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Infrastructure Financing in the Early Modern Age

The Beginning of a 'Little Divergence'

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2.1 Introduction

The three centuries that link the end of the Middle Ages to the first industrial revolution mark a broad and deep change in the evolution of Western Europe. The conquest of the New World, the Reformation, the scientific revolution, the birth and apogee of the modern state: these were all factors that accelerated the historical process. The growth of the population (which between the sixteenth and eighteenth century increased from 57 to over 81 million) and commercial exchanges, along with the flourishing of cities and the progressive specialization in manufacturing, gave strong impetus to the increase in infrastructure. Transport and travel systems in particular attracted new interest also from the great monarchies, who saw an extensive and well-connected transport network as a pre-condition for unifying and controlling the country.

This chapter focuses on how infrastructure provision was financed and managed in early modern Europe. It describes the emergence of two main patterns in the eighteenth century where England radically diverged from the rest of the continent in terms of infrastructure financing. Section 2.2 concentrates on the progressive centralizing process that took place in Continental Europe. This centralization, due mainly to political absolutism, led to the funding of a wide range of infrastructure by the treasury. New long-distance routes were planned and financed by the state, which employed some of the revenues from taxes and also public debt. However, minor and secondary routes, bridges, and ditches remained the responsibility of local authorities,

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which, according to the ancient ‘adjacent dwelling’ rule under Roman civil law, were obliged to cover the costs of their repair.

Section 2.3 focuses on the infrastructure financing model that developed in England. The political, economic, and institutional revolution that had affected the country since the second half of the seventeenth century encouraged private intervention. The rise of the new turnpikes and the emergence of trustees, who were committed to finance and manage roads and bridges, soon proved more efficient than local justices, marking the passage from public to private enterprises. Trustees along with the private water supply service subsequently developed into more organized bodies, the first joint-stock companies, which would be the driving force of the canal mania between the end of the eighteenth and the beginning of the nineteenth century.

2.2 Financing Infrastructure in Continental Europe: Transfers, Earmarked Taxes, and Public Debt

On the continent, the progressive consolidation of monarchies in the sixteenth century and the state-building process that occurred in the following century made infrastructure a priority on government agendas. A well-connected transport system was considered essential to link the countryside and distant towns to the capital, but also to exercise closer control over the territory and to manage fiscality more efficiently, whilst in the eighteenth century economic goals became prevalent and the transport network became the key factor in the expansion of trade and exchange.

In order to finance the overall growth of expenditure on enlargement of the road network, as well as on the army and the bureaucracy, public revenues had to be considerably augmented, which led to far-reaching changes in the administrative machinery of the state and in the relationship between central government and local communities. Improvements in the methods used to assess and levy taxes, and the attempt to spread the increasing tax burden systematically, were also features that characterized the ‘fiscal state’. Obviously, military conflicts and the resources that they required had been the driving forces behind the emergence of what can be best termed the ‘fiscal-military state’; armies—now standing armies—grew larger, more complex in their composition and structure, and more expensive to maintain.¹ But

¹ Although there is disagreement on the timing of the military revolution (Roberts dates it to 1560–1660, Jeremy Black to 1660–1720), there is a consensus that war in Europe and military establishments were radically different in the eighteenth century compared with the sixteenth century. (Bonney, 1999, pp. 1–14).

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the creation of a well-structured fiscal system furnished an important source of funding also for infrastructure, including roads, bridges, and canals.

On a theoretical level, second scholasticism strengthened the medieval conceptions that a civil community is an institution of natural law (*ius naturale*), and that the state's purpose is to serve the common good. In the seventeenth and eighteenth centuries, iusnaturalism—from Hugo Grotius, to Samuel Pufendorf, and Thomas Hobbes—and Jean Bodin's theory of sovereignty, conferred upon the monarch's ordinances issued for the common good the character of law, which was fundamental for the state, and for that reason inviolable by the king himself. The state became increasingly concerned with works of common interest and public necessity. It established a solid theoretical basis for lawful and legitimate exchanges within the framework of the king's ever-growing fiscal requirements. Although initially limited, public works became the founding elements of nation and regional states.

Likewise, a wider range of transport induced a broad group of merchants and entrepreneurs to become increasingly involved in the building and managing of infrastructure, as well as its financing. Centralizing government departments were created to monitor and maintain the condition of roads and bridges, and to administer highways and minor roads. Private citizens and communities adjoining a stretch of road or who benefited from the construction of a bridge were given the task of repairing and maintaining the road, bridge, or canal according to the ancient 'adjacent dwelling' rule established under Roman law. In the age of political absolutism, the *ius commune* of Roman law was spreading across the continent.² After the Middle Ages, Roman law, which was applied in the Italian territories but coexisted with Germanic law, based on customs and in force in German territories and in northern France, took root in Germany, Spain, the Netherlands, and southern France.

In France a gradual centralizing policy had begun in the sixteenth century, and it increased in the following one when economic affairs started to be managed by the newly created General Controller of Finances (1655). Public works became an urgent matter on the government's agenda, and they were encouraged by the national mercantilist ideology, whose objectives were political as well as military. As a consequence, governments increased their interest in the transport and communication network, and they provided the country with the best road system in Europe. New highways were built according to a radial pattern with Paris at its centre, and they were sponsored

² Many elements can explain the extensive spread of Roman law in the 'common law' regions: the backwardness of 'the common law' compared with developing societies; courts populated by lawyers whose educations were based on the Roman law, which underwent renewal in the twelfth century with *Corpus iuris civilis* by Justinianus; and the Humanistic School linked to the first Italian universities (van Caenegem, 1992).

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by the state through a quota of the salt tax.³ The road system in particular was managed by the state Grand Voyer, Chief Inspector of Roads (Sully at that time), who in 1609 allocated almost 6.5 per cent of total expenditure to building and improving national roads and bridges. He also started the Canal de Briare, which connected the two main arteries of commerce, the Seine and the Loire.⁴ Infrastructure transport achieved new importance with Jean-Baptiste Colbert, who employed large transfers from the national budget to build the 242-km-long Canal du Midi. The canal, completed in 1681, was a crucial link between the Garonne—and consequently the Atlantic—and the Mediterranean, and it was the largest-scale public work sponsored by the monarchy.

