



Citation: L. Maddaluno (2020) Materialising political economy: olive oil, patronage and science in Eighteenth-century Rome. *Diciottesimo Secolo* Vol. 5: 97-115. doi: 10.13128/ds-12119

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Data Availability Statement: All relevant data are within the paper and its Supporting Information files.

Competing Interests: The Author(s) declare(s) no conflict of interest.

Saggi

Materialising political economy: olive oil, patronage and science in Eighteenth-century Rome

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Abstract. The present article will explore some significant moments of the patronage bond between the Piarist Bartolomeo Gandolfi and Prince Andrea Doria Pamphilj Landi, patron of arts and science and one of the most powerful members of the Papal States' landed aristocracy in the 1790s. Chair in Philosophy, Mathematics and Theology at the Collegio Nazareno (1780s), Gandolfi had worked as tutor to the children of Prince Andrea, developing a relationship of mutual trust with the Doria Pamphilj Landi family and carrying out land surveys to increase their grain and olive oil productions. This article will focus on Gandolfi's scholarly identity and scientific endeavours and on his agronomic collaboration with the Doria Pamphilj Landi family as a lens to enquire into the function of patronage practices and improvement in the concrete realisation of political economic reforms in the Papal States under Pius VI.

Keywords. Political Economy, Olive oil making, agriculture, Eighteenth-century Rome, Patronage practices, Doria Pamphilj family, Piarist order.

INTRODUCTION¹

On the 1st of May 1796, the skilled farmer, olive grove owner and apothecary in the city of Tivoli, Francesco Carlandi, was signing and sending off a letter to the Prince Andrea Doria Pamphilj Landi. Patron of arts and science and last heir of the renowned Renaissance Genoese family, Prince Andrea was one of the most powerful members of the Papal States' landed aristocracy, and owned lands and feuds from Tivoli to Albano Laziale, from Canino to Montelanico, from Melfi to Genua. The letter accompanied a box con-

¹ This article is the result of research I carried out during my Rome Fellowship at the British School at Rome (2017-2018). I wish to thank the BSR for making this research possible, and especially Stefania Peterlini for helping me get access to various archives in Rome; Arno Witte, from the KNIR, for stimulating conversations about patronage, science and art history, and Maria Pia Donato for encouraging me to submit the present article for consideration in this journal. Finally, I would also like to thank Alessandra Mercantini, archivist at the Doria Pamphilj family Archive, Alessandra Merigliano, from the Archivio Generale dell'Ordine degli Scolopi and Sabina Fiorenzi from the Biblioteca Casanatense, for allowing me to use photographic reproductions of material held in the above-mentioned archives.

taining twelve small flasks of olive oil «for display and to taste» (*per mostre e per assaggio*), for the Prince to taste and to have an idea of what his lands could yield. The small flasks were accurately numbered and labelled with the name of the different cultivars in an attempt to determine the quality of the Prince's agricultural produce and standardise it for marketing purposes². The letter also included information on the quantity of oil produced in the Doria Pamphilj's lands and olive mill in Tivoli, not much, according to other manuscript documents, at least in comparison with the produce yielded from the olive mill that the Pamphilj owned in the city of Albano Laziale³. Carlandi also mentioned that the techniques of olive oil production had been «advantageously» improved by a certain Bartolomeo Gandolfi, a member of the Scolopi order who had been professor in Philosophy, Mathematics and Theology at the Collegio Nazareno, during the 1780s, then taking up the Chair of Experimental Physics at the Sapienza. Archival documents tell us that, as of 1800, Gandolfi had worked as tutor to the children of Prince Andrea for 15 years, developing a relationship of mutual trust with the Pamphilj family and carrying out surveys of their lands to increase their olive oil as well as grain productions⁴. It is not unlikely that he lived with the Doria Pamphilj family, as it frequently happened to the tutors of aristocratic families at the time. The Doria Pamphilj employed Gandolfi for yet another reason, so that he could build new models of olive presses and mills which would extract more olive oil, and fix extant ones at the same time⁵.

This letter, which is part of a series of unpublished

manuscript documents regarding the Doria Pamphilj Landi's olive mill in Tivoli, and held in the family's private archive, features three figures or characters, each displaying a specific form of historical agency: a tenant farmer, possibly, although not certainly, a figure that in the Papal States would be called *ministro di campagna*, a person in charge of managing lands on behalf of a third party, and, in this case, himself owner of a small olive grove; a member of the Roman landed aristocracy, Prince Andrea Doria Pamphilj Landi, and a naturalist, protégé of the aristocratic family and in charge of carrying out agrarian improvements.

The present article will explore some significant moments of the patronage bond between Gandolfi and Prince Andrea in the 1790s. It will focus on Gandolfi's scholarly identity and scientific endeavours and on his agronomic collaboration with the Doria Pamphilj Landi family as a lens to enquire into the function of practices of patronage and improvement in the concrete realisation of political economic reforms in the Papal States under Pius VI. It will be structured in four parts; the first section will frame Gandolfi's collaborations with the Doria Pamphilj family in the context of Pius VI's reforms, focusing on the problem of emulation of foreign powers and on the role of agriculture and improvement in the production of national wealth. The second section will enquire into the political economy imaginary of olive oil production in the Papal States and look at how practical discourses on improving olive oil intersected with the question of economic self-sufficiency. The third section will look at how Gandolfi entered the circles of Roman aristocracy and especially the Doria Pamphilj family's, thus becoming part of a broad patronage network. This section will also underline how Gandolfi portrayed – in his printed works – Andrea Doria Pamphilj Landi as the enlightened Prince who allowed him to realise his ideas of improvement. The last part of the article will be dedicated to explore Gandolfi's acknowledgment of the function of mechanical practitioners (carpenters, blacksmiths and artisans) in modernising machines and technological apparatuses and, more broadly, in the making of political economic reforms. It will also look at some of the sketches and drawings produced by Gandolfi during his surveying activities on the Doria Pamphilj family's lands. Overall, the article will propose a new approach to the study of Eighteenth-century political economy, emphasising its practical, rather than theoretical and normative, nature, and highlighting the centrality of material, scientific and especially agronomic practices to bring about political economic reforms at the time of the Enlightenment.

¹ Archivio Doria Pamphilj (henceforth ADP), «Lettera del Signor Francesco Carlandi di Tivoli al Sig. Principe Doria Pamphilj con nota annessa dell'olive comprate per fare l'olio vergine per uso di S. E. Sig. Principe, 1st of May 1796, Scaffale 95, busta 63, Montano di Albano 5 (interno 4).

² For a comparison between the production in Albano Laziale and Tivoli, see ADP, «Foglio dimostrativo della rendita giornaliera che può ricavarsi dal Montano posto nella città di Tivoli spettante al collegio di Sant'Agnesa in Tivoli», Scaffale 95, busta 63, Montano di Albano 5 (interno 2). This letter is important because it gives us a sense of the daily olive oil production in Albano Laziale (43 *fiscolate*) and Tivoli (36 *fiscolate*). One *fiscolata* corresponded to about 92 litres of olive oil; for these units of measurement, see F. Cavalier Bulgarini, *Notizie storiche, antiquarie, statistiche ed agronomiche relative all'antichissima città di Tivoli*, Tipografia di Giovanni Battista Zampi, Roma 1848, p. 139.

³ Archivio Segreto Vaticano, «Promemoria sulla condotta del P.B. Gandolfi lettore di fisica sperimentale alla Sapienza; 13th February 1800», in *Segreteria di Stato, Epoca Napoleonica, Italia*, Busta 1, fascicolo 2 (interno 24).

⁴ See C. Farinella, s.v. «Bartolomeo Gandolfi», in *Dizionario Biografico degli Italiani*, 52 (1999): <[http://www.treccani.it/enciclopedia/bartolomeo-gandolfi_\(Dizionario-Biografico\)/>](http://www.treccani.it/enciclopedia/bartolomeo-gandolfi_(Dizionario-Biografico)/>) (04/2020); see also a contemporary source, D. Morichini, *Necrologia del p. Bartolomeo Gandolfi delle Scuole Pie*, in Id., *Raccolta degli scritti editi e inediti, co' tipi di M. e L. Aureli*, Roma 1852, vol. II, pp. 443-448.

1. PIUS VI'S REFORMS

Recent literature in the field of intellectual history has been arguing for a while that the Eighteenth century is by definition- the century of political economy⁶. A new field of investigation whose foundation had been triggered by the outbreaks of famines in the 1750s, and sealed through the first chair in political economy (*commercio e meccanica*), entrusted to Antonio Genovesi in Naples in 1754, political economy concerned how to maintain and increase the wealth of a country, and was characterised by the presence of both normative and descriptive aspects. On the one hand, it was conceived as a science to identify and describe economic phenomena (for example, the ways by which wealth was created, the circulation of goods, the mechanisms of trade and commercial exchanges, and price formation). On the other, it was meant to provide the basis for public intervention in the above matters; that is, it was meant to shape policies⁷. Political economy kept busy not only intellectuals and civil servants, but also naturalists, chemists, philosophers, aristocrats, members of the Papal curia, cardinals and Popes⁸.

Yet, literature has not paid much attention to the material and tangible sides of political economic discourses, and failed to bring to light the role played by scientific practitioners, as well as manual workers and artisans in carrying out reform plans. This article will argue that manual workers and artisans contributed not only to the production of scientific knowledge, as Paola Bertucci has recently pointed out for Eighteenth-century France, but also to the concrete realisation of reforms, by building machines to improve grain grinding or olive oil making, by facilitating commerce through the application of hydraulics to river channels, and by encouraging the use of chemical knowledge in manufacturing production⁹. It is certainly true that these attempts at modernisation

– carried out on the basis of technical knowledge and expertise – did not always result in positive outcomes and did not necessarily have an immediate ‘impact’ on the making of reforms or on the levels of wealth production. However, this historical fact should not overshadow the importance that the cooperative and shared endeavours of otherwise invisible actors such as lesser known naturalists and practitioners played in the production of scientific knowledge and of its useful and ‘enlightened’ applications. Even in the case when modernisation did not happen, and the recently improved machines did not yield the hoped-for results, these endeavours and efforts remained central to the construction of the enlightened discourse of public utility and of the role played by scientific knowledge in the secular improvement of society. If one of the most central religious figures in the Enlightenment in the Papal States, Benedict XIV Lambertini, pontiff between 1740 and 1758 was known to his contemporaries through the Montesquieu’s epithet of the «scholars’ Pope», for his patronage of artists and naturalists alike, the latter mostly in the Academy of Sciences in Bologna, and for his appeal to natural laws and reason even in the most untouchable matters of faith and miracles, one of his successors, Pius VI, the Pope under whom our story unfolds, who held his role between 1775 and 1799, was also directly involved in promoting science and culture in order to increase the Papal States’ wealth and bring about public happiness and utility¹⁰.

Giovangelo Braschi, becoming pontiff under the name of Pius VI, relied on Benedict XIV’s cultural agenda and interventions. As literature has shown, Rome was a peculiar city in the early modern period, and so it remained in the long Eighteenth century: it was characterised by a cultural polycentrism, by a coming and going of ambassadors, pilgrims and cardinals, Jesuits and Piarists, librarians and editors, naturalists and travellers. A rich variety of periodicals, among which the «Giornale de’ Letterati» and the «Efemeridi Letterarie», updated the public on the latest developments of the natural sciences, especially from England and France, making Rome part of a broader Republic of Letters¹¹. Rome was also one of

⁶ See *The Economic Turn. Recasting Political Economy in Enlightenment Europe*, ed. by S. Kaplan and S. Reinert, Anthem Press, London 2019.

⁷ See P. Steiner, *Sociologie de la connaissance économique. Essai sur les rationalisations de la connaissance économique (1750-1850)*, Presses Universitaires de France, Paris 1998, and M. Guidi, *Translation and the circulation of economic ideas through nations*, pp. 2-5 (on-line paper dated 2015, an earlier version of which was written for the Conference «Translations of Economic Texts into and from European Languages», University of Pisa, 12th-14th September 2013). <<https://www.gate.cnrs.fr/IMG/pdf/Guidi2015.pdf>> (04/2020).

⁸ On political economy thought and treatises of various authors under Pius VI, see E. Piscitelli, *La riforma di Pio VI e gli scrittori economici romani*, Feltrinelli, Milano 1958, pp. 163-224.

⁹ See P. Bertucci, *Artisanal Enlightenment: Science and the Mechanical Arts in Old Regime France*, Yale University Press, Yale 2017; although Bertucci focuses on Eighteenth-century France, her argument – which vindicates a space of agency for the neglected figure of the *artiste*, or artisans working in multiple areas of scientific expertise, has a broad breadth and can be applied to multiple national contexts.

