all, of ensuring direct control by the grand duke and his collaborators prevented any real progress in this endeavour.⁴⁶

It was only in 1624 that the first sugar refinery was founded in Livorno, not by chance by a Dutch company. However, conditions had now changed. Dutch trade, smuggling, and raids across the Atlantic had increased considerably after the founding of the West India Company in 1621, guaranteeing a greater quantity of American products, including sugar, in the hands of Dutch merchants.⁴⁷ At the same time, the Dutch community in Livorno had grown considerably, acquiring a much greater weight and influence compared to the beginning of the century.⁴⁸ It was therefore in this new phase that Nicholaas du Gardijn, influential Amsterdam merchant and West India Company shareholder, managed to obtain a ten-year monopoly to build and manage a sugar refinery in the port of Livorno from Grand Duke Ferdinando II de' Medici.⁴⁹ The necessary materials and tools were shipped to Tuscany from the Dutch Republic, and another Dutchman, Bernard Jansz van Ens, was sent by du Gardijn to manage the workshop, and possibly to train the necessary workforce directly in the port. The following year, the profitability of this production was such that a second refinery could be built.

⁴⁵ ASF, MdP, 4617a, c. 426, 27 April 1605. On the French commercial projects in the Atlantic, see Guillaume Lelièvre, "Les précurseurs de la Compagnie française des Indes orientales, 1601–1622" (PhD diss., Université de Caen Basse Normandie, 2014).

⁴⁶ ASF, MdP, 2138, c. 462, 4 November 1602; ASV, Notarile, Catti 3376, c. 165, 22 March 1603; ASF, MdP, 2138, c. 551, 13 July 1603; ASF, Ufficiali di Sanità, 135, c. 282, 28 April 1608; Ivi, c. 532, 27 December 1608; Ivi, c. 794, 19 January 1610.

⁴⁷ Johannes Postma and V. Enthoven, eds., *Riches from Atlantic Commerce: Dutch Transatlantic Trade and Shipping, 1585–1817* (Leiden: Brill, 2003), 77–114. Davids, *The Rise and Decline of Dutch Technological Leadership*, 188; Stols, "The Expansion of the Sugar Market," 272–3. In 1607, there were only three to four sugar refineries in the entire territory of the Dutch Republic. In 1622, there were twenty-two.

⁴⁸ Engels, *Merchants, Interlopers, Seamen and Corsairs*; Ghezzi, *Livorno e l'Atlantico*.

⁴⁹ Engels, *Merchants, Interlopers, Seamen and Corsairs*, 143–4; Stols, "The Expansion of the Sugar Market," 274. ASF, MdP, 4258, cc. 184, 23 January 1624; Ivi, c. 300, 16 July 1624.

The Deception of Salt and Mills

Among the several Netherlanders who had frequent contact with the Italian Peninsula in the early seventeenth century, one of the most eclectic surely was Abraham van Tongerlo (1569–1623), merchant, engineer, and inventor. He was a member of a renowned family of Antwerp merchants who had moved to the Dutch Republic, and throughout his life he travelled the length and breadth of Europe in search of commercial opportunities and patrons interested in his projects.⁵⁰ In May 1603, his journeys took him to Livorno, where he presented to the grand duke's officials a plan to build a salt refinery using the latest techniques developed in the Netherlands, along with several windmills of his design.⁵¹

It is well known that salt has been an essential commodity throughout history for human life, closely linked to food production and preservation, especially before the advent of refrigeration and canning technologies. Given the universal use and consumption of this product, every government has been careful to manage and distribute it, from which considerable profits could be made, either through taxation or direct trade. In the early modern era, the salt industry was an important economic sector in the Low Countries, closely linked to the even more crucial fishing industry, allowing the catch to be preserved and transported safely over long distances.⁵² Although the Dutch tried to maximise local salt production by boiling sea brine, in the sixteenth century the Dutch were heavily dependent on salt imports from abroad. Primary sources of raw salt were the Portuguese ports of Aveiro and Setúbal, from where it was taken to Zeeland for refining before its consumption or re-export to the Baltic.⁵³ However, during the Dutch Revolt, embargoes imposed by the Habsburgs prompted Dutch merchants to find alternative sources. Hence, not being able to buy salt freely, the Dutch began to smuggle it and collect it illegally in the Spanish territories of South America, especially at the natural salt pans of Punta de Araya, in what is now Venezuela.⁵⁴ Similarly, since the late Middle Ages, the Low Countries, and further on during the seventeenth century, the Dutch Republic, were at the forefront of windmill technology, employed in several economic activities, from milling grains to sawing woods, textile manufacture, and water drainage.⁵⁵