New financial instruments were devised to meet the ever-increasing need for capital. Louis XIV, urged on by the rise of public expenses, mainly drained by warfare, used the revenues generated by *tontines* to fund public works as well (De Simone, 2003, p. 34). The *tontine* was a type of investment invented by the Neapolitan banker Lorenzo Tonti who, during his exile in France, presented his plan to Cardinal Mazarin in 1652. The system consisted of a group of subscribers, divided into ten age classes; each subscriber had to pay 300 lire per year to the government. In return, the government would pay 5 per cent of the total collected capital. The annual payment would be subsequently distributed among the surviving subscribers and would finish upon the death of the last subscriber (Weir, 1989, p. 102; McKeever, 2009, pp. 491–521). Yet this system was doomed to failure in the long run.

Additionally, in a state under Spanish dominion like Milan, the public management of roads began to play a significant role during the sixteenth century. It had an important function in the *Novae Constitutiones* (1541), which constituted all the state's laws: it defined the powers conferred on the Judge of Roads appointed by the *Vicario di Provvisione*, the head of the city administration, subject to the state governor's approval. His main task consisted in establishing sections of road (the so-called *fatte*); the maintenance of *fatte* was a duty of *terre* (municipalities) in the Milan countryside. According to these laws, the cost of maintaining the roads passing through the provinces of the Duchy of Milan was borne exclusively by rural communities in proportion to the quota of direct taxes (specifically the salt tax) apportioned to them (in the fourteenth century the cost was 17 per cent, in the sixteenth 14 per cent).⁵

³ In Early Modern Europe the salt tax was a direct tax, even if it derived from an ancient tax levied in proportion to salt consumption (Lay, 1992, p. 112).

⁴ Construction work on the canal was begun by soldiers in 1607 and completed only in 1642 (Crouzet, 2003, p. 51).

⁵ Archivio Storico Civico, Milan, Dicasteri, folder 341–343 (strade); ivi, Località milanesi, 1–461; ivi, Acque. Fossa interna, 1–27; ivi, Acque. Acque, canali, rogge, 1–34; Materie, folders: 55–57; Archivio di Stato di Milano (henceforth Asmi), Acque, folders 1–31.

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At the end of the sixteenth century, numerous attempts were made by the municipalities to persuade the cities to share some of the road repair costs, but in vain.

Within this framework, the management of navigable rivers in the Duchy of Milan became gradually more centralized and direct. Between 1553 and 1562 total revenues from the tolls of *navigli* (city canals) amounted to 88,000 lire, 5–7 per cent of the total; but documents from 1563 show that the entire amount was spent on maintaining and improving the navigation system.⁶ Eight years later, to repair and enlarge the Naviglio Grande it was necessary to sell in advance the revenues from tolls,⁷ which meant no longer receiving those revenues for an unlimited period.

When, in 1593, further work was needed to make the River Adda fully and uninterruptedly navigable, the best way to raise capital was to shift the expenditure onto the city of Milan, which then ran into short-term debt by issuing bills of exchange for almost 12,000 lire.⁸ With the significant innovation of the *pactum de ritorsa*,⁹ these bills of exchange were frequently renewed at the Bisenzone exchange (located in Piacenza from 1579),¹⁰ which created an efficient financial network under Genoese control and brought together several credit markets, such as those of Genoa, Florence, Venice, and Milan (Pezzolo & Tattara, 2008, pp. 1098–122; De Luca, 2012, pp. 114–15; De Luca, 2013, pp. 194–6).

In southern Italy, the Spaniards, who succeeded the Aragonesi in 1500, became directly involved in the road policy, which was mainly intended to stimulate the stagnant domestic market. In 1559, when the Spanish government became aware of the disastrous state of local, provincial, and national communications networks, and once it realized that the private and public owners of the plots of lands through which roads passed would never engage in the necessary repair work (i.e. cleaning the ditches, drainage work), it decided to levy an earmarked tax to cover the costs of maintenance. Earmarked taxes, created for a specific purpose, were at first intended to be temporary, but very often they were maintained to construct other stretches of infrastructure. In this case the tax imposed by the Spaniards consisted in one copper coin (*grana*) per household in all the twelve provinces into which the Kingdom of Naples was divided. The income from this tax was employed to repair roads, bridges, and canals. The tax was regularly collected by local treasurers, but it is still unclear whether all the revenues were used for one specific aim. Improving

⁶ Archive general de Simancas, Estado, 1240, ff. 27–30.

⁷ This is the form of public debt adopted by most of the European countries.

⁸ In this case the two creditors of the city were the local widow Brigida Coira, and the apical cambist-banker, Giuseppe Caravaggio, BNB, manuscript AF XIII, 14, no. 40, 14 May 1593.

⁹ Namely the renovation of a bill of exchange.

¹⁰ Bisenzone was an offshore capital market operating on an international scale.

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the transport system was, however, strongly encouraged. In 1562 the road from Naples to Torre del Greco was modernized and widened; in 1564 a bridge was built between Cava and Salerno; in 1568 the route from Naples to the Kingdom's boundaries was opened with the building of numerous bridges, twelve of them in the territory of Sessa Aurunca. In 1595 the Maddalena Bridge was enlarged; in 1608 a wide bridge leading to the town of Cava was built; and two years later the main road to Benevento was constructed.

The same system was employed in northern Italy in the Republic of Venice. In order to cover the ever-increasing costs of water infrastructures, in 1565 the Senate decided to impose an earmarked tax called *quintello alle acque* to finance hydraulic public works; the tax corresponded to 5 per cent of the inheritance bequeathed by all wills. In 1617 the tax was levied not only on *Stato da Mar* (the city) but also on *Stato da Terra* (the mainland). Two years later, the tax was suspended, but in 1664 it was reintroduced throughout the Venetian dominion and persisted under the Austrian domination until 1799 (Pedani Fabris, 1996, p. 105).