¹⁰ On the Bologna Academy of Sciences, see M. Cavazza, *Settecento inquieto. Alle origini dell'Istituto delle Scienze di Bologna*, Il Mulino, Bologna 1990. On the cultural politics of Benedict XIV, and especially his promotion of periodicals, see M.P. Donato, *Gli Strumenti della Politica di Benedetto XIV: Il Giornale de’ Letterati (1742-1759)*, in *Dall'erudizione alla politica. Giornali, giornalisti ed Editori a Roma tra XVII and XX secolo*, a cura di M. Caffiero e G. Monsagrati, Franco Angeli, Milano 1997, pp. 39-61. See C. Johns, *The scholars’ Pope: Benedict XIV and the Catholic Enlightenment*, in *Benedict XIV ad the Enlightenment: Art, Science, and Spirituality*, ed. by R. Messbarger, C. Johns and P. Gavitt, University of Toronto Press, Toronto 2016, pp. 3-4.

¹¹ See Donato, *Gli Strumenti della Politica di Benedetto XIV*, cit., p. 40, and M. Caffiero, *Le Efemeridi Letterarie di Roma (1772-1798)*. *Reti Intel-*

the main centres of antiquarianism and its practices, and became a must-do for grand-tourists, catalysing a constellation of academies and libraries, social and materials repositories of knowledge. This circulation of people, expertise, periodicals and books was enhanced by the patronage of popes and cardinals, whose cultural politics spanned from the promotion of collections of natural history specimens, books and curiosities, to the creation of thriving botanical gardens where exotic specimens coming from the many Catholic missions overseas grew alongside herbs and medicinal plants¹². As recent scholarship has pointed out, that process of revitalisation of scientific knowledge, which in its turn plunged its roots in late Renaissance patronage practices, and in the Seventeenth-century foundation of the «first 'modern' academy of natural philosophy» in Rome and Italy more generally, the Accademia dei Lincei (1603), continued well under Pius VI¹³. This revitalisation program entailed the reform of the Sapienza University under Benedict XIV, through the foundation of a chair in experimental Physics (*fisica sperimentale*) and of a *teatro fisico* to perform experiments; the reorganisation of the Collegio Romano, following the abolition of the Jesuit order, as well as of the Collegio Nazareno, the latter developing its Seventeenth-century Galilean tradition and becoming an important centre for the capillary diffusion and circulation of knowledge regarding chemistry, especially Lavoisier's, experimental physics and mineralogy¹⁴.

With regard to strictly political economic reforms, Pius VI's policies reflected contemporary European

trends; in 1776, he created a *Congregazione particolare*, a team of cardinals and prelates in charge of monitoring the realisation of his reform plan¹⁵. He liberalised the commercial exchanges of agricultural and manufacturing products by abolishing custom duties (both in terms of internal circulation and of exports), making a few exceptions especially with regard to the export of raw materials, and to the import of foreign manufactures. He attempted to dismantle feudal privileges in order to uniform the territories of the Papal States; through the abolition of custom duties, he aimed at facilitating commerce through both roads and river channels (and he entrusted an architect, Natale Marini, with digging and sifting interventions on the Tiber basin) and, most famously, he attempted to increase agricultural production by draining the Pontine marshes, a longstanding endeavour which had commenced in the XIII and continued until the XX centuries. Pius VI also promoted the creation of a new cadastral, which was received with hostility by members of the Papal States' landed aristocracy (and in fact did not work out) although its goal was not directly taxation but a revitalisation of agricultural productions¹⁶.

All these reforms echoed those carried out in other contemporary states of the Italian peninsula, such as the Duchy of Milan and the Grand Duchy of Tuscany¹⁷. They were inspired to mercantilist and protectionist ideas, and encouraged market competition. However, Pius VI's reforms also fostered investments in agriculture, and promoted the diffusion of periodicals to enlighten the public on agricultural and, more in general, political economic subjects, such as the «Giornale di agricoltura, manifattura e commercio» (1776), and the «Giornale di agricoltura o sia Diario economico di agricoltura, manifattura e commercio» (1777). Both periodicals were founded by Luigi Ernesto Riccomanni, an erudite and polymath acquainted with the most recent European, both French and English, developments in the field of political economy, and who gravitated around the Papal curia through personal contacts with Cardinal Gregorio Antonino Salviati¹⁸. This interest in agricultural sub-

lettuali, *Evoluzione Professionale e Apprendistato Politico*, in *Dall'erudizione alla politica*, cit., pp. 63-101.

¹² On these aspects, see M. Caffiero, M.P. Donato et A. Romano, *De la Catholicité Post-Tridentine à la République Romaine. Splendeurs at Misères des Intellectuels Courtisans*, in *Naples, Rome, Florence. Une Histoire Comparée des Milieux Intellectuels Italiens*, éd. par J. Boutier, B. Marin et A. Romano, École Française de Rome, Rome 2005, pp. 171-208. On gardens in early modern Rome and the Vatican botanical garden, see also D.R. Coffin, *Gardens and Gardening in Papal Rome*, Princeton University Press, Princeton 1991, pp. 210-214.

¹³ On this legacy, see M.P. Donato's *Introduction to Conflicting Duties: Science, Medicine and Religion in Rome, 1550-1750*, ed. by M.P. Donato and J. Kraye, The Warburg Institute/Nino Aragno Editore, London-Torino 2009, pp. 1-8. On the Lincei, see S. Brevaglieri, *Science, Books and Censorship in the Academy of Lincei: Johannes Faber as Cultural Mediator*, in *Conflicting Duties*, cit., pp. 109-133.

¹⁴ On these themes, see G. Montègre, *Politiques et Pratiques de la Science en Cour de Rome au Temps de Lumières: Le Renouveau des Pontificats Pio-Clémentins (1769-1799)*, «Archives internationales d'histoire des sciences», 62, 2012, pp. 609-631. For the reform of the Sapienza, see F. Favino, *La 'Grande Riforma' della Sapienza di Benedetto XIV*, in *Rome et la Science Moderne. Entre Renaissance et Lumières*, éd. par A. Romano, École Française de Rome, Rome 2008, pp. 491-526. With regard to the tradition of the Nazareno in the teaching of Galilean science, see S. Montacutelli, *Da Galileo a Borelli e oltre: la filosofia naturale delle Scuole Pie a Roma nel Seicento*, in *Conflicting Duties*, cit., pp. 181-205.

¹⁵ M. Corcione, *Teoria e prassi del costituzionalismo settecentesco. Esperienze nel Regno di Napoli e nello Stato della Chiesa*, Istituto di studi Atellani, Frattamaggiore 2000, see Chapter II in particular.

¹⁶ On the failure of the cadastral and the contemporary debate on customs, see F.P. Caselli, *Il problema dell'efficienza fiscale nello Stato Pontificio. Dalle Dogane Cittadine alle Dogane ai Confini (Sec. XVIII)*, in *La Storia Economica come Impegno. Saggi in Onore di Angelo Moiola*, a cura di P. Cafaro et al., Franco Angeli, Milano 2015, pp. 99-114.

¹⁷ N. La Marca, *Tentativi di riforme economiche nel Settecento Romano*, Bulzoni, Roma 1969, pp. 114-117, 120-121.

¹⁸ A.M. Pult Quaglia, s.v. «Luigi Ernesto Riccomanni», in *Dizionario Biografico degli Italiani*, 87 (2016), pp. 399-401. Cardinal Salviati had covered important positions under both Benedict the XIV, and Pius VI,

jects intersected with the typical enlightened passion for the role of science in bettering the condition of human beings, and with a celebration of rural life which in its turn rested on the reading of classical literature, and especially of Columella, Varro, and Vergil. Such celebration peaked in the participation of many members of the Roman landed aristocracy, including Prince Andrea and one of his brothers, the Cardinal Giuseppe Maria, in the meetings of the Academy of Arcadia, a Seventeenth-century Roman academy which praised and wished a return to the simplicity and sobriety of pastoral life and whose admission requirements included *nobiltà di sangue* and *letteratura non mediocre*¹⁹. The very Academy of Arcadia went through a civic and political metamorphosis in the Eighteenth century, on the one hand incorporating the transformative enlightened discourse of science, culture and sociability as motors of change and modernisation in an anti-Jesuitical framework, on the other preserving the role of religion in the process of civilisation²⁰. As Marina Caffiero has argued, the practices of sociability embodied by the many academies which animated Rome's (and the Papal States') cultural and civic life encouraged the production and circulation of scientific periodicals, fostering the creation of a new cohesive social group of intellectuals and scientific practitioners whose main commitment was the promotion of useful knowledge and the facilitation of communication exchanges between centre and peripheries²¹.

both in a diplomatic capacity, and as the general commissioner of the Pope's army. On academies in Rome and their relation to political economic reforms under Pius VI, see M.P. Donato, *Accademie romane: Una storia sociale (1671-1824)*, Edizioni scientifiche italiane, Napoli-Roma 2000, pp. 144-145. On periodicals in the second half of the Eighteenth century in Rome, see *Dall'erudizione alla politica*, cit.

¹⁹ On the Arcadia and the participation of Roman aristocracy see B. Borello, *Trame sovrapposte. La socialità aristocratica e le reti di relazioni femminili a Roma (XVII-XVIII secolo)*, Edizioni Scientifiche Italiane, Napoli-Roma 2003, pp. 107 ff.

²⁰ See Caffiero, *Le Efemeridi Letterarie*, cit., p. 89. On the Arcadia in the Eighteenth century, see also L. Felici, *L'Arcadia romana tra illuminismo e neoclassicismo*, «Accademia degli Arcadi. Atti e Memorie», 5, 1969, pp. 167-182, and A. Cipriani, *Contributo per una storia politica dell'Arcadia settecentesca*, «Accademia degli Arcadi. Atti e Memorie», 5, 1969, pp. 101-166. On the Arcadia in the Eighteenth century, see A. Nacinovich, *«Il Sogno Incantatore della Filosofia»: L'Arcadia di Gioacchino Pizzi 1772-1790*, L.S. Olschki, Firenze 2003. On the Arcadia as part of the 'Catholic Enlightenment' more in general, see M. Rosa, *The Catholic Aufklärung in Italy*, in *A Companion to the Catholic Enlightenment in Europe*, ed. by U. Lehner and M. Printy, Brill, Leiden-Boston 2010, pp. 215-250.

²¹ See M. Caffiero, *Accademie e Autorappresentazione dei Gruppi Intellettuali a Roma alla fine del Settecento*, in *Naples, Rome, Florence*, cit., pp. 277-292. See also Id., *Centro e Periferie. Reti Culturali e Patronati Politici tra Roma e le Marche nel Secondo Settecento*, in *La Nobiltà della Marca nei Secoli XVI-XVIII: Patrimoni, Carriere, Cultura*, Atti del XXXII Convegno di studi Maceratesi (Abbadia di Fiastra, 23-24 novembre 1996), Centro di studi storici maceratesi, Pollenza 1988, pp. 133-160.

The passion for agricultural subjects- be these in the form of the simple reading of agricultural texts, or of practices- as well as for questions concerning wealth production in general, was an interest which was shared also by some of the most renowned members of the Camera Apostolica, one of the central administrative organs of the Papal States, such as Giovanni Cristiano De Miller, who, besides dealing with developing policies to relaunch agriculture and manufacturing under Pius VI took on the art of spinning and invented a new spinning machine which would increase productivity and profit²². In this connection, also Prince Andrea's brothers, the future cardinals Giuseppe Maria and Antonio Maria would later cover explicit roles in the administration of the wealth of the Papal States: Antonio Maria will be appointed President of the *Grascia*, which dealt with matters regarding the provision and distribution of foodstuff (1778-1780)²³; much later, from 1801 to 1814, Giuseppe Maria will cover the role of pro-Camerlengo, in charge with helping Pius VII develop policies with regard to land management, and Andrea will become President of the *annona*, in charge with monitoring provision and pricing of grain as well as olive oil²⁴. This direct agricultural involvement of both Giuseppe Maria and Andrea is certainly not surprising, and is evidenced further in the context of their personal correspondence as well as unpublished notes. For example, on the 12th of February 1781, Giuseppe Maria, who was in Paris as *nunzio pontificio* at the time, would send Andrea some seeds of American plants, imagining his brother «having fun» and doing «the happiest things» with this unusual gift²⁵. Another instance is a series of notes on agriculture written by Giuseppe Maria in 1783, and in which

²² C. de Miller, *L'arte di filare e di torcere i fili, e refi di tutte le sorti sul nuovo filarello con cui le filatrici possono raddoppiare il giornaliero loro guadagno, lavorando con maggiore facilità e perfezione*, in L. dal Pane, *Lo Stato Pontificio e il movimento riformatore del Settecento*, A. Giuffrè, Milano 1959, pp. 737-784; the original manuscript is held in the Archivio di Stato di Roma (ASR). On Miller's improvement frenzy, see also Caffiero, *Accademie e Autorappresentazione*, cit., p. 290.

²³ See P. Boutry, *Souverain et Pontife: Recherches prosopographiques sur la curie romaine à l'âge de la Restauration (1814-1846)*, École française de Rome, Rome 2002, pp. 369-370. I have found evidence of this sort of exchange in the ADP, especially in Scaffale 8, a series which contains Giuseppe Maria's correspondence from Paris, as well as a series of letters from Giuseppe Maria to the secretary of State, Cardinal Giuseppe Pallavicini, to ship fresh pineapples from France to Rome for the enjoyment of the Pope; see ASV, *Segreteria di Stato, Francia 549*, f. 142 r/v; 162 r/v; 181 r; 215 v. On fruit gifts, see L. Luiten, *Friends and family, fruit and fish: the gift in Quattrocento Farnese cultural politics*, «Renaissance Studies», 33, 2019, 3, pp. 342-357.