Van Tongerlo's projects were expected to be profitable and very useful for the development of Livorno and for the grand duchy in general. Even though Tuscany was a modest salt producer, with its primary gathering sites along the coast near Pisa and Grosseto or in underground deposits near Volterra, the port of Livorno could be easily supplied with salt from all the main production areas in the Mediterranean as Cyprus, Malta, Sicily, and any other areas with exposed, sunny coasts.⁵⁶ Therefore, not only for internal consumption but

⁵⁰ He had also been a middleman in various dealings that involved Dutch and Italians, as for the Venetian Francesco Morosini, for whom in 1598 he arranged the purchase of a Dutch ship in Amsterdam to transport grains to Italy. To Schulting and Beverley Jackson, *Sant'Agata Morosina, an Argosy: An Episode in the Commercial, Diplomatic and Artistic Relations between Venice, Amsterdam and London, 1595–1609* (Florence: Centro Di, 2005); Buning, *Knowledge, Patents, Power*, 217.

⁵¹ ASF, MdP, 919, c. 361, 23 October 1603.

⁵² About the Dutch salt trade and fishing industry in the early modern age, see Israel, *Dutch Primacy in World Trade*, 22–3; Louis Sicking and Darlene Abreu-Ferreira, eds., *Beyond the Catch: Fisheries of the North Atlantic, the North Sea and the Baltic, 900–1850* (Leiden: Brill, 2009).

⁵³ Cátia Antunes, "The Commercial Relationship between Amsterdam and the Portuguese Salt-Exporting Ports: Aveiro and Setúbal, 1580–1715," *Journal of Early Modern History* 12:1 (2008), 25–53.

⁵⁴ Postma and Enthoven, *Riches from Atlantic Commerce*, 62.

⁵⁵ Karel Davids, "Successful and Failed Transitions: A Comparison of Innovations in Windmill-Technology in Britain and the Netherlands in the Early Modern Period," *History and Technology* 14:3 (April 1998), 225–47; Davids, *The Rise and Decline of Dutch Technological Leadership*, 51.

⁵⁶ ASF, MM, 27/II, cc. 572, 579, probable date 1597; Richard A. Goldthwaite, *Economy of Renaissance Florence* (Baltimore: Johns Hopkins University Press, 2011), 524. Fabrizio Borelli, *Le saline di Volterra nel Granducato di Toscana* (Florence: L. S. Olschki, 2000).

also for the possibility of increasing exports, the Medici always paid great attention to the possibilities of improving salt production in their territories. Even before van Tongerloo's arrival, at the end of 1590, Ferdinando I de' Medici received a request from a certain Ottavio Aringhieri, whose exact origin is unknown, for an exclusive privilege to implement a highly effective method of refining salt of his own invention. Since it did not require the sun or metal kettles, it promised an unprecedented purity of the final product, with lower costs and therefore higher profit margins.⁵⁷ However, it does not appear that such privilege was ever granted. As for the mills, such machines would have been useful for producing flour from the grains that the Dutch regularly transported to Livorno and would have supported both the rapidly growing population and the flourishing trade in which Ferdinando himself was involved. Furthermore, it cannot be ruled out that if these machines proved effective, they could have been adopted in other areas of Tuscany and other industrial sectors.

Van Tongerloo's arrival in Livorno seems not just a simple coincidence, but the result of a carefully elaborated plan by Abraham Lus, brother of Isaac, who we have already seen involved in the sugar projects. Lus and van Tongerloo seemed to boast long-standing contacts, probably for their involvement in the grain trade and respective important contacts in Venice.⁵⁸ Given Lus's strong connections in Livorno and his close ties to the Tuscan court, it is plausible that the Flemish sought his assistance in securing an audience with the grand duke. Alternatively, Lus may have recognised the potential of van Tongerloo's expertise and encouraged him to come to Tuscany, knowing that his innovative proposals would likely receive a favourable reception. For Lus, this was yet another opportunity to reaffirm his family's ties to the Medici court and potentially obtain rewards. The two men struck an agreement not to interfere in each other's business ventures. In exchange for Lus's support in gaining the grand duke's favour, van Tongerloo promised to share half of the profits from the salt refinery, for which he sought an exclusive privilege.⁵⁹ However, Lus's contribution went far beyond this agreement.