In the first half of the sixteenth century, there emerged several factors (distinct in substance yet equal in form) according to which charging interest on loans became a legitimate practice. On the one hand, the Church, rather than forbidding interest rates entirely, was in favour of 'modest' ones; indeed, the Church itself was interested in taking part in the capital supply. Religious institutions, such as monasteries, convents, and lay confraternities, had abundant liquidity deriving from dowries, donations, and bequests, and loans represented a fruitful and safe form of capital investment.¹¹ On the other hand, the most dynamic legal and mercantile sectors emphasized the productive potential of money in the hands of traders and businessmen. The latter enhanced the common good and were not inclined to usury. The interest rate paid to the underwriters was similar to the rent from real estate. In 1569, with the bull *Cum onus*, Pius V ratified final approval of the *censo consignativo*, a loan backed by real estate, commonly a plot of land, a house, a mill, or some other kind of remunerative estate. This loan was issued through a notarized contract called *emptio cum locatione* confirming its redeemability.¹² By *censi*, ownership of the borrower's property was transferred to the lender in return for the loan; interest was then paid as if it were the rent for continuous use of the property by the borrower (Delumeau, 1959, pp. 870–3; Alonzi, 2005, pp. 86–102). Such contracts provided a fully lawful interest rate ranging from 4 to 7 per cent for a limited time. By means of this type of census, during the seventeenth and

¹¹ Investing in credit activity was also a good alternative to the traditional investment in land. In the sixteenth and seventeenth centuries a cultivated plot of land could yield a return of 4 per cent on average.

¹² It literally means 'sale with lease', and it was a sort of 'fictitious' sale (Corazzol, 1979, pp. 15–16).

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eighteenth centuries communities, institutions, and private individuals from Italy, France, and Spain—mainly Catholic countries—collected money to build and maintain roads, bridges, and canals. Many of the lenders were well-off merchants and businessmen from the bourgeoisie and the aristocracy, as in Verona. At the end of the seventeenth century, after the violent flooding of the River Adige, the city needed to rapidly raise a huge sum of money in order to repair the river banks destroyed by the flood. Part of the capital was provided first by Francesco Manzoni, a nobleman from Padua, with 16,000 ducats at 4 per cent interest rate.¹³ Some years later, the city wanted to extinguish its debt. To do so, it withdrew half of the sum from the city pawnshop and borrowed the other half from another nobleman of Verona, the earl Paolo Zazzaroni, who in those years was also a member of the city administration. Zazzaroni lent almost 9,000 ducats for ten years at 4 per cent, in return for which the city pawned the butcher shops and ghetto houses.

Some of the largest money lenders were religious orders and lay confraternities, which became the most dynamic operators in the supply of capital in both Catholic and non-Catholic European countries. In the mid seventeenth century in Emilia, between northern and central Italy, the *censi consegnativi* provided by convents, confraternities, and lay organizations (e.g. *fabricerie*) provided almost two-fifths of total capital (Cattini, 1988, pp. 255–66). Laws issued by the Venetian Republic in 1602 and 1605, which obliged all religious and pious institutions to sell the real estate that they had received *ob piam causam* within two years, induced religious bodies almost immediately to acquire a large amount of liquidity stemming first from the sale of their real estate (houses and shops in the city centre, and plots of lands in the countryside, which were usually also the most fertile), and second from the bequests and alms of the parishes that thereafter would be in cash. Far from considering money to be inert, not to be used or exploited, friars and nuns did not hesitate to invest their liquidity in credit activities, specifically in *livelli affrancabili* (a type of redeemable loan common in the Venetian Republic, similar to *censi consegnativi*) (Lorenzini, 2009, p. 63). Through these institutions operating in credit market—the ‘Compagnia di San Paolo di Torino’, the ‘Fabbrica del Duomo’ of Milan, as well as the ‘Monastero de San Miguel de Valencia’ and the ‘Congregacion de San Benito de Valladolid’ to mention but a few—the increasingly ‘forced’ savings of dowries and bequests were partly transformed into direct investments in infrastructure.

In eighteenth-century France, renewed close attention was paid to public works—and among them to the transport network—marking an important step forward in infrastructure building. In 1716 the *École Nationale des Ponts et*

¹³ Archivio di Stato di Verona (henceforth Asvr), *Notarile*, Gio. Francesco Vidali e Domenico Moretti, folder 11295, contract dated 10 February 1681. One ducat equalled 6 lire and 4 soldi.

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Chaussées, which gathered the highly specialized engineers, was founded through the school, and the state took control of building and managing roads and bridges. In the 1730s, a general project of royal roads was drawn up. Works were planned and funded by the *Intendants*, who used compulsory labour by the peasantry, resorting to the ancient *corvées royale*. At the end of the century France had almost 40,000 km of roads. The state intervened in the improvement of the transport network for economic reasons but also strategic ones. As Crouzet pointed out, 'better roads meant faster movements of troops, to the frontiers or to places where disturbances broke out. The star-shaped road system that radiated from Paris was not entirely in agreement with the needs of trade' (Crouzet, 2003, pp. 51–2).

A similar centralizing policy in building and managing infrastructures was pursued in the eighteenth century by Spain, which wanted to follow the French model. The main objective of the Spanish Crown was political unification and control of the territory. The map of the new road network had a radial shape with Madrid at its centre. In 1747 the Real Cédula issued by King Ferdinand VI stated that highways would be financed by the Crown: this was the first time in the history of Spain that the state assumed direct financial responsibility for road construction (Bel, 2010, pp. 6–7). Before this measure, the costs of the transportation system in Spain had been based on the Roman law according to which the municipalities were responsible for maintenance and subsequently had to cover the costs. But incomes were insufficient to fulfil the king's plan, as the limited trade traffic did not generate enough revenues for municipalities to bear the costs of their investment (Bel, 2010, p. 7). Under Ferdinand VI, expenditure on the road network was divided into two: the main roads were the concern of the Crown, while the secondary roads had to be funded by those who benefited from them, primarily the municipalities (Bel, 2010, p. 8). This principle persisted under the governments that followed. In 1761, King Carlos III introduced a new road plan that defined six main radial roads starting from Madrid that would be financed by the Treasury. In order to raise new capital, a specific national salt tax was imposed. This tax was expected to be in force for twenty years, but it remained until the beginning of the nineteenth century.