²⁴ See M. Formica's entry in *Dizionario Biografico degli Italiani*, 41 (1992), pp. 477-481.

²⁵ «Letter from Giuseppe Maria Doria Pamphilj to Andrea Doria Pamphilj», Paris, 12th February 1781, ADP, Scaffale 8, busta 52, (1772-1782), interno 81, pages without numbers.

the cardinal would elaborate on the state of agricultural productions in the Papal States, and on their relation with manufacturing and wealth in general²⁶.

The idea of improving land and manufacturing productivity interwove with broader visions regarding the role of the Papal States in contributing to create the right conditions for a moral elevation of human beings and society, and that is possibly why the Doria Pamphilj family was not the only family part of Papal aristocracy who invested in projects of land improvement. Two further notable examples are Sigismondo Chigi Albani della Rovere, Prince of Farnese, who introduced the cultivation of mulberry trees for silk production in his feud in Ariccia, in the 1780s, and the Marquis Giovanni Potenziani, who had been quite active in introducing the cultivation of *rafano* in Rieti, while attempts at cultivating rice would be made – only later – by the iron entrepreneur Gioacchino Bramini and the Rospigliosi Prince (the latter had also built one of the first rice mill in the Lazio area)²⁷. Although literature has highlighted how agricultural improvements really took off in the first decade of the Nineteenth century, the interest of landed aristocracy in the promotion of agricultural improvements cannot be neglected, especially for what this can tell us about the interaction between political economic reforms, patronage and scientific knowledge and practices at the end of the Eighteenth century²⁸.

Pius VI's reforms, and especially his liberalisation measures and attempted relaunch of the manufacturing sector, had inspired many writers in political economy, who wrote mostly laudatory texts about the Pontiff's economic policies. Paolo Vergani, one of Pius VI's financial advisors, would compose a celebratory text on the Papal States' finance, pointing out the importance of promoting manufacturing as well as agriculture, and so had done, each in their own fashion, writers such as Alessandro

Aleandri (1789), the sceptical superintendent of finance for Romagna Marco Fantuzzi, the Turin's aristocrat and *referendario pontificio*, Giovanni Cacherano di Bricherasio, who focused on the historical reasons for the centuries-long lack of improvement in the Pontine marshes (1785), and Francesco Bernabei, writer of an agronomic treatise, and advocate of a direct engagement and participation of the Papal States in international trade²⁹.

With regard to olive trees, Pius VI's policies went in the direction of granting prizes and reducing levies for those who would invest in increasing and improving olive oil production³⁰. More generally, such policies aimed at making the Papal States competitive on the international market, at a time when making olive oil was still a difficult business, and its production, as the historian Jacques Revel has pointed out, was still extremely irregular, at least in comparison with the production of wheat, corn, oat and rye in the Papal States at that same time³¹. Olive oil was in fact produced almost exclusively in the areas of Tivoli, Velletri and Sabina; overall, it was not a remunerative business, as it took

²⁶ «Sull'agricoltura», ADP, Scaffale 7, busta 52, pages without number.

²⁷ *Gazzetta Universale, o sieno Notizie storiche, politiche, di scienze, arti e agricoltura*, vol. 23, Roma 1796, p. 728.

²⁸ On how the discourse on public utility intersected with models of polite society, civic commitment, agricultural improvement, and the slow transformation of academies from the erudition of the *belle lettere* to the cultural project of realising public happiness through agrarian reforms, see Donato, *Accademie Romane*, cit., pp. 144-155. The debate on improvement at the time of the Enlightenment is very broad; here I refer to some key texts, such as P. Borsay, *The culture of improvement, in The eighteenth century 1688-1815*, ed. by P. Langford, Oxford University Press, Oxford 2002, pp. 184, 204; quoted in P. Jones, *Agricultural Enlightenment*, Oxford University Press, Oxford 2016, p. 68. See also the collective volume edited by R.W. Hoyle, on the polarity between custom and improvement (the first seen as the epitome of backward practices and the second as a «process of modernisation» and the «promise of future achievement»), in R.W. Hoyle, *Custom, improvement and the landscape in early modern Britain*, Ashgate, Farnham Burlington 2011, pp. 2-38.

²⁹ P. Vergani, *Dell'importanza e dei pregi del nuovo sistema di finanza dello Stato Pontificio*, Presso i Lazzarini, Roma 1794; this was an anti-Physiocratic text, promoting manufacturing production rather than agriculture exclusively, and it supported Pius VI's policies. Vergani's book was followed by the publication of N. Corona, *Riflessioni economiche, politiche e morali sopra il lusso, l'agricoltura, la popolazione, le manifatture e il commercio dello Stato Pontificio*, Gioacchino Puccinelli, Roma 1795; the latter was a treatise that went against Pius VI and argued that, given the fecundity of Roman soil, agriculture is the only source of wealth, and luxury was unnecessary; on this see D. Strangio, *Crisi alimentari e politica annonaria a Roma nel Settecento*, Istituto Nazionale di Studi Romani, Roma 1999; Alessandro Aleandri did not cover important roles like Vergani, but only in the local administration; however, this did not keep him from writing about political economy, as well as scientific subjects; see his *Dell'ingrandimento dell'agricoltura e delle arti nello Stato Pontificio*, Gioacchino Puccinelli, Roma 1789; see Piscitelli, *La riforma di Pio VI*, cit., pp. 211-215. With regard to G.C. di Bricherasio, see his *De mezzi per introdurre ed assicurare stabilmente la coltivazione e la popolazione dell'Agro Romano*, dalle stampe del Barbiellini alla Minerva, Roma 1785, and F. Venturi's entry «Giovanni Cacherano di Bricherasio», in *Dizionario Biografico degli Italiani*, 16 (1973) <[http://www.treccani.it/enciclopedia/cacherano-di-bricherasio-giovanni-francesco-maria_\(Dizionario-Biografico\)/>](http://www.treccani.it/enciclopedia/cacherano-di-bricherasio-giovanni-francesco-maria_(Dizionario-Biografico)/>) (04/2020) on the critical side stood F. Campilli, who was concerned that the liberalisation of grain trade could create the condition for the outbreak of famines: F. Campilli, *Racconto della cagione e del principio della penuria dei grani sofferta negli anni 1763-1764 e degli ordini dati per la provvista dei grani forestieri*, Stamperia Salomoni, Roma 1783; F. Bernabei, *Riflessioni sopra l'industria dei popoli applicata agli abitatori dell'Agro Romano*, nella stamperia di Giovanni Zempel presso S. Lucia della Tinta, Roma 1789.

³⁰ R. de Felice, *Aspetti e momenti della vita economica di Roma e del Lazio*, Edizioni di Storia e Letteratura, Roma 1965, p. 27.

³¹ See J. Revel, *Les privilèges d'une capitale: L'approvisionnement de Rome à l'époque moderne*, «Annales. Économies, Sociétés, Civilisations», 30, 1975, 2-3, p. 571. On the annona in the Papal States between the XVI and XVII centuries, see M. Martinat, *Le juste marché: Le système annonaire romain aux XVI^e et XVII^e siècles*, publications de l'École Française de Rome, Rome 2004.

far too long, as the historian Hans Gross remarked, to yield a significant amount of produce³². Such irregularity in the production of olive oil had been the reason why one of Pius VI's predecessors, Clemens XIII, in 1764, had created a specific *annona* for olive oil, to keep tight control on its price. Olive oil storages were built right under the Chiesa degli Angeli, close to the Diocletian baths³³. Olive oil was very much needed at the time: it was not only used in cuisine, but also in manufacturing, and especially in the making of soap and wool, and as a fuel for urban illumination.

The intermittent production of olive oil explains why the Doria Pamphilj family took an active interest in improving its production, and why they resorted to the help of a naturalist such as Gandolfi. Olive oil production had a role in the moral, as well as rural and material economy of the Papal States; as to the moral economy, it would be infused with symbolic meanings, and would be substituted to animal fats, such as butter, during Lent, thus being part of a local system of values and social order³⁴; as to the material and rural economy, we know that, despite the time that olive trees took to grow, making olive oil was a source of direct income for landowners: according to feudal rights, peasants and farmers were required to pay to crush their olives in the olive mill of the feudal lord on whose lands they lived. These rights were still enforced in the late Eighteenth century, and many were the controversies arising from the farmers' and peasants' refusal to use the olive mill of the feudal lords (the use of which was often overpriced)³⁵.

³² See H. Gross, *Rome in the Age of the Enlightenment. The Post-Tridentine syndrome and the ancien regime*, Cambridge University Press, Cambridge 2002, pp. 171-172.

³³ Strangio, *Crisi alimentari e politica annonaria*, cit., p. 62.

³⁴ Although this term is famously used by E.P. Thomson to understand the crowd's behaviour without resorting either to psychology or to reductionist approaches, I use it here in the sense of Lorraine Daston, who has attempted to transport it from the realms of social history to the history of science; in Daston's approach, moral economy is a «web of affect-saturated values that stand and function in a well-defined relationship to one another»; see E.P. Thompson, *The Moral Economy of the Crowd in the Eighteenth-Century*, «Past and Present», 50, 1971, 1, pp. 76-136, and L. Daston, *The Moral Economy of Science*, «Osiris», 10, 1995, 2, p. 4.

³⁵ One possible evidence of such controversies, which plunge their root in models of feudal land management, is a case between Prince Andrea Doria Pamphilj and Signor Nicola Minou (eventually won by the Prince) over a missed payment for the grinding of olives in the Doria Pamphilj's olive oil mill in Albano Laziale, between 1809-1810; see the «Causa» in ADP, Scaffale 90, busta 24 (Albano), 19th September 1810; another occurrence of controversies regarding the use of the Doria Pamphilj's olive mill, this time in Loano, saw the involvement of some members of the local community who began to refuse to grind their olives in the Doria Pamphilj's olive mill; see the «Pro Memoria del Signor Principe Doria Pamphilj stata rassegnata alla Segreteria di Stato per gl'affari interni a proposito della tassa fissata per li gombi di Loano li 30 Ottobre 1797, e 32 Gennaio 1798», in ADP, Scaffale 65, busta 66

As to the material economy, we learn from the letter of the Doria Pamphilj's tenant farmer, Francesco Carlandi, that olive oil was a high-quality produce which would appeal to the refined taste of Roman and foreign aristocracy³⁶. This is something that is confirmed in Gandolfi's treatise on olive oil – on which we will return later – in which the naturalist praised the olive oil produced by the Doria Pamphilj family in Albano Laziale and pointed out how it was appreciated by people from Genua and Lucca (two renowned places for olive oil production in the Italian peninsula), as well as by foreign aristocrats during their diplomatic missions in the Papal States³⁷. However, also lower sectors of society would use olive oil, for example, in the context of the less refined cuisine of the «friggitori romani»³⁸. Olives (and oil) were not only part of the diet of the rich, as we can see from a multifarious range of early modern still nature paintings, especially Flemish, but were also sold on the streets of Rome, at least since the first decades of the XVII century, at a time of demographic expansion of the city, as the famous early modern print by Ambrogio Brambilla, representing Roman street vendors, *Those who go selling and working around Rome* (1616) suggests³⁹.

2. POLITICAL ECONOMIC IMAGINARY OF OLIVE OIL PRODUCTION AND THE PRACTICE OF EMULATION

The episodes emerging from the papers of the Doria Pamphilj family which highlight the relevance of olive

(1567-1797, Mulini a olio). On agrarian controversies and consuetudinary rights in Lazio, see M. Caffiero, *Solidarietà e conflitti. Il sistema agrario consuetudinario tra comunità rurale e potere centrale (Lazio, XVIII e XIX secolo)*, «Mélanges de l'Ecole française de Rome. Moyen-Age, Temps modernes», 100, 1988, 1, pp. 373-399. On the rupture between Ancien Regime and the Repubblica Romana, and the abolition of feudal rights, see D. Armando, *I baroni romani nella Repubblica giacobina: l'abolizione dei diritti feudali*, in *Roma negli anni di influenza e dominio francese. 1798-1814. Rotture, continuità, innovazioni tra fine Settecento e inizi Ottocento*, a cura di P. Boutry, F. Pitocco e C.M. Travgolini, ESI, Napoli 2000, pp. 35-64.

³⁶ «Lettera del Signor Francesco Carlandi di Tivoli al Sig. Principe Doria Pamphilj con nota annessa dell'olive comprate per fare l'olio vergine per uso di S. E. Sig. Principe», 1st of May 1796, in ADP, Scaffale 95, busta 63, Montano di Albano 5 (interno 4).