While the mills did not seem to arouse much interest in the grand duke, the salt refinery project prompted him to get directly involved in its organisation. However, technical obstacles soon emerged. As for sugar refining, salt production also required great investments and specific tools, principally large metal cauldrons for boiling brine.⁶⁰ Unfortunately, no artisan in Livorno was capable of producing such tools of the necessary size and quality, forcing the court to commission them in the Netherlands and have them shipped.⁶¹ Unexpectedly, the grand duke bypassed van Tongerloo and entrusted the order to Abraham Lus, also instructing him to recruit an expert Dutch salt maker and organise his journey to Livorno. We can assume that it was Lus himself to have persuaded the grand duke not to grant an exclusive monopoly to the Flemish, pushing for more direct control of the enterprise by the court and offering in exchange a more advantageous agreement and greater

⁵⁷ ASF, MM, 27/II, c. 270.

⁵⁸ In 1596, van Tongerloo assisted Francesco Morosini, the Venetian envoy to Amsterdam and future trading partner of the Lus brothers, in purchasing grains. It was probably on this occasion that the three had their first contact. Also, van Tongerloo and Lus may have met in Venice, where the former had a permanent residence and the latter a business base.

⁵⁹ ASF, MdP, 919, c. 361, 23 October 1603; Ivi., 1290, c. 60-63, 5 July 1605.

⁶⁰ Although from a few centuries later, an interesting description of salt refining techniques of the Dutch can be found in the book by William Brownrigg, *The Art of Making Common Salt, as Now Practised in Most Parts of the World* (London, printed by C. Davis, 1748), chapter 8: "Of the Dutch method of preparing salt upon salt. ... Their salt pans are made of iron, commonly of a round form, and of an extra-ordinary magnitude; being usually forty feet in diameter, and eighteen inches deep; and are bound round very strongly with large bars of iron. These pans are placed over a hearth furnace. The fuel which they burn in these furnaces is altogether turf, which they endeavour to procure as dry as possible; wet turf being found to corrode their pans, and to make them consume more quickly than that which is dry. The pan being filled with brine, and the fire kindled, the brine is made to boil violently."

⁶¹ ASF, MdP, 917, c. 311, 26 July 1603.

guarantees regarding the future commercialisation of refined salt in the Dutch Republic. Salt from the Mediterranean would in fact have become a competitive product on the Dutch market, being generally considered of better quality than that from Northern Europe.⁶² Moreover, compared to that imported from the Americas, given the lower risks and costs of navigation, it would have been sold more easily and at lower costs. In the end, van Tongerlo was excluded from an enterprise he had initially proposed.⁶³

By late November 1603, the iron cauldron was completed and en route to Tuscany on a Lus ship, while the departure of the salt master and his assistants, recruited by Lus in the city of Zierikzee, was delayed by the outbreak of plague in Zeeland.⁶⁴ Despite this setback, the project's framework remained intact. The salt master and his team were expected to spend six to eight months in Tuscany, during which they would establish the refinery's operations and train personnel selected by the grand duke to ensure its long-term success. Understanding the importance of securing the salt master's commitment, Lus made arrangements for his family's well-being, advancing a month's salary to his wife as a goodwill gesture.⁶⁵ Lus also took meticulous precautions regarding the newly crafted cauldron, instructing that it remain untouched until the master's arrival to avoid any potential damage. Additionally, he proposed that, once the master arrived and assessed the available resources, a second cauldron be manufactured locally in Livorno, provided there was sufficient iron on hand. Lus repeatedly emphasised the need for discretion and vigilance over the project, warning in particular against allowing van Tongerlo any access to the refinery or contact with the salt masters, fearing that he might steal their techniques and sell them to rival states such as Genoa.⁶⁶ This insistence on secrecy underscores the competitive and strategic nature of industrial ventures at the time. Technological expertise was a valuable asset, capable of shaping the economic fortunes of both states and merchants.