In the rest of the continent, however, the process of centralization, reorganization, and intervention in the infrastructure sector reached its peak under the Enlightened Absolutism that characterized most of the European countries during the second half of the eighteenth century. During that period, the central power strengthened its reforming capacity, coordinating the modernization of the state through an efficient bureaucracy and a varied cultural and rationalist patrimony.

The Enlightenment forced governments to act for the common good. Albeit in different ways and with different results, economic development and the

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expansion of productive forces were among the main goals of these states, as key factors in 'public happiness' and indispensable conditions for increasing the state revenues required by growing war needs. All sectors were involved in pursuing these aims: in the second book of Baldassarre Scorza's *Discorsi* on the commercial balance sheet of the state of Milan, after the equalization of taxes, the payment and elimination of public debts, the vigilance on public administration, privatization of common lands, and tax exemptions, we find the '*aprimiento di nuovi canali, e l'adattamento della private e pubbliche strade*' (the opening of new canals and improvement of private and public roads) (Scorza, 1938, p. 166). The continent, still with absolute governments, paid close attention to infrastructure works like streets, harbours, and canals, the aim being to liberalize trade and create new commercial sectors, thereby sustaining their economies. In the Habsburg Empire, Prussia, and France, as well as in the states of the Italian peninsula, intervention in these sectors became one of the priorities of the political economy even though it was managed in different ways. In the Habsburg Empire, during the reign of Joseph II, toll leaseholders were introduced for the main roads, but this proved a mistake due to the notorious lack of contractors to service those routes.

In the state of Milan, for instance, where the Habsburgs of Austria succeeded the Spaniards at the onset of the eighteenth century, the road infrastructure network was reclassified—in 1770—into main or provincial roads, communal roads, and private roads, and the expenditure for maintenance was more evenly distributed by involving the cities as well. All the costs of the provincial roads, that is those radiating from the cities to the provinces, had to be covered by the provinces; the costs of the communal roads, that is those not considered to be provincial, had to be borne by the communes (and therefore also the cities were charged) and, eventually, private roads by their users. The intense programme of road restoration and construction—which created a road network that spread through the entire state within twenty years and which initiated improved delivery of the works needed—was linked to replacement of the system of *fatte* charged to the *rustici* (the village inhabitants), with that of tolls and earmarked taxes contracted out to local and active entrepreneurs.¹⁴ Again, it was the state of Milan that directly bore the costs of building a new road system, serving long-distance commerce, digging new canals, and creating new bridges by using the state revenues. Expenditure on public works rose six-fold between 1761 and 1794, increasing from 0.84 to 5 per cent of total revenues (Bianchi, 1978, p. 192). Most of the costs were absorbed by the building of streets and canals for the trade in goods, which had sometimes been continued as sort of grants provided to private citizens. In the 1760s and 1770s huge investments were made by the government in

¹⁴ Asmi, *Dispacci reali*, cart. 256, 13 February 1773.

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developing and improving the harbour of Mesola, in order to provide a direct link, via water, to the Habsburg port of Trieste and the Danubian Basin, but the mercantile flow to the Adriatic town never fulfilled expectations. In 1777 the Paderno canal was opened, having been started four years earlier. It connected Lake Como with the Martesana canal leading to Milan; while the Naviglio Pavese, which had been started in 1773, remained only a project until the age of Napoleon (Bruschetti, 1821, pp. 71–130).

In 1777 a paved road from Maloia to Engadina opened which facilitated trade with northern Europe. It was part of a more extensive road network linking the countries under Austrian rule which had another important benchmark in the Abetone road between Pistoia and Modena.¹⁵

The imposition of taxes or the collection of tolls were often controversial decisions for governments, and the choice of one measure or the other provoked heated debate. For instance, territories that in the eighteenth century were under the dominion of the Prince-Bishop of Trent (part of the Empire), specifically Trent and its valleys (today Italian territories), discussed how to cover the costs of a stretch of the Imperial route connecting the German territories to the Italian peninsula, which for this reason performed a very important commercial function. The road had to be repaired and it entailed very high costs. Consequently, the debate concerned whether to increase the toll at the bridge in Lavis (a village in the territory of the Prince-Bishopric) or to impose taxes on the adjacent communes. Tolls were strongly opposed by merchants, who believed that they would increase goods prices, so that their goods would become less competitive than foreign ones. In 1754, the chancellor (*cancelliere aulico*) Alberti Poia, on his return from Innsbruck, addressed the problem of the toll usually charged at the Lavis bridge, on the border between Tyrol and the Prince-Bishopric of Trent, and the need to suspend and eventually eliminate that burden.¹⁶ The work required to repair the stretch of the Imperial route from Campotrentino to Gardolo would imply high costs that, according to Poia, the city of Trent could not afford.¹⁷ The chancellor presented two alternatives. The first was to allow the commune of Trent to use the 15,000 *fiorini* that the Habsburg government promised to give to the city; in this way the city would be able to eliminate the toll and cover the costs with this capital. The second solution was to widen and improve access to another road passing through Meano (3 km distant from Gardolo

¹⁵ Asmi, *Dispacci reali*, cart. 249.

¹⁶ The 'Via Claudia Augusta' was built in the first century BC by the Roman general Druso and completed by his son Claudius. It was a crucial route connecting the Roman regions to the German territories. Starting from the Adriatic Sea, it passed through the present-day Veneto, Trentino, Alto-Adige, Tyrol, and Bavaria. Although alternative and new roads were built during the Middle Ages, the Imperial route was maintained and became an important route for trade and business.

¹⁷ Archivio di Stato di Trento (henceforth Astn), *Libri copiali*, 1754.