³⁷ B. Gandolfi, *Saggio teorico pratico sopra gli olivi*, Nella Stamperia di Giovanni Zempel, Roma 1793, p. 26; the interest in improving olive oil production was also related to the Genovese tradition and expertise in the production of olive oil, a tradition that the Genoese branch of the Pamphilj family had encouraged over time, as we can see from various manuscript fonds in the Doria Pamphilj family archive.

³⁸ Gandolfi, *Saggio teorico pratico sopra gli olivi*, cit., p. 331.

³⁹ See M. Calaresu, *Costumes and customs in print: Travel, ethnography and the representation of street sellers in early modern Italy*, in *Not dead things. The dissemination of popular print in England and Wales, Italy and the Low Countries. 1500-1820*, ed. by R. Harms, J. Raymond and J. Salman, Brill, Leiden 2013, pp. 181-209: 191.

oil in the material economy of the Papal States are many. Suffice here is to mention three of them before focusing on a broader contextualisation of the political economic imaginary of olive oil in Enlightenment Rome. The first interesting example is the correspondence between one of Andrea's brothers, the Cardinal Antonio Maria Doria Pamphilj and his cousin, Tomaso Spinelli, an aristocrat who married into the Doria Pamphilj family. This correspondence consists of more than 50 letters, spanning the early 1780s, and concerns the quality control of the oil purchased by the Doria Pamphilj and Spinelli families to support the Roman *annona*⁴⁰. A second episode which sheds light on the importance that olive oil played in the early modern period concerns Francesco Bettini, renowned Lombard artist and garden planner, as we would call him nowadays, who had made his fortune working at the Court of Louis XVI in Paris, and whose patron was Prince Andrea's brother, *nunzio pontificio* in Paris and future cardinal Giuseppe Maria Doria Pamphilj. In 1798, at the time of the short-lived Roman Republic, Bettini had drawn new models of oil lamps for urban nocturnal illumination on the basis of those he had seen in Paris in the 1780s⁴¹. This form of urban intervention and planning would later become part of a more general reorganisation of urban spaces and underlined the centrality of olive oil not only in terms of dietary practices but also in relation to the new Republican policing of the city of Rome: as the historian Daniel Roche has remarked, lighting embodied an obsession with order and transparency; it echoed debates on public safety, as well as on the perfection of the machinery of state administration and of the efficacy of its police⁴². Finally, olive oil would acquire a higher prominence in terms of the tax payments enforced against landowners again under the Roman Republic, between 1798 and 1799, as we can see from a letter dating 15th January 1799, in which Prince Andrea Doria Pamphilj Landi was kindly invited to pay 2% of the profits yielded from his lands in Albano Laziale, «as oil, or any other produce you wish»⁴³. In 1800, at a time of scarcity under French

rule, it will be Andrea's brother, Giuseppe Maria Doria Pamphilj, who had by then become Secretary of the Papal States, who will encourage Andrea to donate the oil stored in St Agnes' tanks (in Piazza Navona) to the Camera Apostolica⁴⁴. St. Agnes's tanks were part of the Collegio Pamphilj, or Collegio Innocenziano, commissioned to Francesco Borromini under Pontiff Innocent X Pamphilj (1654). The Collegio had been conceived to educate the young sons of the Doria Pamphilj's employees and tenant farmers. In terms of provisioning, it relied on the agricultural produce and olive oil produced by the Doria Pamphilj's *montano*, or olive press in Tivoli, whose productivity and quality of oil Carlandi had praised, and which Gandolfi was in the process of improving.

Although from different historical moments, these three episodes shed light on the role that the Doria Pamphilj family played in the material economy of Rome and its countryside. They tell us that the discourse on controlling the quality and increasing the quantity of olive oil which emerges also from the letter of Carlandi to Prince Andrea Doria Pamphilj, intertwined with the concern and interest of local aristocracy in the promotion of public welfare, be it in the form of fuelling the Roman olive oil *annona*, or guaranteeing enough oil for urban illumination, or paying taxes. These episodes also suggest the intertwined nature of discourses on the quality and improvement of olive oil with political economic questions of competition and trade, as well as with the emulation of other countries' modes and models of production.

All these aspects converge in Gandolfi's introduction to his *Saggio teorico pratico sopra gli olivi, l'olio e i saponi*, written in 1793 and dedicated to Pope Pius VI. Gandolfi made it clear that his overall intention was to improve not only the quality, but also the quantity of the olive oil produced in the Papal States, for the purpose of both agriculture, and manufacturing:

*Quantity and quality are the first two objects which must be taken into account when dealing with the cultivation of olive trees, as well as with the practices to collect and prepare their fruit, in order to extract that precious liquor which facilitates life conservation as much as manufactures and arts*⁴⁵.

⁴⁰ «Letter from Antonio Doria Pamphilj to Tommaso Spinelli», 25th April 1780, in ADP, Scaffale 10, busta 24, pages without numbers.

⁴¹ «Progetto del c. Francesco Bettini per illuminare tutte le strade, e particolarmente li capostrada della città di Roma», in ADP (Cartella Bettini) 1798; also referred to in M. Formica, *La Città e la Rivoluzione. Roma 1798-99*, Istituto per la Storia del Risorgimento Italiano, Roma 1994, p. 134; more specifically on nocturnal illumination practices in Rome during the French period, see *ibidem*, pp. 126-127, 475. See also «Progetto illuminazione Roma come Parigi», in ADP, Cartella 10, interno 55 (1798).

⁴² D. Roche, *The History of Everyday Things. The Birth of Consumption in France 1600-1800* (1997), Engl. transl. by B. Pearce, Cambridge University Press, Cambridge 2000, p. 120.

⁴³ «Letter from Odoardo Chimà», no recipient, 15th January 1799, in ADP, Scaffale 93, busta 2, Lettere Albano Laziale (1768-1814).

⁴⁴ *Gazzetta Universale, o sieno, notizie istoriche, politiche, di scienze, arti e agricoltura etc.*, 24 (1797), p. 240.

⁴⁵ Gandolfi, *Saggio teorico pratico*, cit., p. xi. The passage reads as follows: «Quantità, e qualità sono i due oggetti primarj, che si dee proporre di esaurire chiunque vuole scrivere utilmente sulla coltivazione degli ulivi, e sulla maniera di raccogliere, e preparare il loro frutto, onde esprimerne quel prezioso liquore, che [...] conferisce [...] alla conservazione della vita non meno, che al buon successo delle manifatture, e dell'arti».

Gandolfi's goal was to transform olive oil in a competitive agricultural produce, to be traded with foreign countries, similarly – he wrote – to the olive oil produced in France, Aix-en-Provence and Nice and around Genua, in Oneglia. He claimed that there were no reasons why Roman families should buy foreign olive oil, given that it should be possible to improve its production in the Papal States:

*Are there any intrinsic and insuperable obstacles because of which this nation cannot compare to other nations in terms of such an important product? Is there a reason why families have to invest a considerable amount of money to buy foreign oil for everyday use?*⁴⁶

Finally, Gandolfi hoped that the techniques outlined in his book could awake the spirit of emulation and industry of his fellow-countrymen and make them apply it to the cultivation of olive trees, olive oil and soap (as soap making was based on olive oil) production: «The goal of my treatise is to awake competition by means of example and comparison with the industrious people from Nizza, Oneglia and Genua and stimulate a noble enthusiasm to increase and improve olive oil for the profit of the State and the pleasure of individuals»⁴⁷.

Despite being framed in the context of the material practices of olive oil making, Gandolfi's discourse on emulation and human industry echoes some of the long-standing and broader preoccupations of Eighteenth-century enlightened political economists, such as how to achieve State self-sufficiency and the participation, of individuals and states alike, in the growth of commercial society. As John Shovlin has pointed out, the role of emulation in Eighteenth-century political economy went hand in hand with those of virtue and patriotism, of an interest which was not selfish, but rather oriented to pursue the good of society⁴⁸. Emulation was central to political economy; emulating foreign models of production, as well as practices, meant for a state to reinforce and improve agricultural as well as manufacturing productions and become an independent economic power, able to trade with other countries on the international mar-

ket⁴⁹. Although the term of 'improvement' has quite a peculiar connotation in English which is lost in the correspondent Italian *miglioramento*, we can still use it to indicate those practices directed to increase the efficiency and quality of wealth production, be it in manufacturing or agriculture. Emulation was itself both a form of and a means to improvement. Factually, it enabled the introduction of new ideas, as well as practices of production; morally, it opened the mind and excited the indus-

⁴⁹ Discourses on the positive effects of emulation on the production of wealth and trade originated in the 1750s, in the circle of the French Intendant de Commerce, Jacques-Claude-Marie Vincent de Gournay, a circle which brought together economic writers and public officers such as Forbonnais, George-Marie Bûtel-Dumont, André Morellet and Turgot. On Gournay, see L. Charles, F. Lefebvre et C. Théré, *Le cercle de Vincent de Gournay: Savoirs économiques et pratiques administrative en France au milieu du XVIII siècle*, Ined, Paris 2011. Gournay's circle was dedicated not only to debating some of the hottest topics of contemporary political economy, but also to discussing works by Jean-François Melon, especially his *Essai politique sur le commerce* (1734), as well as to studying and translating texts by early Eighteenth-century British and Scottish thinkers such as Charles King, John Cary and David Hume, and the Spanish Geronimo Ustariz, all of whom shared the political economy belief regarding the positive effects of commerce, trade and luxury on society. This seems a context only remotely related to Eighteenth-century Italian peninsula, let alone Rome; however, the contemporary circulation of political economic knowledge from France and England through the practice of translation, as well the emergence of political economic chairs, first in Naples (1754), then in Milan (1769), allowed for a diffusion of Gournay's ideas, and especially of the Gournayan Bûtel-Dumont's translation (1755) of John Cary's *Essay on the State of England* (1695). Cary's *Essay*, proposing that was labour and technology, through the mediation of commerce, which allowed nations such as England to flourish in the early modern period, was in its turn creatively translated and appropriated by Genovesi as *Storia del Commercio della Gran Bretagna* (1757-1758), and would inform the thought of Italian political economists such as Pietro Verri and Cesare Beccaria in Milan. On the circulation of political economic ideas from France to Italy in the 1750s, see J. Robertson, *The case for the Enlightenment. Scotland and Naples 1680-1780*, Cambridge University Press, Cambridge 2007, pp. 344-345. More broadly, on the role of emulation in the making of political economy and the pivotal role of Cary's essays and of its translations, see S. Reinert, *Translating Empire. Emulation and the Origins of Political Economy*, Harvard University Press, Harvard 2011, pp. 1-12; on Cary's perspective and on how he was appropriated by Genovesi, see pages 186 ff. See also J.L. Cardoso, *Genovesi and Enlightened Political Economy*, in *Economic Analyses in Historical Perspective. Festschrift in Honour of Gilbert Faccarello*, ed. by H.D. Kurz, and P. Steiner, Routledge, London and New York 2018, pp. 103-112. This collection of essays also includes a contribution by Marco Guidi on the role of translations in fostering knowledge of political economic questions «Translations and the circulation of economic ideas through Nations». On the circulation of political economic models in the *antichi stati italiani* see the essays in *Modelli d'oltre confine. Prospettive Economiche e Sociali negli Antichi Stati Italiani*, a cura di A. Alimento, Edizioni di Storia e Letteratura, Roma 2009, pp. IX-XLI. By appropriating the English Cary's ideas on the stimulating effects of commerce and exports and introducing them in his later *Lezioni di Commercio*, Genovesi would make emulation pivotal to the theory and practice of political economy in the Italian peninsula. «L'emulazione accende l'industria» that is, emulation is key to the participation of individuals to wealth production, and goes hand in hand with the practice of improvement.

⁴⁶ *Ibidem*, pp. 6-7. Original as follows: «Avvi forse qualche ostacolo intrinseco, e insuperabile, per cui non possa a questa nazione essere egualmente che all'altre commune il traffico di una derrata di così grande importanza? Avvi anzi ragione, per cui le primarie famiglie debbano commettere con spesa gravissima olj forestieri per uso di tavola?».

⁴⁷ *Ibidem*, pp. 6-7. The original reads as follow: «Lo scopo di questa [Gandolfi's work] si è quello di risvegliare universalmente collesempio, e coi confronti degli industriosi nizzardi, oneglini, genovesi &c. una gara lodevole, ed un nobile entusiasmo di accrescere, e migliorare gli olj a profitto dello Stato, e a comodo de' particolari».

⁴⁸ J. Shovlin, *Emulation in eighteenth-century French economic thought*, «Eighteenth-Century Studies», 36, 2003, 2, pp. 224-230.

try of the members of society, thus creating the conditions for the attainment of public happiness and utility.