In December 1603, Abraham van Tongerlo returned to Livorno, likely unaware of the manoeuvres behind the scenes that had marginalised his involvement in the salt refinery project. Still eager to impress the grand duke, he arrived with five additional windmills for evaluation, along with an advanced instrument for water drainage, another area where Dutch engineering was particularly advanced.⁶⁷ His credibility in this field was well established. He had previously contributed to the construction of the Zijpepolder north of Amsterdam in 1597 and had been involved in draining marshy fields in the Venetian countryside.⁶⁸ Seeking to showcase his expertise, he conducted demonstrations in the moats of Livorno's fortress, impressing the Tuscan ministers.⁶⁹ Once again, van Tongerlo aimed to secure an exclusive privilege to build and operate his innovations in Tuscany. However, despite his efforts, Ferdinando I de' Medici declined all his requests. By March 1604, disappointed by his failure to gain the grand duke's favour, van Tongerlo requested passports to leave Tuscany, marking the end of his aspirations in the region.⁷⁰

⁶² ASF, MM, 27/II, cc. 572, 579.

⁶³ ASF, MdP, 917, c. 768, 25 August 1603.

⁶⁴ ASF, MdP, 920, c. 353, 22 November 1603. Zeeland, and in particular the city of Zierikzee, was the principal salt refining area of the Low Countries during the sixteenth century, polishing local and Iberian imported salt. Israel, *Dutch Primacy in World Trade*, 23.

⁶⁵ ASF, MdP, 921, c. 350, 28 January 1604.

⁶⁶ ASF, MdP, 922, c. 99, 6 March 1604.

⁶⁷ ASF, MdP, 919, c. 361, 23 October 1603; Ivi., 920, c. 603, 13 December 1603.

⁶⁸ A polder is coastal land below sea level that has been artificially created by blocking the ingress of water with dikes, then drained and made habitable or cultivable. This technique has been widely used in the Netherlands since the Middle Ages. Buning, *Knowledge, Patents, Power*, 217; ASV, Notarile, Spinelli 11924, 428, 30 August 1603.

⁶⁹ ASF, MdP, 920, c. 603, 13 December 1603.

⁷⁰ ASF, MdP, 914, c. 117, 10 March, 1604.

Meanwhile, the salt refinery venture proceeded smoothly. In April 1604, the salt masters made their long-awaited arrival in Tuscany, and although specific details about their activities and methods remain scarce, the initial results were promising.⁷¹ By August 1604, Abraham Lus was glad to hear that the salt produced in Livorno was “very good and beautiful.”⁷² In order to organise the trade, he reported to Florence the salt prices in Amsterdam along with a barrel of the size used in the Netherlands.⁷³ While preparations were continuing, he tried to tempt the grand duke with a new proposal. He offered to import a special type of coal from England, which would be particularly useful for the blacksmiths in charge of forging the iron cauldrons for the refinery.⁷⁴ However, it does not appear that the grand duke accepted this proposal, likely due to the merchant’s excessive demand for an exclusive eighteen-year privilege. Nonetheless, this case serves as a perfect example of how the spread of new technologies and productive activities could stimulate broader economic and commercial development in related sectors.

Another player entered the scene in this second phase of the organisation of the business. In February 1605, the grand duke secretly sent one of his agents, the Fleming Jan van der Neesen, to the Dutch Republic.⁷⁵ Originally from Antwerp but forced to flee due to the war, he entered the service of the Medici in 1602 after various hardships and was frequently employed as an informant and undercover commercial agent in both Germany and France.⁷⁶ He would have assumed a similar role in the Dutch Republic, regularly reporting on the conflict in Flanders and the Dutch market, also with a view to identifying profitable trade opportunities for investment. He therefore settled in the Lus mansion in Amsterdam, working as their collaborator on projects for the grand duke, but at the same time also as their controller on behalf of the court, to report on their economic situation and prevent abuse and speculation. Consequently, he also became involved in the salt trade project, with the promise of a share of the eventual profits.

Tasked with assessing the market potential for Livorno’s salt in the Dutch Republic, the agent submitted a lengthy and detailed report on the matter in November 1605.⁷⁷ In it, he described the current state of the salt industry and trade within the republic, providing insights into Dutch smuggling operations in the Americas, the refining process in Zeeland, and the export of the finished product across Northern Europe. However, he concluded by expressing doubts, shared by Lus, about the likelihood of obtaining a trade license from the States General, because the salt trade was too vital for local traders and entrepreneurs to allow foreigners to enter it. He therefore suggested redirecting shipments to Danzig or Königsberg in the Baltic, where they would more easily find a market.⁷⁸

We don’t know if the Medici court actually considered and undertook this alternative, as the question of the salt trade disappears from the correspondence of both van

⁷¹ ASF, MdP, 922, c. 783, 13 April 1604.