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and 2 from Lavis). The Judiciary of Trent, for its part, decided to offer 10,000 *fiorini* to cover the costs of restoration.

Some years later, in 1772, the Prince-Bishop of Trent, Cristoforo Sizzo de Noris (1763–76), told the Captain of the Non and Sole valleys, Earl Felice D’Arsio, how to finance repair of the road connecting the two valleys. The bishop stated that imposing a *tantum*, an earmarked tax, would allow elimination of the toll, which was considered a hindrance to traffic.¹⁸ There were in fact two roads leading to Trent: the first passed through the commune of Mezzolombardo, but it was very rarely used because it was much longer and had traffic only when there was an overflow of the River Adige. Using that route would require paying pontage on the bridge at Saint Michele. The second road was the much shorter one through Porto della Nave. This road required passing through a short stretch of the Imperial route and the toll charged was just 1 *carantano* per horse.¹⁹ The road was used mainly by horses, not by coaches or carts, which—the Prince-Bishop argued—meant that damage to the road was relatively minor. The commune, and above all local merchants, asked that the toll for that stretch of road not be increased, as it would increase the prices of goods, which would consequently become less competitive: ‘Increasing the road tolls for citizens, who are already burdened by other impositions and already impoverished, would be intolerable for them. It would also make Trent uncompetitive with neighbouring countries. Commerce would suffer from the levying of tolls at Rocchetta and Lavis.’²⁰ An increase in the toll was therefore considered harmful for traffic, trade, and the local economy. Indeed, choosing to use taxes instead of tolls to finance public infrastructures meant shifting the costs from a single group of people, mainly merchants, to the entire community.

In the same years (1779), in nearby Verona, at that time still under the Republic of Venice, the captain of the city, Francesco Donà, sent a report to Venice denouncing the poor conditions of two important roads (one leading to Salò, the other to Vicenza).²¹ The costs of the works would have been borne by the territory, which would distribute the costs among the communes adjacent to the road; the exact amount (the so-called ‘*carato*’) would be calculated according to the miles of road that concerned the

¹⁸ The document states: ‘*fissare l’idea che ad una contribuzione da prestarsi una tal volta per tempo [una tantum] ed in tal guisa sottrargli dal pedaggio [...] al miglior vantaggio di codesti sudditi*’, Astn Libri Copiali, Serie II, vol. 56, c. 33 *recto*.

¹⁹ The *carantano* was the sixteenth part of the *fiorino*.

²⁰ Literally: ‘*Accrescendosi il dazio stradale, questo congiunto con gli altri aggravi derivanti dalla natura della loro situazione ne forma un peso intollerabile al suddito altresì mendico e mette inoltre Trento e li confini d’Italia fuori di concorrenza con li paesi superiori finitimi a dette Valli e ne patirebbe quindi l’attuale commercio non senza pregiudizio de dazi della Rocchetta e Lavis e del Stradale medesimo*’, Astn Atti trentini, folder 133, Affari edili, 7, c. 37.

²¹ Asvr, Antico Archivio del Comune, folder 30, 337, In materia di strade, 1779 (letter sent by the captain of Verona Francesco Donà to the Venetian government).

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community. Some months later, on 26 September, Donà sent a second letter to Venice emphasizing the urgent need for intervention. A good and solid transport system was considered a prerequisite for the expansion of traffic, and Verona was a crucial crossroads connecting northern Europe with the Italian peninsula.

In the eighteenth century, in an area politically divided, like the Italian one, and made up of several small independent states, a good road network was considered a priority for commercial purposes, rather than for political reasons. There was awareness that a good communications system was the key to commercial and economic growth: 'Given a route so frequented by subjects and foreigners, and with the praise afforded to trade, which owing to the poor conditions of the roads suffers delays and burdens absolutely more incommodious than a toll, reimbursement of the costs of repair and maintenance should be instituted.'²² In areas that were economically vibrant and where merchants constituted a strong group, the toll system to fund the repair and building of roads was usually hindered because it was considered harmful for trade; taxes were conversely better accepted and preferred.

But tolls were very commonly used in Alpine roads, which in the eighteenth century drew new attention from governments who considered them a way to optimize trade between communities. The first significant roads were built in 1591 by the Duke of Savoy Carlo Emanuele, who had a mule track cleared in the Tenda pass and improved in 1782 for vehicles. Soon afterwards, Emperor Joseph II ordered the construction of a new road in the Arlberg pass, which was restored in 1793. Some years earlier, in 1765, the Archbishop of Salzburg ordered the opening of the Mönchberg to wagons and coaches. The road running from the Saint Giacomo valley up to the Spluga pass—the so-called Cardinello road (Riedi, 2007, p. 29)—was conversely built by a private merchant and entrepreneur, Thomas Massner of Coira. Massner was helped by the public authorities (The Three Leagues) but was charged with managing and maintaining the road. To meet the construction and maintenance expenditure, he levied tolls on passengers. According to Roman civil law, these costs were usually to be met by citizens. This rule was followed also in the reigns of the Merovingians, Franks, and Carolingians, who considered roads to be public goods to be built, repaired, and maintained at the expense of citizens. Between the twelfth and fourteenth centuries the *Geleitregal* (also called *ius conductus*) was established to define the rights and obligations of subjects in relation to road maintenance, toll collections, transport, and safety. Originally, the privilege pertained only to kings, but then shifted to territorial governors,

²² The document states: '*in faccia d'un transito così frequentato da sudditi ed esteri e nell'aver in questa parte felicitato il commercio, il qual dall'imperfezione delle strade risente un ritardo e un aggravio di condotte assolutamente più incomodo di quello sarebbe un pedaggio, che volesse instituirsi al rimborso della spesa occorrente al ristauero e mantenimento*', Asvr, Antico Archivio del Comune, folder 30, 337.