Gandolfi's book, and its praise of the practice of emulation, will not go unnoticed by contemporary political economists in the Papal States, being directly mentioned in Nicola Corona's *Saggi economici politici e morali* (1795) as «a modern, yet classical, author, who tells us that we are capable to sell the superfluous, and do not need to envy the refined olive oil from Liguria»⁵⁰. The theme of emulation in relation to olive oil improvement emerged also in Vergani's *Dell'importanza dei prezzi*, a text which argued that «we (the Papal States) could practice foreign trade in an extensive way, especially with regard to the production of olive oil and wine»⁵¹. Corona and Vergani held contrasting views on how wealth should be produced; the first one advocated a Physiocratic approach, which saw agriculture as the only true source of wealth; the second one sustained a broader vision of wealth production, which included the encouragement of manufacturing and the positive and re-energizing function of luxury on the economy⁵². Vergani explicitly used Cary's ideas on the role of exports in the creation of wealth, and of manufactures especially, a choice through which he reconnected to Genovesi's tradition of political economy and to its praise of commerce⁵³. Where Corona saw olive oil as an agricultural product, Vergani interpreted it as a luxury item, which could offer the Papal States opportunities of growth on the international market.

The question of emulation cannot be separated from the role that networks, intellectual and factual, played in the production of Gandolfi's versatile knowledge and expertise, which spanned mechanics, soil chemistry, hydraulics and agriculture. For example, suffice is to leaf through one of the many scientific treatises written by Gandolfi to realise that he was acquainted not only with French chemistry, but also with the recently born French *agronomie*, in particular with the agricultural works written by François Rozier and the botanical ones of the French Valmont De Bomare, as well as with the works on olive oil of the Italian Marquis Domenico Grimaldi and the physician Giovanni Presta, both trying to improve olive oil production in the Kingdom of Naples. Gandolfi's knowledge had mostly a practical nature, and

was generated in specific spaces, such as his classrooms in the Collegio Nazareno, or his workshop and laboratory, likely to have been located in the Sapienza, where the naturalist also taught; the countryside of Tivoli, Albano Laziale and Canino, where he carried out surveys on behalf of the Doria Pamphilj family, as well as the *campagna* of Siena, Genua and Aix-en-Provence, which he had visited when on an olive oil production "Grand Tour" in northern Italy and France in the 1780s, a tour during which he had written a short and sketchy, albeit insightful, travel diary⁵⁴. However, the making of Gandolfi's knowledge also took place in the architectural spaces of the olive presses and mills owned by the Doria Pamphilj family, whose improvement he had worked upon. This space, even more than the academic and institutional contexts of the Sapienza and Collegio Nazareno, provided the setting for what Paola Bertucci has called 'intelligent networks', that is, a group of social relationships and locals which helped our Gandolfi gain knowledge and information regarding the mill and the surrounding area which he surveyed⁵⁵. These relationships included the local *ministro di campagna* of the Doria Pamphilj family, Francesco Carlandi, who sent the samples of olive oil to Prince Andrea, the carpenters and blacksmiths who were physically working in the mill, the architect Pasquale Belli, who surveyed river channels passing through the Doria Pamphilj lands, especially the Aniene, and finally, the very owner of the mill, Prince Andrea Doria Pamphilj Landi⁵⁶. Such relationships revealed not only the function of material practices as well as socio-economic settings in the production of scientific knowledge, to which I will go back soon, but also the central role of patronage.

3. PATRONAGE AND NETWORKS

In his *Saggio*, Gandolfi explicitly represented Prince Andrea as a patron; he believed his function to be that of facilitating the production of scientific knowledge, by transforming theories into practices, and pursuing the interest and benefit of the State, of the public as much as of private individuals. As it would have happened with any other patron in the early modern period, Prince

⁵⁰ N. Corona, *Saggi economici politici e morali*, dal tipografo di Gioacchino Puccinelli a S. Andrea della Valle, Roma 1798, pp. 226-227.

⁵¹ Vergani, *Dell'importanza e dei pregi del nuovo sistema di finanza dello Stato Pontificio*, cit., p. 280.

⁵² On Corona and Vergani, and their contrasting views on the function of luxury, see C. Carnino, *Lusso e Benessere nell'Italia del Settecento*, Franco Angeli, Milano 2014, p. 236 ff.; see also M. Caffiero, *La Repubblica nella città del Papa: Roma 1798*, Donzelli, Roma 2005, p. 90.

⁵³ Vergani, *Dell'importanza dei prezzi*, cit., pp. 80-81.

⁵⁴ Gandolfi's travel diary is held, in manuscript form, in the Archivio Generale delle Scuole Pie (AGSP henceforth), Reg. L-Sc. 292 (busta 7).

⁵⁵ P. Bertucci, *Enlightened Secrets. Silk, Intelligent Travel and Industrial Espionage in Eighteenth-Century France*, «Technology and Culture», 54, 2013, 4, pp. 820-852: 837.

⁵⁶ On Belli's involvement in attempting to improve (apparently unsuccessfully) water provisioning for the buildings and lands owned by the Doria Pamphilj family in Tivoli and Albano Laziale, see ADP, Scaffale 95, busta 63 (*Mulino a Tivoli, 1795-1859*) (interno 5:3 and 5:4).

Andrea and Gandolfi would both gain something from their exchange: Gandolfi could carry out his mechanical experiments, test his theories, and acquire further visibility, while Prince Andrea would gain in terms of land productivity and, possibly, also obtain moral recognition for acknowledging the public role of science in preserving and increasing the wealth of the State⁵⁷.

We do not know exactly when and how Prince Andrea met Gandolfi and decided to act as his patron. It is likely that this happened after the Doria Pamphilj family sold their palace in Albano Laziale to the Collegio Nazareno, the institution where Gandolfi started teaching in the 1780s. Or, possibly, during one of the many *conversazioni* (which were the equivalent of the French salons) organised by Roman nobility, one of the most renowned of which used to be held by the Princess of Doria, Eleonora Carafa della Stadera, Prince Giovanni Andrea Doria's wife, and attended by members of the Papal curia and aristocracy, as well as by erudites, *letterati*, naturalists and travellers⁵⁸. As remarked by Maria Pia Donato, culture was not anymore something to practice in isolation, a meditative activity, but something to share socially, something that was deemed to have – at least potentially – a social impact⁵⁹. Also, Prince Andrea Doria Pamphilj Landi was part of a network which spanned well beyond the Papal States: his brother, the cardinal Giuseppe Maria Doria Pamphilj, had been *nunzio pontificio* in France and *nunzio straordinario* in Spain between the 1770s and the 1780s, thus getting acquainted with the highest ranks of the Spanish and French monarchies, as well as with all those naturalists, artists, civil servants, finance ministers and collectors who gravitated around the various courts⁶⁰. We must

keep in mind the Doria Pamphilj family's networks and the roles they played in late Eighteenth-century Rome to contextualise the milieu of Gandolfi's activities and understand the political economic implications of his relationship with the aristocratic family.

The first explicit reference to Prince Andrea in Gandolfi's printed production appears in a short treatise, in the form of a published letter to Prince Andrea, on the *falsa ardesia*, a type of hard coal to be found on the Doria Pamphilj's lands. Written in 1789, Gandolfi dedicated it to Prince Andrea. The importance and potential relevance of the *falsa ardesia* for the Doria Pamphilj family stood in its use as fuel in various factories, from saltpetre to metallurgical productions, from salt to soap making practices. From a reading of the text, we know that the treatise sprang from a private conversation between Andrea Doria Pamphilj and the naturalist, happened on Easter day that year⁶¹. While building a narrative of the relationship between patron and protégé, Gandolfi also evoked public happiness as the goal of any examination of nature sponsored by virtuous and magnanimous citizens:

*Here I am to readily satisfy you with regard to everything which concerns not exclusively a philosophical otium, but also, and mostly, public happiness. Public happiness constitutes the only goal of philosophical investigations on nature; these are animated and promoted by that enlightened and generous zeal which sages acknowledge as the distinctive characteristic of virtuous and magnanimous citizens*⁶².

In the broad philosophical culture of Eighteenth-century Italy, *felicità* bore a strong connection with *utile*, in line with the strong legacy left by the diffusion of Ludovico Muratori's *Della pubblica felicità* (1749). In Muratori's book, practicing science was portrayed as a necessary and useful condition for the achievement of the happiness of a Republic, where happiness stood for the enjoyment of goods as well as the absence of evils⁶³.

⁵⁷ Gandolfi, *Saggio teorico pratico sopra gli olivi*, cit., p. XII. See also G. Donno, *Su una controversia olivicola-olearia della fine del Settecento*, «Rivista di storia dell'agricoltura», 10, 1970, 2, pp. 39-61. On the Doria Pamphilj family's various patronage practices, especially Cardinal Benedetto Pamphilj, see S. Leone, *The Pamphilj and the Arts: Patronage and Consumption in Baroque Rome*, University of Chicago Press, Chicago 2001, pp. 11-21. I thank Dr. Arnold Witte for discussing this specific aspect with me on more than one occasion. On patronage as central to the practice of science, see M. Biagioli, *Galileo, Courtier. The Practice of Science in the Culture of Absolutism*, Chicago University Press, Chicago 1993.

⁵⁸ M.P. Donato, *Female self-affirmation in the Roman salon*, in *Italy's eighteenth century: gender and culture in the age of Grand Tour*, ed. by P. Findlen, W.W. Roworth and K.M. Sama, California University Press, Stanford 2009, pp. 59-68: 62. On the *conversazioni*, see also chapter III in Donato, *Accademie romane*, cit., p. 117-170.

⁵⁹ On this aspect, see M.P. Donato, *Cultura dell'antico e cultura dei lumi a Roma. La politicizzazione dello scambio culturale durante il Pontificato di Pio VI*, «Mélanges de l'Ecole française de Rome. Italie et Méditerranée», 104, 1992, 2, p. 513.

⁶⁰ The ADP holds a vast quantity of private letters, mostly unpublished, exchanged between the three brothers between the 1770s and the first decade of the Nineteenth century.

⁶¹ B. Gandolfi, *A sua eccellenza il Principe di Doria Pamphilj ... Lettera del Padre Bartolomeo Gandolfi*, Nella Stamperia di Giovanni Zempel, Roma 1789, p. 3.

⁶² *Ibidem*, p. 4. (italics mine). The original reads as the following: «Eccomi dunque ad appagarla colla maggiore prontezza possibile in tutto ciò specialmente, che non si restringe soltanto a servire di pascolo lusinghiero ad un qualche ozioso Filosofo; ma tende ben anche direttamente alla pubblica felicità, unico scopo delle intralciate ricerche della natura, quando vengano queste animate, e promosse da uno zelo illuminato e generoso qual fu sempre riconosciuto da' Saggi pel distintivo più vero di un virtuoso e magnanimo cittadino».

⁶³ L. Muratori, *Della pubblica felicità oggetto de' buoni principi*, a cura di C. Mozzarelli, Donzelli, Roma 1996, p. 52. See G. Imbruglia, «Ludovico Antonio Muratori», in *Dizionario Biografico degli Italiani*, 77 (2005), pp. 443-452. See A. Saltini, *Manifesto degli Studi di Politica Agraria*, in *Corte, Buon Governo e Pubblica Felicità. Politica e Coscienza Civile nel*

As it will become clearer in Gandolfi's *Saggio* (1793), the naturalist's *Lettera* also highlighted that useful sciences which directly led to an increase in public happiness were not the occupation of the *ozioso filosofo*, a philosophical rumination, but rather represented a form of political commitment, promoted by sovereigns as much as by single individuals⁶⁴. The end of Gandolfi's *Lettera* also gives us a better glimpse into some of the naturalist's local networks, from the Benedictine abbots at Subiaco, whom Gandolfi helped by fixing their olive oil mill, to his 'friends' who encouraged him to finish his treatise on olive oil, to the members of the Collegio Nazareno, where he was teaching at the time⁶⁵.

Gandolfi was part of a wide network of naturalists that his engagement and patronage bond with the Doria Pamphilj family undoubtedly helped expand. His good connections allowed him to develop his interests, which spanned from mechanics to chemistry, from hydraulics to mathematics, passing through Philosophy, which he had taught at the Collegio per Nobili in Ravenna from 1779 to 1784, moving to the Collegio Nazareno straight after⁶⁶. The 1780s were flourishing years for the Nazareno. Under the rectorate of the mineralogist Vincenzo Petrini, the Roman institution became an hub of scientific research, mineralogical, chemical and physical, bringing together figures such as the geologist Scipione Breislak and Carlo Giuseppe Gismondi who will later be involved – at different levels – in the short-lived project of a Repubblica Romana in 1798, sharing Gandolfi's scientific interests and enlightened vision of science as publicly useful, at the service of the State and of the happiness of its subjects⁶⁷. The Nazareno had a strong legacy in the study of mathematics, since the foundation of a mathematical school in San Pantaleo by the Galilean scholar Giovanni Alfonso Borelli in the 1670s⁶⁸. As Morichini reports in his *Necrologia* of the natural-

ist, Gandolfi seems to have introduced the teaching of calculus in the Nazareno, attracting the attention of the mathematician Gioacchino Pessuti, who contributed to have him appointed Professor in Fisica Sperimentale at the Sapienza in 1792. Gandolfi was also one of the first naturalists to introduce the chemical vocabulary of the French chemist Lavoisier, thus going beyond the tradition of the Dutch chemist Hermann Boerhaave⁶⁹.