⁷² ASF, MdP, 925, c. 171, August 1604.

⁷³ ASF, MdP, 926, c. 49, 11 November 1604.

⁷⁴ Ivi., c. 544, 13 November 1604.

⁷⁵ ASF, MdP, 67, c. 231, 14 January 1605; ASF, MdP, 4256, c. 174, 6 April 1605.

⁷⁶ Jan van der Neesen (1571–1630), born in the village of Dendermonde in Flanders, joined the retinue of the Tuscan merchant-knight Niccolò Venerosi Pesciolini at a young age to escape the disasters of war. Pesciolini educated him in languages and trade, and took him to the grand duchy, then placing him in the service of Ferdinando I in 1602. Trusting in his linguistic and commercial skills, the Medici employed van der Neesen as a spy and economic intermediary on numerous missions to Germany and France, mainly for the purchase of cereals. While in Tuscany, van der Neesen passed on to the ministers of the grand duke the news he received from his contacts in the Netherlands, including letters from the Lus family, and facilitated communication with all the Dutch and Flemish people who sought the patronage of the Medici. See: Bomboni, “The New Gateway to the World”, 130–136, 177–198.

⁷⁷ ASF, MdP, 4750, c. 691, 29 November 1605.

⁷⁸ ASF, MdP, 4259, c. 9, 6 December 1605.

der Neesen and the Lus family. Van der Neesen left the Dutch Republic in 1607, while the Lus family, increasingly suffocated by debts due to a series of bad investments and frauds they had received, began to be increasingly ousted from the network of the grand ducal court.⁷⁹ Within a few years they also lost their properties in Livorno. In this, the fate of the salt refinery of Livorno is still unknown. From the lists of patents and privileges preserved in Florence, no merchant, local or foreign, seemed to have been granted the grand duke's privilege to manage salt production and trade during Ferdinando I de' Medici's rule.⁸⁰ However, a few years later, the same Dutchmen who successfully created the sugar refinery, van Ens and du Gardijn, seemed to want to open one for salt as well.⁸¹

As for van Tongerlo, who had started the whole project, in 1605 he managed to discover the deception Lus had plotted against him, deciding to take legal action. Also asking the grand duke for justice, from his letters to Florence we also discover that Abraham Lus, his former partner, tricked him into building overpriced mills and even pocketed a bribe meant for grand ducal officials, which, the Flemish discovered, was never required.⁸² While the case against Lus was still pending, he continued in his activity as an itinerant entrepreneur, as in April 1607, we see him back in Venice where he entered a company that built wells.⁸³ In August 1608, the same day he signed a notarial act formally asking the grand duke for reimbursement for the mills he had built in Livorno for demonstration, he sold two other mills to the Republic of Lucca.⁸⁴ By 1613, having severed ties with the Tuscan court, van Tongerlo embarked on a new venture, opening a Venetian-style glasshouse in Amsterdam.⁸⁵

Conclusions

The interactions between Dutch entrepreneurs and the Grand Duchy of Tuscany at the turn of the seventeenth century offered a valuable lens through which to examine the complex mechanisms of technological circulation and its deep connection with economic migration and transcultural trade in the early modern period. By analysing the economic and political strategies that shaped Livorno's development, this study has illustrated the dynamic interplay between state-led initiatives and private enterprise. While the Medici court sought to leverage foreign expertise to modernize local industries or introduce new ones, Dutch merchants and artisans viewed Livorno as an emerging hub for investment and trade. However, as the case studies demonstrate, the successful transfer and implementation of technological advancements were contingent upon a complex set of factors, including geopolitical constraints, economic viability, and the agency of intermediaries who facilitated or obstructed these processes.

The development of Livorno from the 1590s and its rapid rise in the following years as a lively multicultural port demonstrated the crucial role of political power in creating favourable environments for foreign entrepreneurship and the long-distance circulation

⁷⁹ Eric H. Wijnroks, *Handel tussen Rusland en de Nederlanden, 1560-1640: een netwerkanalyse van de Antwerpse en Amsterdamse kooplieden, handelend op Rusland* (Hilversum: Verloren, 2003), 360; Bomboni, "Da Amsterdam a Livorno."