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such as the Prince-Bishop of Chur. Towards the end of the fourteenth century the prerogative acquired co-management and veto rights. After the decline of the bishop's powers and feudal authorities in the sixteenth century, the commune claimed the rights and obligations of the *jus conductus*. The road was used mainly by merchants (it was the shortest route from Milan to Lake Constance, and from Coira to Chiavenna), and it was enlarged during the Middle Ages. It is very likely that the maintenance and repair of the route was financed by part of the revenues paid for passage. For transportation, merchants had to pay three or four tariffs: the normal transport tariff, an extra tariff to be paid in winter (for the damage caused by snow), the *Fürleiti* (i.e. the tariff for every package (*collo*) of goods transported), and the *Zoll* (toll) in Splügen and Reichenau (Riedi, 2007, p. 33). For goods transported for personal use, only the toll had to be paid. In the eighteenth century an alternative road was constructed by the abovementioned entrepreneur, Thomas Massner, who in 1708 presented the project to the federal diet. The plan was almost immediately approved and represented the first road financed by the Three Leagues. The work was co-financed by the extra price of 10 *Kreuzer* (per package) paid on goods transported to Chiavenna. The stones for the road surface and the walls were provided by the valley dwellers (Riedi, 2007, p. 29). Massner personally collected the extra tariffs and managed the financial aspects of the project. He was also appointed by the Three Leagues to manage the *Hausegeld*, that is, the coffer of the tolls on goods in transit, as well as the treasury of the Three Leagues. Once the road had been completed,²³ the 10 *Kreuzer* of extra tax remained, and was invested in the building of new roads, such as part of the Via Rofla (1723), the Via Viamala (1733), the two stone bridges on the Via Viamala (1738–9), the maintenance of roads and bridges in the Saint Giacomo valley (1755), and the wooden bridge of Thusis (1757) (Riedi, 2007, p. 34). The Cardinello road represents one of the first and successful private and public partnerships in infrastructure.

2.3 The Emergence of Turnpikes and Companies in the Land of the Financial Revolution

In England, the government's growing concern with the infrastructure issue, which defined the Early Modern age, assumed features very different from those on the continent and was bound up with the great expansion that took place in the last quarter of the eighteenth century. England was undergoing an institutional and political evolution that was much more advantageous to the economic process than in continental countries. Already by the end of the twelfth century, the king's court had created a national and unique law based

²³ The road was started in 1710 and finished in 1714.

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on customs, *customary law*, which was ‘common’ to the English kingdom and hindered the spread of European *ius commune* (van Caenegem, 1992, chap. 3). Being much more flexible and adaptable to social changes—customary law is a regulated justice based on changing habits and established by precedents that become patterns for future cases, rather than on compliance with a set of laws which can be modified only after a very long period—this type of law progressively reinforced the protection of private interests against other interests, but also against the state’s obtrusiveness. It simultaneously imposed rules on respect for a general or common interest. After enactment of the Magna Carta in 1215, the English monarchy became progressively less absolute. The Tudor dynasty, which succeeded the Plantagenets in 1485, ruled with respect for the parliament’s prerogatives, which represented the interests of a very active aristocracy and an enterprising mercantile class.

The Tudors’ statutes, which had given each parish responsibility for repairing all its roads, soon proved inadequate for the highways used by long-trade merchants and wagoners. As commerce developed, the growing numbers of heavy carts and carriages caused severe damage to those roads which could not be remedied by the piecemeal approach to road maintenance based on the parish financing of main road improvements using local taxes (Pawson, 1977, pp. 70–92). An alternative method was introduced to coordinate efforts on a single road passing through several parishes: in 1663 an Act of Parliament gave the local justices powers to erect toll gates on a section of the Great North Road between Hertfordshire and Huntingdonshire. This provision was quite forceful, and in that year the first tollhouse was opened at Wadesmill to the north of London. The toll served mainly for the road used by numerous malt wagons from outside the parish (Lay, 1992, p. 105).

Yet tolls were easily evaded, with the consequence that they were suspended for some time.²⁴ In order to deal with the problem of evasion, in 1695, during the reign of William III, the first Turnpike Act was issued: this allowed the erection of barriers—that is ‘pikes’ on the example of military barriers—at the beginning of roads (Lay, 1992, p. 106). The act appointed toll collectors to levy the fees with which they were obliged to maintain and repair the roads. They were also authorized by order of the Justices to borrow money at 5 per cent, on security of the tolls.²⁵ The fees charged were proportional to the number of haulage animals being used.

In 1706 the first act giving toll powers to independent bodies of trustees, rather than to local justices, was issued. This marked the passage from public

²⁴ Tolls were frequently levied also on bridges and were much more preferred because they were easier to collect and more difficult to evade (Lay, 1992, p. 105).

²⁵ Secretary of State (1852), pp. 4–5.

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to private enterprises (Lay, 1992, p. 105). Under this scheme, turnpike trustees would manage resources from the several parishes through which the roads passed. They would augment these resources with tolls from foreign users and invest the profits in maintenance of the main roads. This became the pattern for the creation of turnpikes on a growing number of roads by authorities wanting to improve the flow of commerce through their part of a county. The proposal to turnpike a particular section of road was normally a local initiative, and a distinct Act of Parliament was required to create each trust. The act gave the trustees responsibility for maintaining a specified part of the existing highway, and the right to collect tolls from users of the road. Local gentlemen, clergy, and merchants were nominated as trustees. They in turn appointed a clerk, a treasurer, and a surveyor to manage and maintain the streets, who were paid directly by the trust. Trustees were not remunerated in order to prevent rent-seeking because of their monopoly of the service; they received indirect benefits from the better transport system, which improved access to markets and led to increases in rental income and trade. Parliament also pursued more indirect strategies by allowing competing trusts to enter the market and by requiring trustees to own property.

The strength of the turnpike system consisted in the fact that the better turnpikes provided more effective road maintenance than did the parishes. Consequently, road haulage costs declined significantly in the first half of the eighteenth century. The turnpike system spread widely, and road travel consequently increased in parallel during the eighteenth century: in the years between 1751 and 1771, the British Parliament passed about 870 separate turnpike acts during the 'turnpike mania'; over half the total turnpike length was constructed during this period (Lay, 1992, p. 106). A further stimulus for turnpikes came from the development of the post office. After 1784 coaches replaced the usual postboys riding horses who provided a faster service (Lay, 1992, p. 108). Although trusts initially organized the collection of tolls directly, it became common for them to auction a lease to collect tolls. The grant of a trust was normally limited to twenty-one years, after which it was assumed that responsibility for the now-improved road would be handed back to the parishes (Pawson, 1977, pp. 70–92).