However, Gandolfi's networks were not only local: we know from a printed letter from the Portuguese diplomat Luigi Alvarez da Cunha e Figueiredo to the Portuguese ambassador in the Papal States, Alessandro De Sousa Holstein, that Gandolfi's book on olive oil was bought in 40 copies by De Sousa Holstein, for diffusion in Portugal⁷⁰. This of course gives us a sense of the reach of Gandolfi's expertise, as well as of the relevance of olive oil in the economy of the Mediterranean⁷¹. Olive oil was the most significant export in countries such as Portugal and the Kingdom of Naples, although it was widespread also in other areas⁷².

In terms of mechanical and architectural knowledge, we also know that Gandolfi had contacts with the architect Pasquale Belli, who had been supervising him in the process of restructuring olive mills on the Doria Pamphilj's lands, and who had become more widely known under Pope Pius VI for installing the obelisks in Quirinal Square, Trinità dei Monti and Montecitorio⁷³. Gandolfi's network also reached Habsburg Milan, as it emerges from his surprising reference, in one of his manuscripts, to Don Alberto Alamanna (Alemagna), a Milanese science amateur and passionate of mechanics

Muratori, Atti della III Giornata di Studi Muratoriani (Vignola, 14 ottobre 1995), L.S. Olschki, Firenze 1996, pp. 155-176.

⁶⁴ On science as a form of education for cultural elites in view of a transformation of society, see Caffiero, *Le Efemeridi Letterarie*, cit., p. 84.

⁶⁵ Gandolfi, *Lettera del Padre Bartolomeo Gandolfi*, cit., pp. 28-29.

⁶⁶ Morichini, *Necrologia*, cit., p. 443.

⁶⁷ On the involvement of the Piarists at the Nazareno at the time of the Repubblica Romana, see D. Armando, "La vertigine nel chiostro". *Gli Scolopi romani nella crisi Giacobina*, «Ricerche per la storia religiosa di Roma» 9, 1992, pp. 245-304. See also D. Armando, *Gli Scolopi nelle istituzioni della repubblica romana del 1798-1799*, «Studi romani», XL, 1992, 1-2, pp. 37-55, and L. Pepe, *L'Istituto nazionale della Repubblica romana*, «Mélanges de l'Ecole française de Rome. Italie et Méditerranée», 108, 1996, 2, pp. 703-730. On lay political participation during the Repubblica Romana, see M. Formica, *Rivoluzione e "Milieux Intellectuels"*, in *Naples, Romes, Florence*, cit., pp. 293-327.

⁶⁸ On the impact of Galilean science on the teaching of natural philosophy in the Piarist Order, see Montacutelli, *Da Galileo a Borelli e oltre*, cit., pp. 201-205.

⁶⁹ Morichini, *Necrologia*, cit., p. 444.

⁷⁰ *Memorie per servire alla storia letteraria e civile*, Della Nuova Stamperia, Venezia 1796, p. 54. Although further archival research (very likely in the Arquivo Torre do Tombo in Lisbon) is needed before establishing the impact of Gandolfi's treatise on olive oil production in Portugal, or if it had an impact at all, we can speculate that Gandolfi's book was known at least in Lisbon's Academia Real das Ciências, since the second edition of the vice-secretary of the Academia Real das Ciências, J.A. Dalla Bella's *Memoria sobre a cultura das Oliveiras em Portugal* (1786), typ. da Academia real das ciencias, Lisboa 1818, enriched by the comments of Sebastião Francisco Mendo Trigo, mentions his activities and treatise twice (pp. 148, 187). I thank prof. José Luis Cardoso for discussing this topic with me and orienting me towards potential new paths of research.

⁷¹ For comparison, see M. Costantini, *L'olio della Serenissima. Dal Commercio alla Produzione. Per una Storia dell'Uso Produttivo di un Territorio d'Oltremare in una Strategia Mercantilistica*, in *Levantate Veneziano. Aspetti di Storia delle Isole Ionie al Tempo della Serenissima*, a cura di M. Costantini e E. Nikiforou, Bulzoni, Roma 1996, pp. 11-19.

⁷² M. Mazzotti, *Enlightened mills. Mechanising olive oil production in Mediterranean Europe*, «Technology and culture», 45, 2004, pp. 277-304: 277.

⁷³ See again *Memorie per servire alla storia letteraria e civile*, cit., p. 54; on the life and works of Belli, see S. Betti, *Notizia intorno alla vita e alle opere di Pasquale Belli*, Tipografia Boulzaler, Roma 1833.

who had devised a prize-winning spinning machine⁷⁴. Alamanna was a member of the Milanese Società Patriotica, a Habsburg-founded academy for the improvement of agriculture and manufacturing. He was mostly known for supervising the construction of various machines in the context of the Società and was often consulted to establish their level of efficiency⁷⁵.

4. MATERIALISING POLITICAL ECONOMY

Gandolfi's acknowledgment of the function of mechanical practitioners is fundamental because it reminds us of the role that these figures (who could be either carpenters, blacksmiths, or artisans) had in improving machines and technological apparatuses according to the principles outlined by naturalists; more broadly, it reminds us of their role in the making of political economic reforms. Often neglected by most scholarship on early modern political economy, it is worth to highlight that it was the invisible hands of these figures who practically built and maintained the machines discussed in contemporary political economic and scientific treatises; those same machines which were meant to increase productivity and improve the quality not only of olive oil, but also of grain, wine, cheese, silk and other agricultural produce and manufactures. The absence of these figures from the literature on political economy reminds us how mechanical practitioners have been seen throughout the centuries, not only in the early modern period, but even earlier, as mere operators, as representative of mechanical arts, and in charge of building, activating and maintaining mechanical devices, and opposed to the supposedly purer and nobler liberal arts⁷⁶. It also tells us about the tension between theory and practice, between ideas and their practical

and concrete realisations, a tension that underlies the Enlightened ideals of knowing and controlling nature and its resources to increase the wealth of the State and realise the happiness of state subjects. Finally, it echoes the distinction between knowing by principle and knowing by habit, a distinction which emerges in many early modern technical texts and mechanical treatises, and which is reflective of the contemporary, certainly questionable gap between naturalists and practitioners.

However, current historiographical narratives in the history of science have been for a few decades reclaiming a space of agency for invisible technicians and workshop assistants, to use Steven Shapin's canonical expression, in the making of scientific knowledge⁷⁷. In the case of Gandolfi, we know that he constantly interacted with the carpenters and blacksmiths who worked on the Doria Pamphilj's olive mill in Tivoli. These skilled workers engaged with the naturalist, as it emerges from their manuscript account books. In the blacksmiths' account book, which listed all the operations carried out in the olive mill in Tivoli, and their price, one can find a comment on how they operated on certain specific sections of the olive mill «following the indications of lecturer Gandolfi»⁷⁸ (fig. 1).

This basically means Gandolfi had been there, on site, discussing technical details with skilled workers. I will not enter into the specificities of the technical details of Gandolfi's suggestion. Suffice it to say that these two figures, the skilled worker and the naturalist collaborated to improve the mechanics which would allow a better economic production. In a sense, this reference also tells us of the multiplicity of cultures of knowledge at play in the Doria Pamphilj's mill, which would turn into a place and space, to put it in the words of Pamela Long, «where learned and skilled individuals interacted and exchanged substantive knowledge»⁷⁹.

⁷⁴ «Esperienze sul pane», in AGSP, Reg. L.-Sc. 293 (Busta 49), pages with no number.

⁷⁵ Alamanna (Allemagna) makes an appearance in the *Atti della Società Patriotica*, vol. 2, Nell'Imperial Monisterio di Sant'Ambrogio Maggiore, Milano 1789, p. 50, as well as in the manuscript proceedings of the Patriotica which are held in the Biblioteca Nazionale Braidense in Milan, *Copialettere della Società Patriotica*, AF XI 38, pp. 12, 42, 61.

⁷⁶ This is a central question in the history of technology, which brings to the fore the intersections and exchanges between technical practice and "theoretical" mechanics; on this see C. Poni, *The Craftsman and the good engineer*, «History and Technology», 10, 1993, 4, pp. 215-232, and Id., *The Worlds of Work: Formal Knowledge and Practical Abilities in Diderot's Encyclopédie*, «Jahrbuch für Wirtschaftsgeschichte/Economic History Yearbook», 50, 2009, 1, pp. 135-150. Also, see the works of P. Rossi, especially *I filosofi e le Macchine*, Feltrinelli, Milano 1962; for a critical perspective of Rossi, see R. Nanni, *Technical Knowledge and the Advancement of Learning: Some Questions about "Perfectibility" and "Invention"*, in *Philosophies of Technology. Francis Bacon and his Contemporaries*, ed. by C. Zittel et al., Brill, Leiden-Boston 2008, pp. 51-66.

⁷⁷ S. Shapin, *The invisible technician*, «American scientist», 77, 1989, 6, pp. 554-563. Literature on this theme is vast and cannot be discussed in full here; two among the most significant representatives of this approach in the history of science are P. Smith, especially her *The Body of the Artisan: Art and Experience in the Scientific Revolution*, Chicago University Press, Chicago 2004, and the collective volume *The mindful hand: inquiry and invention from the late Renaissance to early industrialisation*, ed. by L. Roberts, S. Schaffer and P. Dear, Koninklijke Nederlandse Akademie van Wetenschappen, Amsterdam 2007. More recently, see also Bertucci, *Artisanal*, cit. On the intersection between two different domains of knowledge, the artisan/practitioner and the naturalist, see P. Galison, *Trading Zones: Coordinating Action and Belief*, in *The Science Studies Reader*, ed. by M. Biagioli, Routledge, London 1999, pp. 781-844, and P.O. Long, *Artisans/Practitioners and the Rise of the New Sciences 1400-1600*, Oregon State University Press, Oregon 2011, p. 95.

⁷⁸ ADP, Scaffale 96:63 (interno 7), page with no number.

⁷⁹ See Long, *Artisan/Practitioners*, cit., p. 96. On the role of artisans and practitioners in the process of scientific knowledge production, see also



Fig. 1. ADP, Scaffale 96:63 (interno 7) (Roma, Archivio Doria Pamphilj © with kind permission of the Amministrazione Doria Pamphilj s.r.l.).

This episode appears in the same archival series of that letter from Carlandi to Prince Andrea Doria Pamphilj Landi which opened this article. This correspondence is important as it reflects the perspective of different actors on the management of the Doria Pamphilj's olive press in Tivoli, and especially with regard to its maintenance, productivity, quality of the oil produced and plans for potential improvement. It also tells us about models of land management in the Eighteenth-century Papal States, and of the role of a *ministro* such as Carlandi in acting as a go-between, mediating between the Prince, manual workers and the naturalist Gandolfi. Although we can still make the hypothesis that Gandolfi communicated directly with the Prince, no part of their correspondence can be retrieved, while many are the letters that the Prince received from Pietro Ludovisi, the director of the Collegio Innocenziano,

the Doria Pamphilj's institution that owned the olive press in Tivoli, and Filippo Tomei, priest in the parish of Tivoli, in 1795⁸⁰. The name of Gandolfi appears in this correspondence in relation to his surveys of the *montano* in Tivoli, as well as of other parts of the lands of the Doria Pamphilj family, being evoked by the *ministro di campagna* almost as a *deus ex machina* for the resolution of technical problems. One significant example is a letter that Pietro Ludovisi sent to Prince Andrea in November 1796:

The upper press as well as the two grindstones are almost ready for use- the upper press is situated on the top of the second press, which was properly set the 20th day last month. The only missing thing are the stigli di rame which Your Excellence would like to substitute with iron ones- in case you believed there is no time to order them after your return to Rome, just let me know the name of an artisan, and I will immediately ask to have them done with Father Gandolfi's approval and supervision⁸¹.

Or yet another letter, this time from Carlandi to Ludovisi, in which the former reassured Ludovisi, so that he informed Prince Andrea, that Gandolfi had already sorted out «the whole thing» (probably a reference to some technical problem in the olive mill in Tivoli) and that he had sent a carpenter with three young assistants to Tivoli⁸².

But what was, in practice, Gandolfi's main concern with the improvement of olive mills? Why did he feel the need of writing a treatise on it rather than just doing fieldwork and carrying out improvements on the lands of the Doria Pamphilj family? Gandolfi was concerned about efficiency and economy. As to efficiency, the naturalist aimed at building an olive oil mill which – he said – «could be moved by one man only, or a robust woman with the addition of innovative pieces in comparison with ordinary olive mills» or otherwise, by the force of water⁸³. Also, he was preoccupied with regard to the climatic and environmental conditions of the mill, whose

⁸⁰ See the various letters in ADP, Scaffale 95, busta 67 (*Montano Tivoli/Colonna*), and Scaffale 95 busta 63 (Mulino a Tivoli, 1795-1810).