⁸⁰ In 1619 the Frenchman Antonio Vitali was given the privilege by Grand Duke Cosimo II to develop and exploit the salt pans around Livorno and Pisa. In 1628, the Florentine Raffaello Alamanni was given the privilege by Grand Duke Ferdinando II to refine white salt with his new method without the use of fire, pans, or cauldrons. ASF, Pratica Segreta, 191, nn° 36, 98.

⁸¹ ASF, MdP, 4258, cc. 184, 23 June 1624; Ivi., 300, 16 July 1624.

⁸² ASF, MdP, 1290, c. 60-63, 5 July 1605.

⁸³ The Flemish would have helped with the construction, organization of tools, and workforce and would have obtained a quarter of the profits. ASV, Notarile, Spinelli, 11928, c. 237, 9 April 1607.

⁸⁴ ASV, Notarile, Spinelli, 11929, c. 460, 4 August 1608.

⁸⁵ Jutta-Annette Page and Ignasi Doménech, *Beyond Venice: Glass in Venetian Style, 1500-1750* (Corning, N.Y.: Corning Museum of Glass, 2004), 234.

of knowledge. The far-sighted policies of Grand Duke Ferdinando I, offering economic incentives, religious tolerance, crucial infrastructures, and legal protections, combined with the contingent situation of the grain trade made it possible to overcome the political and geographical distance that initially hindered relations between Tuscany and the Dutch Republic. In both case studies explored, trade emerged as the principal catalyst for the circulation of technology between the Netherlands and the Grand Duchy of Tuscany.

I have therefore highlighted the fundamental dynamics of dialogue, negotiation, and mediation at the basis of this circulation of knowledge and, from this, the indispensable role of intermediaries in technological diffusion. Individuals such as Don Giovanni, Abraham van Tongerlo, and the Lus brothers played crucial roles in bridging the gap between the Dutch Republic and Tuscany, facilitating not only the movement of goods but also the recruitment of skilled labour and the transmission of specialized knowledge. Together with the material conditions necessary for the effective implementation of new technologies and productive activities, it is therefore clear that personal relationships with the political authorities and among the entrepreneurs themselves also played a decisive role in determining the success of these initiatives.

Both cases also illustrated the inherent challenges of long-distance trade and technological adaptation. While Dutch expertise in sugar refining was well established in the Low Countries, replicating these production methods in Tuscany proved to be far more complex. The lack of direct access to raw materials, restrictions imposed by Spanish and Dutch authorities on transatlantic trade, and the competing interests of merchants all contributed to the failure of early initiatives. On the other hand, despite the successful adaptation of salt refining techniques, its eventual profitability was further hindered by market competition. These challenges also highlighted the limitations of state intervention in fostering technological innovation; despite the grand duke's support and control over the socio-economic context of Livorno, structural barriers and market dynamics ultimately dictated the feasibility of technological transfers. This case further demonstrates how technological diffusion was not simply a matter of importing skills and equipment but required a well-integrated commercial framework to sustain long-term success.

In conclusion, this work has attempted to provide a new perspective on the complex forces that influenced the circulation of technology in the early modern period, from state economic strategies to the convergence of private interests, which together stimulated the movement of people, materials, and ideas on an international level. Technology transfer was thus not a passive process, but the result of calculated negotiations, opportunistic alliances, and, at times, open conflict between these different actors. Finally, the case of Livorno illustrates how emerging commercial centres could act as melting pots of innovation, where competition and collaboration between economically and culturally heterogeneous forces could stimulate technological transformation. Future research could further explore the long-term impact of the contributions of the Dutch, or other migrant communities, to Livorno's technological landscape, along with the role of this port itself as a centre of exchange and diffusion of knowledge in the decades that followed.

Acknowledgements. The author would like to thank Professor Michela Catto (University of Turin) and Professor Catia Antunes (Leiden University) for their guidance and supervision during the doctoral research from which this paper emerged, as well as the University of Turin and Leiden University for their institutional support.

Funding statement. The author would like to express his sincere gratitude to the University of Turin and the Medici Archive Project in Florence for the financial support provided during the research for this paper.

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Cite this article: Bomboni, Massimo, “Sugar, Salt, and Mills for the Grand Duke: Dutch Trade and Technological Innovation in Early Seventeenth-Century Livorno,” *Itinerario* (2026): 1–19, <https://doi.org/10.1017/S016511532610062X>