In 1688 the Glorious Revolution and the Bill of Rights made England a constitutional monarchy in which public finance was under the control of the Parliament. There ensued the so-called 'financial revolution' which gave rise to significant innovations; first, the funded public debt (cushioned in the balance sheet) managed by the Bank of England, which obtained monopoly on the issue of banknotes; second, the introduction in 1696 of the balance sheet of the Exchequer; third, the negotiability and transferability of public bonds; fourth, the nationalization of tax collection and rationalization of the monetary system through the creation of the Gold Standard.

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Yet the introduction of toll gates was resented by some local communities that had freely used the routes for centuries and were suspicious of abuses by trustees.²⁶ In eighteenth-century Britain, nearly 1,000 turnpike trusts were established along 20,000 miles of road, resulting in one of the most expensive toll road networks in history, which connected roads over new bridges and new routes in the growing industrial areas. As Dan Bogart pointed out, turnpike trusts spent between ten and twenty times more than the parishes, which previously relied obligatorily on local taxes (Bogart, 2005, p. 483). As a consequence, they were less likely to undertake road improvements that largely benefited road-users passing through their jurisdiction. Turnpike trusts addressed this problem by levying tolls and thereby forcing road-users to contribute to the costs of investment. Moreover, trusts improved coordination by replacing a multitude of parishes with a single body of trustees who could direct investment over an entire roadway or a network of roads. By solving the borrowing constraints faced by parishes, they could issue debts at a low cost and resolve intra-parish disputes between labourers and landowners concerning the level of investment and the relative tax burden paid by each group, transferring control rights to local property owners, who had a common interest in financing investment.

In this period, a cluster of innovations in the English road sector embraced developments in wagon and carriage design, changes in the techniques of road building, improvements in horse breeding, and increases in form-size (Bogart, 2005, p. 483). The cumulative effect of all these innovations was a 40 per cent reduction in freight charges, a 7.5 per cent reduction in passenger fares, and a 60 per cent reduction in passenger travel times. Turnpike trusts contributed half of the 40 per cent reduction in freight charges during this phase; they represented a pattern of organizational change that helped lower costs and improved the quality of services. By satisfying existing demand for road transport services, they met the needs of the expanding economy. Moreover, they were able to reduce freight charges and travel times, augmenting as a consequence demand for such services (Bogart, 2005, p. 480).

However, the institutional and organizational change of infrastructure financing that had enormous consequences also on modern economic growth was the evolution of the joint-stock company in England. By developing regulated companies for major activities, and limited partnerships, which were inherited from the Italian finance of the Renaissance, from the late sixteenth to the beginning of the seventeenth century in England, France, and the Netherlands, state-granted monopoly rights were issued with transferable shares in joint-stock form. The reliance

²⁶ In *The Wealth of Nations*, Adam Smith suggested that abuses by trustees made the tolls twice as heavy as was necessary for the road network maintenance (Bogart, 2005, p. 489).

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on joint-stock introduced distinct advantages in mobilizing capital, by lowering transaction costs (in particular information and agency costs reduced by more valuable communication flows and good techniques for monitoring performance) and by enhancing investor liquidity (Barron Baskin & Miranti, 1997, p. 60). Throughout the seventeenth century, leading overseas joint-stock companies prospered because they were able to achieve previously unfeasible economies of scale and scope in their operations by converging a huge amount of capital on a single initiative (Barron Baskin & Miranti, 1997, p. 61). In 1720 the collapse of John Law's *Compagnie du Mississippi* in France and the South Sea Bubble in England—both of which demonstrated the limits of joint-stock equity conversions as means to lessen huge public debt levels—had different repercussions on the development of finance in the two countries. In France, the disruption provoked profound distrust in all financial activities, while in England, the panic induced the state to intervene by reorganizing rather than liquidating the endangered financial institutions. In England the Bubble Act, issued on 11 June 1720, imposed severe restrictions on the formation of new joint-stock companies, and for over a century new businesses were organized primarily as partnerships or joint venture associations (some historians maintain that this may have slowed down the progress of industrialization).

A remarkable exception to this general prohibition was the use of the joint-stock form for the construction of canals and related enterprises during the mid eighteenth century. The need for efficient internal transport improved river navigation from 1660 to 1730; merchants and entrepreneurs who became involved in navigation had to compete with millers who conversely favoured dams, fishermen opposed to weirs, and urban centres and villages on other rivers opposed to the deviation of waterways or loss of trade. Despite such successes as the Aire and Calder Company linking Leeds with the inner area by canal boat to Hull on the coast, river improvement was insufficient (Kindleberger, 1984, pp. 197–8).

In the second half of the eighteenth century, canalization had therefore been started, and the first wave of joint-stock companies in England under the Bubble Act began, opening the way for their increasing use in the nineteenth century.

The Duke of Bridgewater's canal—which connected the coal mines on his estates to Manchester and was completed in 1761—spurred the movement. Between 1730 and 1790, canals in Britain doubled in length and reached 2,200 miles. Demand was largely for the transport of coal, which could not be moved economically by road, while deviations from the restrictive policy on joint-stock formation were tolerated owing to the quasi-public nature and size of the enterprises, as well as the impeccable backgrounds of their chief sponsors, who were often noblemen (Ward, 1974, pp. 19, 156–72). The initiative was taken mainly

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by local landowners (and especially by the local—not London—mercantile community), who provided most of the capital. Industrialists, such as Bolton and Watt and Wedgwood, were greatly interested in promoting the canal system so that they could move their products more cheaply and more safely.