⁸¹ «Pietro Ludovisi to Prince Andrea», Rome, 6th November 1796, in ADP, Scaffale 95, Busta 63, page with no number. The original reads as the following: «Un torchio, cioè quello superiore, è già pronto all'opera quando si voglia, e così ancora ambedue le macine, e presentemente si sta sopra al secondo torchio, ch'è sperarei montato a perfezione circa li venti del mese presente. Di tutto l'occorrente non manca altro ch'è gli stigli di ferro che Vostra Eccellenza vuol sostituire a quelli di rame, e questi, quante volte creda non si faccia a tempo di ordinarli dopo il suo ritorno in Roma, basta che si degni significarmene l'artefice, li farò subito fare con l'intesa, e direzione, del P. Gandolfi».

⁸² «Piero Ludovisi to Francesco Carlandi», Tivoli, 3rd October 1795, in ADP, Scaffale 95, Busta 63, page with no number.

⁸³ Gandolfi, *Saggio*, cit., p. 258.

Smith, *The Body of the Artisan*, cit., pp. 59-94 (this is a section dedicated to the question of «artisanal epistemology»).

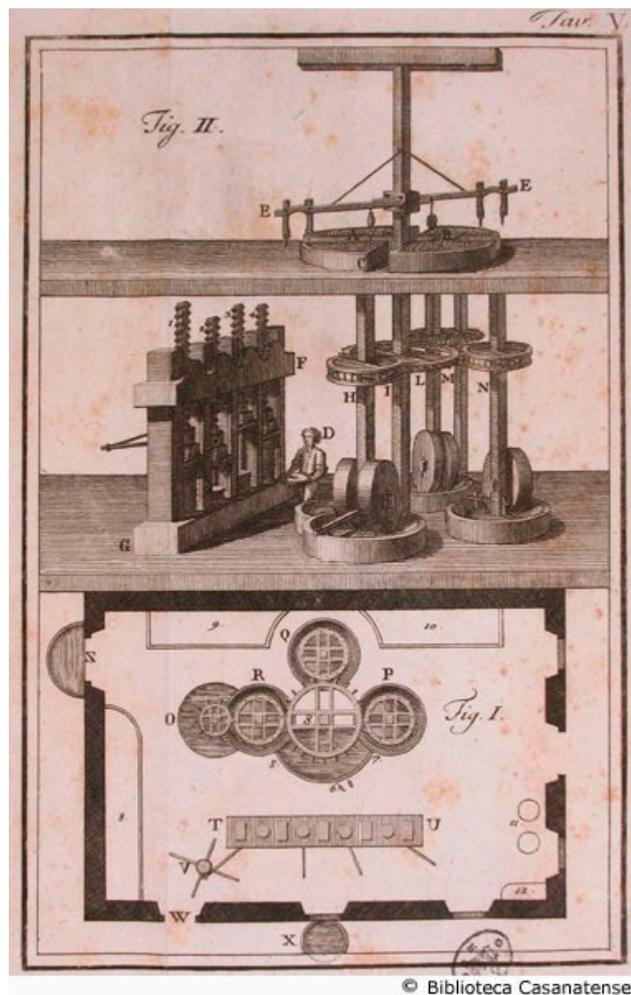


Fig. 2. Gandolfi, *Saggio teorico pratico sopra gli olivi*, Nella Stampateria di Giovanni Zempel, Roma 1793, late nr. V (Rome, Biblioteca Casanatense. With kind permission of the Biblioteca).

interiors needed to be exposed towards the sun for most of the day, or otherwise warmed up with the help of a stove. The preparation of the olives also required some time and efforts: after being cleaned, they should be distributed so as to fill the all surface of the *pila*, the bottom part of the millstone's tank, be repeatedly crushed and washed, until they reached the right texture. The residues of the stones also had to be removed, so as not to give to the final product a sour and unpleasant taste. The *sansa*, or olive waste, was used as fuel in ceramic factories and bakeries. Gandolfi's book was enriched with plates, one of them representing what the naturalist called an «economic distribution of mechanical pieces» in the mill⁸⁴. As it is visible from the image below (fig.

⁸⁴ *Ibidem*, pp. 421-422.



Fig. 3. Jan Collaert I from Jan Van Der Straet, *Nova Reperta. The Invention of the Olive Oil Press*, plate 12 (New York, Metropolitan Museum, The Elisha Whittelsey Collection, The Elisha Whittelsey Fund, 1949. Open access).

2), the structure of this mill, with the presses close to the tanks for the kneading of olive paste, would allow to use only one man to put everything in motion, rather than eight, as it would happen in normal mills⁸⁵.

The plate in Gandolfi's treatise can in fact also be compared with the famous Sixteenth-century print by Giovanni Stradaro, in which olive oil making was shown in all its complexity and necessary workforce (fig. 3).

Reducing the time of production went hand in hand with the improvement of the quality of olive oil, and would impact its price, which would increase, making olive oil an appealing sector for individual investments⁸⁶. The term 'economic' is here central; it does not have to do with efficiency exclusively, or with specific technicalities, but evokes a whole discourse on political economy, a discourse which had been developed in France, a few decades before Gandolfi wrote his essay. The use of the adjective 'economic', with regard to the model of mill, could perhaps be referred to the political economic discourse of the Physiocrats – who defined themselves *économistes* – and to those debates regarding the new technologies to thresh grain and turn it into flour which were developed between the 1760s and the 1770s, as a strategic technology to keep under control possible famine outbreaks⁸⁷. Nevertheless, eco-

⁸⁵ *Ibidem*, p. 422.

⁸⁶ *Ibidem*, p. 258.

⁸⁷ S. Kaplan, *Provisioning Paris*, Cornell University Press, Ithaca (NY) 1984, chapters 10-11, especially pp. 422-423; see also Id., *The Bakers of Paris and the Bread Question*, Duke University Press, Durham (NC) 1996, pp. 510-514; 'economic milling' is the translation that Kaplan gives for *mouture économique*. On *mouture économique* in the broader

conomic milling cannot be defined as originally and inherently Physiocratic, in that it had appeared for the first time in France under Louis XIV, its realisation being inspired by the continuous requests of Parisians for white flour, as well as, later on, between the seventeenth and the eighteenth centuries, by the necessity to counteract dearth. This latter point is interesting, as it might help us further highlight that Gandolfi's project was influenced by debates which had transversally characterised Eighteenth-century European political economy rather than just Physiocracy.

Introducing new technologies to rationalise and further mechanise production would increase national wealth and eventually prompt political and social advancements, in line with the Enlightenment ideal of the function of science in the promotion and realisation of public happiness. Gandolfi's book on olive oil is however not an isolated case in Eighteenth-century Mediterranean countries: treatises on improving the production of olive oil were published in the Kingdom of Naples, such as the *Istruzione sopra la nuova manifattura dell'olio* (Naples, 1773), by the Genovese landowner and reformer Domenico Grimaldi who was working on olive oil production on his estates in Calabria, or Rozier in France, who dedicated a significant section in his *Cours complet d'agriculture* (Paris, 1781-1805) to olive oil production, or the Italian living in Portugal Antonio della Bella's *Memoria sobre a cultura das oliveiras em Portugal* (Coimbra, 1786)⁸⁸. Gandolfi did not seem to be aware of della Bella, at least he does not refer to him in his *Saggio*, but he took into account both Grimaldi and Rozier, that testifies, as mentioned before, to the extent of his intellectual networks⁸⁹.

Of course, the plate picturing the structure of the olive oil mill in Gandolfi's *Saggio* is not the only one highlighting the tight intersection between political economic themes and technological advancement, and the function of human and living beings in the production of wealth in particular. Another significant plate from this point of view pictures a horse-powered mill and its millstone (fig. 4). The shape and weight of the millstone, and its relation to the diameter of the tank in which olives were crushed was in fact a decisive factor to determine how much olive oil could be produced and how fast, and attracted Gandolfi's attention.

Indeed, many are the references, in manuscript material regarding Gandolfi's works on the Doria Pam-

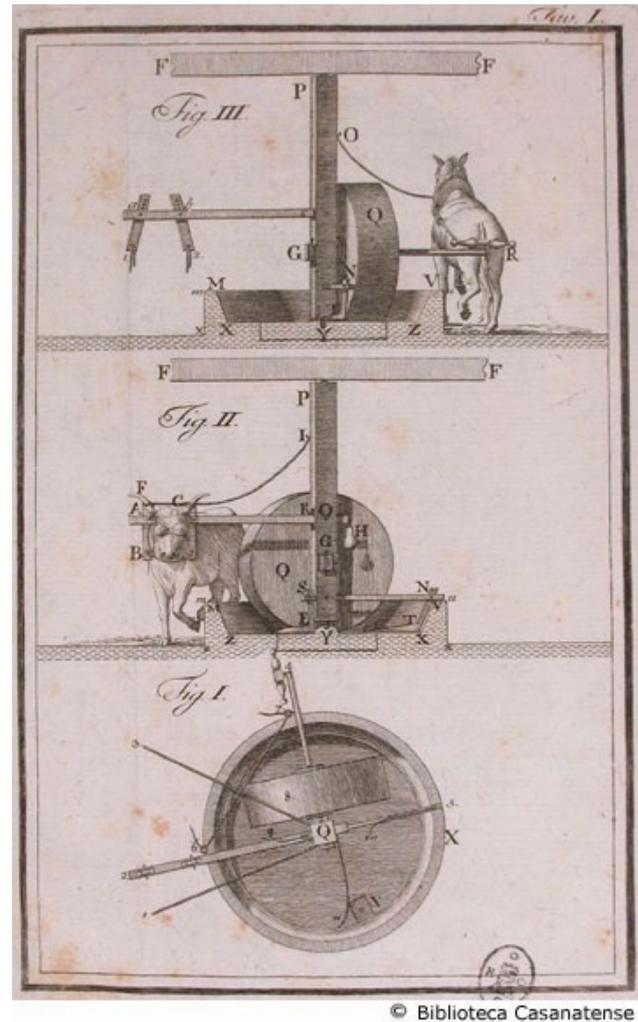


Fig. 4. Gandolfi, *Saggio teorico-pratico*, Nella Stamperia di Giovanni Zempel, Roma 1793, plate nr. I (Roma, Biblioteca Casanatense, coll. N.V. 59. With kind permission of the Biblioteca).

philj's lands, to his interventions on the shape of the millstone, not only for oil, but also for grain production. Most of this material – which consists not only of scattered notes, but also of sketches and drawings – is held in the Archivio Generale delle Scuole Pie⁹⁰. The sketchy nature of Gandolfi's drawings reveals that they were not made for circulation but were rather the result of the naturalist's on-site data collection practices. A possible example is a drawing incorporated in a series of written passages that showed how to increase the production of flour in Montelanico (another estate of the Doria Pamphilj family) by changing the shape and weight of

context of Physiocracy see also C. Larrère, *La physiocratie comme science nouvelle*, in *Nouvelles sciences. Modèles techniques et pensée politique de Bacon à Condorcet*, éd. par F. Tinland, Editions Champ Vallon, Seyssel 1998, pp. 133 ff.

⁸⁸ Mazzotti, *Enlightened mills*, cit., pp. 284-286.

⁸⁹ Gandolfi, *Saggio*, cit., pp. 152, 174, 281.

⁹⁰ The AGSP holds a significant amount of material pertaining to Gandolfi's multifarious activities, in particular AGSP, Reg. L-Sc. 288, 289, 290-293.

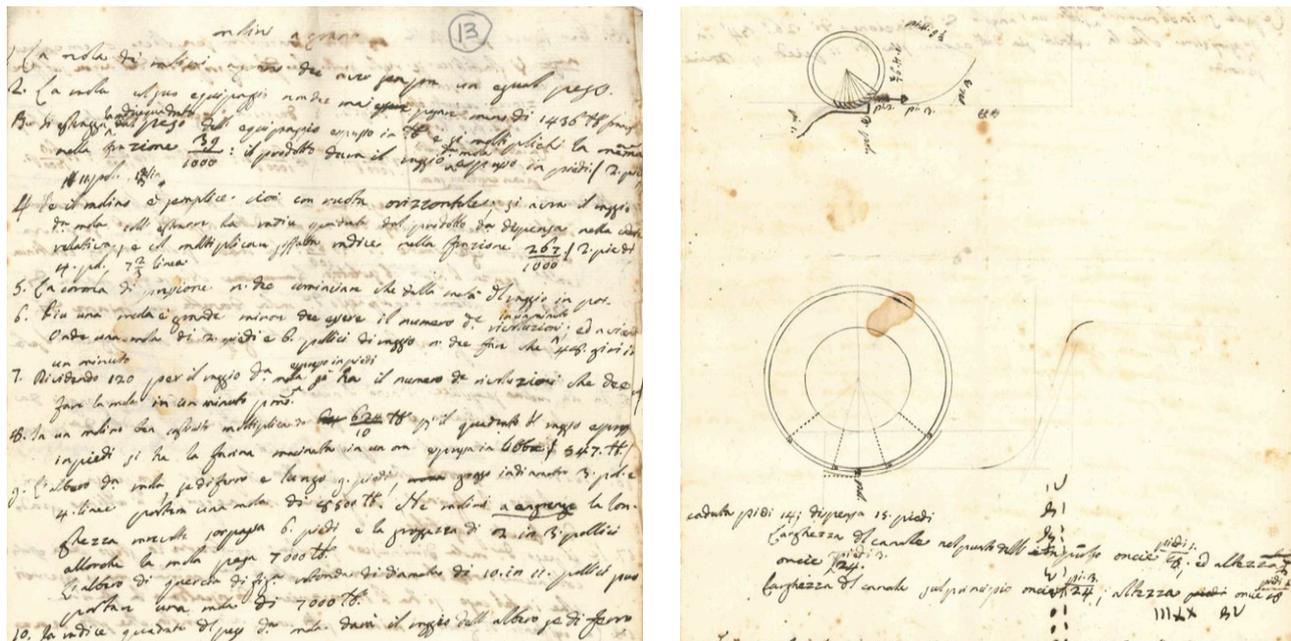


Fig. 5. Archivio Generale delle Scuole Pie, Reg. L.-Sc. 291, fasc. 13 (Roma, Archivio Generale delle Scuole Pie © With kind permission of the Curia Generalizia dei Padri Scolopi).

the millstone⁹¹. In this piece, Gandolfi is almost thinking out-loud, numbering the logical and necessary steps and eventually establishing that, in «well-built mills» the square of the radius of the millstone should be proportional to the quantity of flour produced (fig. 5)⁹².