Between 1791 and 1794, eighty-one acts were passed allowing the construction of canals. Then the ‘canal mania’ exploded due to the sharp decline in the returns on consols after the American War of Independence and the outflow of capital from France caused by the Reign of Terror in early 1793. The forty-two new canals cost £6.5 million and the original share denominations were large: £200 was the prevalent share, those of less than £50 each were rare. But speculation was infrequent: at least 56 per cent of the original shareholders buying shares after 1789 retained ownership in 1800 (Kindleberger, 1985, p. 198).

In France, the state played a different role in promoting navigation ways, and infrastructure as a whole, and most of the canals and routes were realized by public and private intervention (Skempton, 1958, p. 454), as shown by the case of Pont de la Mulatière (1766–1915) analysed by Hugh Goldsmith.²⁷ The project was promoted and financed by Antoine-Michel Perrache, who gathered a group of investors and in 1771 created a specific company, namely the Compagnie Perrache. The bridge crossed the River Saône in the city of Lyon. Notwithstanding the initial scepticism of citizens, the project was approved and the state granted some plots of land. When Perrache died, after some years the company was taken over by his sister who, together with the Comte de Laurencin, borrowed funds in order to complete the project. Construction of the bridge, made of wood, was completed in 1782, but in only the next year it was destroyed by a flood. In 1784, King Louis XVI signed a treaty according to which he would build a new bridge made of stone. In 1789, when the French Revolution erupted, the works were suspended, but soon afterwards, following a new treaty, the bridge was finally built. To finance the project, future tolls were used under a ninety-nine-year lease. Construction of the bridge finished in 1792. Capital was collected through the issue of up to 880 shares for 500 livre each, potentially raising an additional 440,000 livre. The shares were at a fixed interest rate of 6 per cent plus a 20 per cent premium when the share was bought back by the company.²⁸

Although broad, impersonal financial markets had emerged to facilitate the sale of government debt obligations, they slowly became accessible to

²⁷ A railway line connecting Lyon to Saint-Étienne was subsequently built by the Segun Company. After twenty years (1846) a new bridge was constructed. In 1860 the city removed the toll and let long-term maintenance contract. In 1915 the bridge was newly built and financed by the state, see H. Goldsmith, *Le Pont de la Mulatière* (mimeo).

²⁸ Ibid.

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corporate securities during the last decades of the eighteenth century and the early ones of the nineteenth because of the quasi-public nature of the first issuing entities: canals and early railroad companies. Before 1800, many corporate bodies had been formed to undertake specific public functions; corporations were also effective mechanisms with which to blend the economic interests of the state and private groups in a mutually beneficial manner. The distinction between public and private corporations was not sharply defined at that time. The early canals in Europe were considered to be public improvements whose establishment was vital for enhancing the local economic system. This often motivated prominent local leaders to encourage promoters of new canals and railroads to serve their towns and to persuade their neighbours to support those projects by purchasing the securities of the companies.

2.4 Concluding Remarks

The Early Modern age was a milestone in the infrastructure endowment of Western European countries, and the ways in which it was sponsored and managed gave rise to different patterns of infrastructure financing. Recent studies have pointed out the 'little divergence' (Van Zanden, 2009) that occurred in pre-industrial Europe, causing north-western countries to diverge from the rest of Europe in their economic growth process. This chapter has shown that a 'little divergence' also took place in the systems adopted to finance infrastructure, in particular roads, bridges, and canals. This gave rise to two main patterns. On the continent, the rise of absolute monarchies and the persistence of civil law led to the progressive centralization of the financing and managing of public works. The increasing costs of building and maintaining new highways were covered directly by the state, which employed transfers from the national budget, earmarked taxes, and public debt. Conversely, in the countryside the communes remained responsible for repairing and managing the stretch of road, waterway, or bridge that passed through their territory, according to the 'adjacent dwelling' rule under Roman law. The communes, usually highly indebted, used tolls and further debts. The employment of tolls raised heated debates, especially along trade routes. Merchants firmly resisted the imposition of tolls that had to be paid only by users, who were mostly merchants. For this reason, they considered tolls to threaten the competitiveness of their exported goods, and they were in favour of taxes, which implied distribution of the costs to the entire community.

In England, by contrast, the toll system spread widely, and it developed its own model of infrastructure financing. After the second half of the seventeenth century, at the beginning of the political, institutional, and financial

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revolution, the newly created Parliament started issuing numerous acts on tolls that gave local justices the power to levy them. Yet they proved inefficient in the management of roads and bridges. The first turnpikes were then created and controlled by independent bodies of trustees that substituted local justices, marking the passage from public to private enterprise. The strength of the turnpike system consisted in providing more effective route maintenance than did the parishes. Consequently, road haulage costs declined significantly in the first half of the eighteenth century. Trustees, along with private water supply services, represented the initial step toward the future joint-stock companies that triggered the canal mania at the end of the eighteenth and beginning of the nineteenth centuries, and were the prelude to modern finance.

However, a mixture of public and private intervention was possible and present also on the continent, as the case of the Cardinello road in the Alps demonstrates. At the beginning of the eighteenth century, a private merchant-entrepreneur Thomas Massner projected a new and alternative route across the Alps. He obtained the help of the Three Leagues, which gave him permissions and funds to build and manage the road.

It is apparent that the political, economic, and institutional framework in which the European countries were embedded was mainly responsible for the different solutions adopted, even though the different financing systems circulated and were widespread within the continent.

Historical evidence proves that each wave of infrastructure financing innovation was based on prior techniques and instruments, for example earmarked taxes stemmed from tax and fiscal states, and joint-stock companies from silent partnerships and regulated companies. This does not mean that the new instruments entirely replaced the old ones; very often they coexisted and were somehow complementary. Yet the different contexts were discriminating: the same financing system that proved successful in one country could fail in others, or even in other parts of the same state. For instance the introduction of toll-contracting in the Austrian Crown lands turned out to be a disaster, while it produced thriving outcomes in Austrian Lombardy. Likewise, the creation of joint-stock companies proved a failure in eighteenth-century France, while they successfully spread and developed in England.

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