Improving the shape of the millstone and its functionality was on top of Gandolfi’s thoughts while surveying the lands of the Doria Pamphilj. This is also evidenced by a letter regarding the millstone of one of the mills of Prince Andrea in Albano Laziale. Dating 1799, this letter was sent from a vassal to Prince Andrea, who likely forwarded it to Gandolfi in virtue of his expertise⁹³. As a source, it is important because it shows how Gandolfi relied on the knowledge of local actors, in this case of one of the vassals of the Prince, to collect information on the condition of the mechanical pieces of the olive oil mills which he was asked to improve. A further source which also sheds light on the surveying activities of the naturalist and his interventions on the Doria Pamphilj’s mills is represented by a series of notes – among which some «necessary measurements» – which the naturalist took of various parts of the olive oil mill

in Albano Laziale, and which were also combined with quantitative figures regarding the quantity of olive oil produced in the same mill⁹⁴.

Gandolfi’s attempts at improvement were tightly connected with the problem of emulation which has been mentioned in section 2 of this article. Many of his observations, as well as notes regarding mills mechanics, heavily relied on the writings of the early Eighteenth-century French engineer Bernard Forest de Bélidor (1698-1761) to the extent of consisting, in some cases, of translated excerpts from Bélidor’s treatise *Architecture hydraulique* (1737-1739)⁹⁵. Gandolfi considered the French savant as the peak of advancements in terms of mill-related technologies and craftsmanship. In line with this idea, the naturalist not only transcribed sections of the *Architecture hydraulique*, but also drew copies of the French engineer’s plates, complete with plate numbers and references⁹⁶. In practice, Gandolfi was trying to appropriate French practical knowledge and adapt it to the circumstances of the Doria Pamphilj’s

⁹¹ AGSP, Reg. L.-Sc. 291 Fasc.1; see also a later source, from 1812, which also consists in a series of passages to solve the same question, in AGSP, Reg. L.-Sc. 290 Fasc. 1, Busta 5.

⁹² AGSP, Reg. L.-Sc. 291 Fasc.13.

⁹³ I make this hypothesis because said letter is preserved in AGSP, Reg. L.-Sc. 291 Fasc. 2, Busta 9 rather than in the ADP.

⁹⁴ AGSP, Reg. L.-Sc. 292 Fasc. 3, Busta 60.

⁹⁵ AGSP, Reg. L.-Sc. 290 Fasc. 1 (Busta 9).

⁹⁶ AGSP, Reg. L.-Sc. 289 Fasc. 4. This group of documents is a series of drawings, supposedly by Gandolfi himself, replicating Bélidor’s plates. On copying images in the earlier context of architecture/engineering, and on how such practice reflects a shared body of knowledge, see E. Merril, *Pocket-size architectural notebooks and the codification of practical knowledge, in The Structures of Practical Knowledge*, ed. by M. Valeriani, Springer Press, Cham 2017, pp. 21-54.

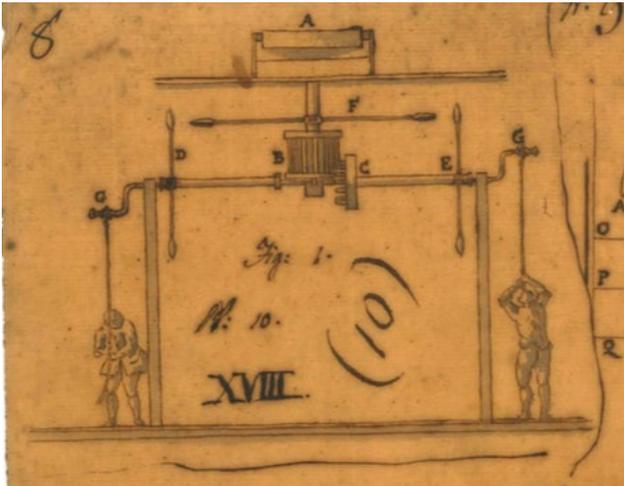


Fig. 6. Archivio Generale delle Scuole Pie, Reg. L- Sc. 289 Fasc.4 (Roma, Archivio Generale delle Scuole Pie © With kind permission of the Curia Generalizia dei Padri Scolopi).

lands and mills, by copying images as well as translating passages from Bélidor's treatise. In the words of Sven Dupré, through the practice of translation, Gandolfi was «transferring knowledge from one place to another», mediating between separate models of knowledge and practices⁹⁷. This emulative aspect clearly emerges from the similarities between two images which we can find in Gandolfi's unpublished papers: his own copy of a human-powered mill, from Bélidor's treatise (fig. 6), and his own sketch of a similar mill, also put in motion by two human beings («mulino girato da due uomini»), which Gandolfi drew at the end of what seems to be a small treatise in applied mechanics (fig. 7).

Overall, we could claim that the numerous drawings that Gandolfi left us were ways of representing and visualising some of the technology needed to reinvigorate the political economy of the Papal States at the end of the Eighteenth century, with a special focus on olive oil production. The naturalist's images – sometime copies, sometime the production of his own creativity – tell us not only about knowledge transfers throughout Europe, but also about the potential applicability of technology and mechanics to increase agricultural productions. Overall, Gandolfi's images make the materiality of wealth production visible, revealing social, economic, personal and professional relations, such as the role of

⁹⁷ On scientific translation, see S. Dupré, *Introduction: Science and Practices of Translation*, «Isis», 109 (special issue: *Translating Science over Time*), 2018, 2, pp. 302-307: 303, and the bibliography provided; more broadly on scientific translation, see the recent *Translating Early Modern Science*, ed. by S. Fransen, N. Hodson and K.A.E. Enenkel, Brill, Leiden 2017, pp. 114.

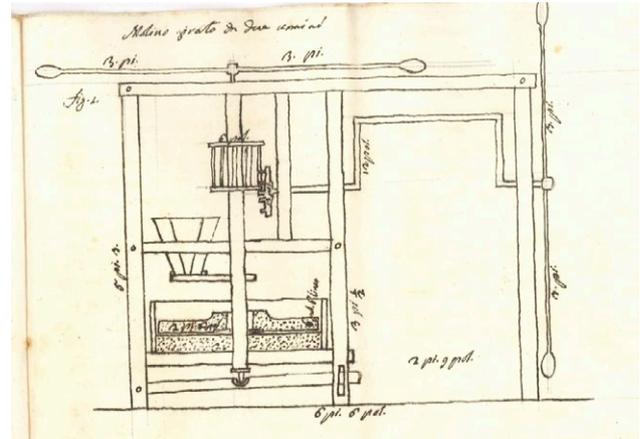


Fig. 7. Archivio Generale delle Scuole Pie, Reg. L- Sc. 290 Fasc. 1 (Roma, Archivio Generale delle Scuole Pie © With kind permission of the Curia Generalizia dei Padri Scolopi).

local actors, carpenters, blacksmiths, architects as well as, more broadly, of models of efficiency and mechanics, in the maintenance of the olive oil mills on the lands of the Doria Pamphilj family⁹⁸. They also tell us how discourses of technological improvement, emulation and modernisation intertwined and were central to the making of reforms, even when these did not turn out to be successful.

CONCLUSION

To conclude, let's go back to the letter written by Carlandi, Prince Andrea's tenant farmer, which opened this article. At the end of it, Carlandi added that «neither nature, nor art can produce a better oil than this», with reference to the olive oil produced on the lands of the Doria Pamphilj family. With this statement, he shed light on two elements: first, he elaborated on the intersection between technology, commercial products and taste; he hinted at the fact that producing good quality oil is a process that, if properly supervised by a natural-

⁹⁸ On technical images see *Picturing Machines 1400-1700*, ed. by W. Lefevre, MIT Press, Harvard 2016, and especially M. Popplow, *Why drawing pictures of Machines? The Social Context of Early Modern Machine Drawing*, pp. 17-48. On the function of images in the context of scientific knowledge production, see *Transmitting Knowledge: Words, Images and Instruments in Early Modern Europe*, ed. by S. Kusukawa and I. MacLean, Oxford University Press, Oxford 2006. On images and how they «partake in the constitution of knowledge», see H. Bredekamp, V. Dünkel, B. Schneider, *Introduction. The Image – A Cultural Technology. A Research Program for a Critical Analysis of Images, in The Technical Image. A History of Styles in Scientific Imagery*, ed. by H. Bredekamp, V. Dünkel and B. Schneider, The University of Chicago Press, Chicago-London 2015, pp. 1-4.

ist such as Gandolfi, will lead to unquestionably good outcomes. Furthermore, his comment on nature and art and olive oil implied that – in his view – refined taste was not something subjective; rather, it was subject to processes of making agricultural produce according to specific qualitative standards, a sort of *ante litteram* DOP. Second, he forged an association between the natural and the artificial, between the natural laws described in scientific and technological treatises and their prescriptive, Baconian implications, highlighting the transformative function of technology on nature and agricultural produce in the creation of national wealth. This is one of the themes at the core of enlightened reformism, that is, the translation of theory into practice, mostly in the framework of the realisation of the happiness of state subjects.

More broadly, Carlandi's discourse leads us to reflect on the contemporary attempts of Pius VI to diversify agricultural productions in the Papal States, by encouraging types of cultivation other than just wheat and various grains. Gandolfi's activities are not only a window into how political economy was constructed and practiced in Eighteenth-century Papal States, but are also a way to monitor conceptions of wealth production within the boundaries of a given State. Although further research should be done to enquire into the effective impact of Gandolfi's interventions with regard to olive oil production on the Doria Pamphilj's lands, we know that his name was not forgotten, and would appear in future Nineteenth-century treatises on olive oil production in Tuscany, the Lombardo Veneto, France, and Portugal. The Doria Pamphilj family placed themselves in line with Pius VI's political economy reforms, by supporting Gandolfi's endeavours and practices, and by encouraging technological interventions and advancements in other sectors, not only agricultural, but also at the intersection between agriculture and manufacturing, such as in the case of silk making practices. More specifically, the function of the Doria Pamphilj in attempting to open up further sectors of production tells us again of their involvement in making the Papal States a competitive economic power, at a time when one of the most pressing concerns of European countries was to be able to attain self-sufficiency and possibly that sought-for trade surplus. Not only they acknowledged the role of scientific practitioners and their material practices in the making of political economic reforms; they also actively participated in the making of such reforms, by covering important roles in the administration of the Papal States landed wealth, and acquiring a direct knowledge on how agriculture was actually made on the ground. A significant example, which would be worth further investiga-

tion, is the direct interest of cardinal Giuseppe Maria Doria Pamphilj in agriculture and husbandry, that is witnessed by the letters to his brother Andrea from France, sending seeds of plants to import to the Papal States, as well as by his manuscript text on the topic of agricultural improvement and, further to this, by the hundreds of letters exchanged with the architect, engineer and gardener Francesco Bettini, who would reorganise, restructure and rethink the Pamphilj's gardens at Porta San Pancrazio in Rome. However, we should not interpret the Doria Pamphilj's interest in science, technology and political economy exclusively in terms of narratives of power and status. Their international diplomatic network, which spanned from Spain to France, to almost all of the Italian peninsula, and which will see a further expansion later in the early Nineteenth century, through family ties, suggests that they did not think themselves in the limited and self-enclosed spaces of their estates. They did not turn the material borders of their lands into hopes and phantasies of self-sufficiency and autarky – nor they used scientific knowledge and practices of patronage as tools to reinforce their position in the administration of the Papal States, or at least not exclusively. Rather, they fully embraced the Enlightened dream of cosmopolitanism, by transforming their patronage endeavours and social international networks into a tool to perpetuate the principles of a commercial society, of the extended patria of the Enlightened Republic of Letters, rooted not only on immaterial ideas but also on contingent and tangible practices of making, exchanging and knowing.